FINAL

INTEGRATED NATURAL RESOURCES MANAGEMENT PLAN FOR NAVAL WEAPONS STATION SEAL BEACH DETACHMENT FALLBROOK

SAN DIEGO COUNTY, CALIFORNIA

31 MAY 2016

U.S. Department of the Navy
Naval Weapons Station Seal Beach
Detachment Fallbrook
700 Ammunition Road
Fallbrook, CA 92028

Prepared by:
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INTEGRATED NATURAL RESOURCES MANAGEMENT PLAN
For Naval Weapons Station Seal Beach
DETACHMENT FALLBROOK
Fallbrook, California

APPROVAL

I approve this Integrated Natural Resources Management Plan (INRMP) as an official management representative for the Naval Weapons Station Seal Beach with the level and authority necessary to commit and/or coordinate resources to fully implement the Plan.

Approving Officials-U.S. Navy, Navy Region Southwest

M.H. Hardy
Captain, U.S. Navy
Commanding Officer
Naval Weapons Station Seal Beach

7/22/2016
Date

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For Naval Weapons Station Seal Beach
DETACHMENT FALLBROOK
Fallbrook, California

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Approving Officials-U.S. Navy, Navy Region Southwest

LCDR Raymond Oviedo, P.E.
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INTEGRATED NATURAL RESOURCES MANAGEMENT PLAN
For Naval Weapons Station Seal Beach
DETACHMENT FALLBROOK
Fallbrook, California

APPROVAL

This Integrated Natural Resources Management Plan (INRMP) was prepared under the direction and coordination of the following Environmental and Natural Resource Managers who certify that it meets the requirements for the INRMP in accordance with the Sikes Act (as amended), DoDINST 4715.03, and OPNAVINST 5090.lD, and thereby recommend for approval and implementation.

Approving Officials-U.S. Navy, Navy Region Southwest

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INTEGRATED NATURAL RESOURCES MANAGEMENT PLAN
For Naval Weapons Station Seal Beach
DETACHMENT FALLBROOK
Fallbrook, California

APPROVAL

This Integrated Natural Resources Management Plan (INRMP) fulfills the requirements for the INRMP in accordance with the Sikes Act (as amended), DoDINST 4715.03, and OPNAVINST 5090.ID. This document was prepared and reviewed in coordination with U.S. Fish and Wildlife Service and California Department of Fish and Wildlife South Coast Region in accordance with the 2013 Memorandum of Understanding for a Cooperative Integrated Natural Resource Management Program on Military Installations.

Concurring Agency-U.S. Fish and Wildlife Service

G. Mendel Stewart, Field Supervisor
U.S. Fish and Wildlife Service
Carlsbad Fish and Wildlife Office
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Carlsbad, California 92008

June 29, 2016
Date

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INTEGRATED NATURAL RESOURCES MANAGEMENT PLAN
For Naval Weapons Station Seal Beach
DETACHMENT FALLBROOK
Fallbrook, California

APPROVAL

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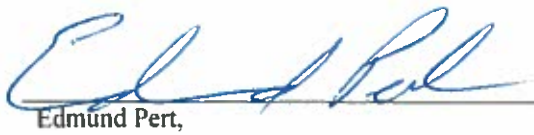
Concurring Agency-California Department of Fish and Wildlife



7-8-16

Edmund Pert, Date
South Coast Regional Manager
California Department of Fish and Wildlife
3883 Ruffin Road
San Diego, CA 92123

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INTEGRATED NATURAL RESOURCES MANAGEMENT PLAN
For Naval Weapons Station Seal Beach
DETACHMENT FALLBROOK
Fallbrook, California

APPROVAL

The National Marine Fisheries Service has reviewed the Naval Weapons Station Seal Beach Detachment Fallbrook Integrated Natural Resource Management Plan (INRMP), and provided comments to the Navy concerning the NMFS trust resources that are described in the plan. NMFS agrees that, if revised in accordance with the comments provided by NMFS, the plan, Chapters 3 and 4, in particular, endeavor to promote the conservation, protection, and management of fish and wildlife resources, as further elucidated in 16 U.S.C. § 670a(b).

Our agreement discussed above should not be taken to signify consultation or compliance with any applicable federal law (e.g., ESA, MMPA, FWCA, MSA) or regulations regarding NOAA trust resources, nor is it a substitute for compliance with any such laws or regulations. If the Navy determines that the projects implemented under this INRMP or management strategies identified in this INRMP (1) constitute federal actions that may affect listed species under NMFS jurisdiction or their critical habitat, (2) may adversely affect any essential fish habitat, or (3) otherwise require consultation under the FWCA, such projects or management strategies would require consultation.

Furthermore, the agreement discussed above shall also not be interpreted as an automatic preclusion of Naval Weapons Station Seal Beach Detachment Fallbrook lands or marine habitats from consideration for designation as critical habitat under the ESA. Any such preclusion would be considered during the regulatory processes associated with the designation of critical habitat.

14 July 2016
Date

William W. Stelle, Jr.
Regional Administrator
National Marine Fisheries Service
7600 Sand Point Way Northeast
Seattle, WA 98115

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EXECUTIVE SUMMARY

This Integrated Natural Resources Management Plan (INRMP) provides Naval Weapons Station (NAVWPNSTA) Seal Beach Detachment Fallbrook (Detachment Fallbrook or Detachment) with a viable framework for future management of natural resources on lands it owns or controls. The primary purpose of an INRMP is to ensure that natural resources conservation measures and military operations on the installation are integrated and consistent with stewardship and legal requirements. Required by the Sikes Act (16 U.S. Code [USC] § 670 et seq., as amended), the INRMP is a long-term planning document for the U.S. Department of Defense (DOD) to guide the installation commander in the management of natural resources to support the installation mission, while protecting and enhancing installation resources for multiple use, sustainable yield, and biological integrity.

The Sikes Act requires the military services to prepare INRMPs in cooperation with the appropriate federal and state fish and wildlife agencies. The Detachment Fallbrook INRMP is an ecosystem-based plan developed in cooperation with the U.S. Fish and Wildlife Service (USFWS), National Oceanic and Atmospheric Administration (NOAA) - National Marine Fisheries Service (NMFS), and the California Department of Fish and Wildlife (CDFW). This INRMP has been prepared in accordance with the Sikes Act and reflects the mutual agreement of these agencies concerning the conservation, protection, and management of fish and wildlife resources.

The INRMP facilitates compliance with environmental laws, integrates the natural resource components of all Detachment Fallbrook plans and instructions, and meets the requirements of the Sikes Act and all applicable DOD and U.S. Department of the Navy (DON) regulations and policies. Specifically, this INRMP satisfies the requirements of the DOD Instruction 4715.03, Natural Resources Conservation Program (2011), and its implementing manual, DODM 4715.03, Integrated Natural Resources Management Plan (INRMP) Implementation Manual (2013) and follows the "Integrated Natural Resources Management Plan Guidance for Navy Installations" (USDON 2006a).

Implementation of the INRMP also fulfills the Commanding Officer's stewardship responsibilities to implement the Secretary of the Navy Policy for Environmental Protection, Natural Resources, and Cultural Resources Programs (SECNAV Instruction 5090.8A; 30 January 2006), and meets the requirements of Chief of Naval Operations Instruction (OPNAVINST) 5090.1D, Environmental Readiness Program, and its implementing manual, OPNAV M-5090.1.

The INRMP is used by the Navy for planning and preparing installation-related project approvals, management actions, orders, instructions, guidelines, standard operating procedures, and other plans. It is an extremely important management tool to ensure military operations and natural resources conservation programs/measures are integrated and consistent with legal and stewardship requirements.

The INRMP provides technical and planning guidance for integrating natural resources issues and concerns with facilities and operational planning, using decision-making processes consistent with the Navy's Environmental Management System (EMS) and compliant with the National Environmental Policy Act (NEPA). Mission drivers at Detachment Fallbrook generate numerous infrastructure requirements (e.g., magazines, holding yards, and an extensive road network), land use practices (e.g., mowing of clear zones, firebreak maintenance), and support services. The predominant drivers for the military mission of ordnance storage, handling, and transportation are rooted in physical security and safety requirements, and are discussed further in Chapter 2.

The INRMP is the primary means by which natural resources compliance and stewardship priorities are set and funding requirements are determined. The Navy intends to implement this INRMP within the framework of regulatory compliance, mission obligations, anti-terrorism and

force protection limitations, and funding constraints. A commitment to implement priority projects, as funding permits, comes with the Navy signature endorsements associated with this INRMP.

The INRMP is not meant as a definitive list of projects that will be automatically funded upon enactment of the Plan. Any requirement for the obligation of project funding in this INRMP shall be subject to availability of funds appropriated by Congress, and none of the proposed projects shall be interpreted to require obligation or payment of funds in violation of any applicable law, most notably the Anti-Deficiency Act (31 U.S. Code [U.S.C.] 1341 et seq). As opportunities become available to seek funding for environmental projects, the INRMP provides guidance to the resource managers on strategies to employ and serves to help prioritize projects to better enable effective ecosystem management.

Natural resources management at Detachment Fallbrook is guided by the overarching philosophy, directions, and instructions of the DOD and Navy, and reflects the installation's unique mission, land use drivers, and ecological landscape. Natural resources management goals have been established at various levels of command and incorporated into programs at the Detachment. The following goals are consistent with DODINST 4715.03 and OPNAV M-5090.1:

- **Ensure military mission sustainability and environmental compliance.** – Manage for no net loss of the capacity of Detachment Fallbrook lands to support mission operations, while meeting all environmental compliance responsibilities. Sustain the current and future military mission by providing stewardship of open space and natural resources that include land, water, and wildlife. Foster an ethic of compliance and stewardship through education, outreach, and awareness.
- **Manage, protect, and enhance sensitive populations and resources.** – Provide ecosystem-based management to preserve, protect, and enhance natural resources and native biodiversity for long-term sustainability to include high-value, scarce, and at-risk species and habitats.
- **Provide the organizational support and develop partnerships necessary for effective planning and implementation of this INRMP.** – Provide sufficient staffing, funding, and capacity necessary for effective strategic planning and implementation of this INRMP. Partner with others to realize management goals, inspire innovative solutions, and contribute to the regional community.

Key to achieving overarching management goals, as well as program specific objectives covered in-depth within Chapter 4, is the multi-species, ecosystem approach of the INRMP. An ecosystem approach balances the needs of all ecosystem components including biological and ecological aspects as well as mission, economic, and other human elements. Ecosystem management requires the Detachment Fallbrook managers to operate at many different hierarchical levels and to recognize that such cross-boundary and landscape level initiatives often necessitate interagency cooperation and conservation partnerships among land owners and managers.

An ancillary function of the INRMP is that it may preclude the need for the USFWS to designate critical habitat for federally listed species under the Endangered Species Act (16 USC §§1531-1544 as amended) if the USFWS determines that the INRMP provides a benefit to such species.

At Detachment Fallbrook, natural resources management actions that benefit the ecosystem and its habitats are expected to directly and indirectly provide a conservation benefit to species at risk, including federally listed threatened and endangered species known to, or having the potential to, occur on the installation. Section 4.13 further specifies management strategies and actions that are expected to provide a conservation benefit to federally listed species.

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ACRONYMS AND ABBREVIATIONS

AA&E	Arms, Ammunition, and Explosives
aka	also known as
AMSL	Above Mean Sea Level
AU	Animal Units
AUM	Animal Unit Months
BA	Biological Assessment
BCC	Birds of Conservation Concern
BEAP	Base Exterior Architecture Plan
BGEPA	Bald and Golden Eagle Protection Act
BLC	Business Line Coordinator
BLUF	Bottom Line Up Front
BMP	Best Management Practice
BO	Biological Opinion
c	Circa
CA	Corrective Action
CAA	Clean Air Act
Cal/EPA	State of California Environmental Protection Agency
Cal-IPC	California Invasive Plant Council
CalTrans	California Department of Transportation
CATEX	Categorical Exclusion
CDFG	California Department of Fish and Game
CDFW	California Department of Fish and Wildlife
CDWR	California Department of Water Resources
CESU	Cooperative Ecosystem Studies Units
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulation
CIM	Climate-Informed Monitoring
cm	Centimeters
CNDDB	California Natural Diversity Database
CNIC	Commander Navy Installations Command
CNPS	California Native Plant Society
CNO	Chief Naval Operation
CNRSW	Commander, Navy Region Southwest
CO	Commanding Officer
CPIF	California Partners in Flight
CRPR	California Rare Plant Rank
CSS	Coastal Sage Scrub
CWA	Clean Water Act

CWHR	California Wildlife Habitat Relationships
Detachment Fallbrook	Naval Weapons Station Seal Beach Detachment Fallbrook
DOD	U.S. Department of Defense
DOD Components	Collectively refers to multiple departments, offices, and organizational entities within DOD chain of command, as appropriate.
DOD PARC	DOD Partners in Amphibian and Reptile Conservation
DOD PIF	DOD Partners in Flight
DODD	U.S. Department of Defense Directive
DODINST	U.S. Department of Defense Instruction
DODM	U.S. Department of Defense Manual
DOE	U.S. Department of Energy
DOI	U.S. Department of the Interior
DOJ	U.S. Department of Justice
DON	U.S. Department of the Navy
DTSC	Department of Toxic Substance Control
EA	Environmental Assessment
EARR	Environmental Aspects and Requirements Review
EDDR	Early Detection and Rapid Response
EIR	Environmental Impact Report
EIS	Environmental Impact Statement
EMS	Environmental Management System
EO	Executive Order
EPA	Environmental Protection Agency
EPR	Environmental Program Requirements
EPSO	Environmental Programs and Services Office
ERL	Environmental Readiness Level
ESA	Endangered Species Act
ESED	Expeditionary Systems Evaluation Division
ESQD	Explosive Safety Quantity Distance
ESU	Evolutionarily Significant Unit
FAA	Federal Aviation Administration
FE	Federally Endangered
FPUD	Fallbrook Public Utilities District
ft	Feet
FT	Federally Threatened
FP	State fully protected
FPUD	Fallbrook Public Utilities District
FY	Fiscal Year

GCM	Global Climate Models
GFDL	Geophysical Fluid Dynamics Laboratory
GIS	Geographic Information System
gpd	Gallons Per Day
GPS	Global Positioning System
GSOB	Goldspotted Oak Borer
HCP	Habitat Conservation Planning
ICRMP	Integrated Cultural Resources Management Plan
IDS	Intrusion Detection System
IEPD	Installation Environmental Program Director
IERP	Integrated Environmental Response Plan
INRMP	Integrated Natural Resources Management Plan
IPCC	Intergovernmental Panel on Climate Change
IPMP	Integrated Pest Management Plan
IRP	Installation Restoration Program
JV	Joint Venture
KSHB	Kuroshio Shot Hole Borer
LCC	Landscape Conservation Cooperative
L-FORM	Landing For Operations Readiness Munitions
listed species	Species listed under the ESA as threatened or endangered
LTETM	Long Term Ecological Trend Monitoring
MAERU	Mobile Ammunition Evaluation and Reconditioning Unit
MAPS	Monitoring Avian Productivity and Survivorship
MBTA	Migratory Bird Treaty Act
MCAS	Marine Corps Air Station
MCB	Marine Corps Base
MCV	Manual of California Vegetation
MEC	Munitions and Explosives of Concern
MOA	Memorandum of Agreement
MOU	Memorandum of Understanding
MRP	Munitions Response Program
MSCP	Multiple Species Conservation Program
MSHCP	Multiple Species Habitat Conservation Plan

NAAQS	National Ambient Air Quality Standards
NABCI	North American Bird Conservation Initiative
NCP	National Contingency Plan
NAD	Naval Ammunition Depot
NAVFAC	Naval Facilities Engineering Command
NAVFACINST	NAVFAC Instruction
NAVFAC SW	Naval Facilities Engineering Command Southwest
NAVSEA	Naval Sea Systems Command
NAVSUP	Naval Supply Systems Command
NAVWPNSTA	Naval Weapons Station
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NCAR	National Center for Atmospheric Research
NCCP	Natural Communities Conservation Planning Program
NDAA	National Defense Authority Act
NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
NOSSA	Naval Ordnance Safety and Security Activity
NRCS	Natural Resources Conservation Service
NTTP	Navy Tactics, Techniques, and Procedures
NVC	National Vegetation Classification
O&MN	General and Administrative, Operations and Maintenance Navy
OHWM	Ordinary High Water Mark
OPNAV	Chief of Naval Operations
OPNAV M	Chief of Naval Operations Manual
OPNAVINST	Chief of Naval Operations Instruction
OSD	Office of the Secretary of Defense
OUSD	Office of the Under Secretary of Defense
PAO	Public Affairs Officer
PARC	Partners in Amphibian and Reptile Conservation
PCM	Parallel Climate Model
PCP	Pentacholorphenol
PIF	Partners in Flight
PM	Particulate Matter
PSHB	Polyphagous Shot Hole Borer
PWD	Public Works Department
PWD FMD	Public Works Department - Facilities Management Division
PWO	Public Works Officer

QE	Quality Engineering
RAB	Restoration Advisory Board
RAWS	Remote Automated Weather Station
RCRA	Resource Conservation and Recovery Act
RDM	Residual Dry Matter
RI	Remedial Investigation
RIFA	Red Imported Fire Ant
RPD	Regional Program Director
RWQCB	Regional Water Quality Control Board
SAR	Species At Risk
SAIA	Sikes Act Improvement Act
SARA	Superfund Amendments and Reauthorization Act
SDAPCD	San Diego Air Pollution Control District
SDSU	San Diego State University
SoCal IBI	Southern California Index of Biotic Integrity
SDG&E	San Diego Gas and Electric
SDSU	San Diego State University
SE	State Endangered
SECNAVINST	Secretary of the Navy Instruction
SI	Site Investigation
SMR CUP	Santa Margarita River Conjunctive Use Project
SPAWAR	Space and Systems Warfare Command
SR	State Rare
SSC	California Species of Special Concern
ST	State Threatened
State-listed species	Species listed under California's ESA as threatened or endangered
SWANCC	Solid Waste Agency of Northern Cook County
SWPPP	Storm Water Pollution Prevention Plan
SWRCB	State Water Resources Control Board
TMDL	Total Maximum Daily Load
TNR	Trap Neuter Release
U.S.	United States
USACOE	U.S. Army Corps of Engineers
USC	U.S. Code
USDA	U.S. Department of Agriculture
USDOD	U.S. Department of Defense

USDON	U.S. Department of the Navy
USEPA	U.S. Environmental Protection Agency
USFS	U.S. Department of Agriculture, Forest Service
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
VERTREP	Vertical Replenishment
VA	Vulnerability Assessment
WFMP	Wildland Fire Management Plan
WFMP BO	Wildland Fire Management Plan Biological Opinion
WG	Working Group
WMI	Watershed Management Initiative
WNS	White-nose Syndrome
WWII	World War II

CHAPTER 1 INTRODUCTION

CHAPTER 1
INTRODUCTION

Naval Weapons Station (NAVWPNSTA) Seal Beach Detachment Fallbrook (Detachment Fallbrook) is an 8,852-acre Navy installation that is remotely located from (a "detachment" of) its parent command at NAVWPNSTA Seal Beach, which is roughly 80 miles north on the coast of southern California (Photo 1). Together, these installations provide ordnance storage, maintenance, production, and distribution for the western United States. For more information on the location and mission of Detachment Fallbrook, see Section 1.1.3 and Chapter 2.

The stewardship of natural resources Detachment Fallbrook is essential to ensure optimum service and sustained support for the installation's military mission and mission support activities. This Integrated Natural Resources Management Plan is designed to provide the analytical basis and criteria for sound land use and management decisions that facilitate regulatory compliance and natural resources stewardship.

1.1 PURPOSE OF INTEGRATED NATURAL RESOURCES MANAGEMENT PLANS

In recognition of the fact that military lands contain significant natural resources, Congress enacted the Sikes Act in 1960 to address wildlife conservation and public access on military installations. The Sikes Act (16 U.S.C. § 670-670f), as amended, requires the Secretary of Defense to carry out a program to provide for the conservation and rehabilitation of natural resources on military installations in cooperation with the United States Fish and Wildlife Service (USFWS) and state fish and wildlife agencies. The 1997 amendments to the Sikes Act require the U.S. Department of Defense (DOD) to develop and implement an Integrated Natural Resource Management Plan (INRMP) for each military installation with significant natural resources.

Photo 1. Administrative area at Naval Weapons Station Seal Beach Detachment Fallbrook.

The purpose of INRMPs is to ensure that natural resources management is implemented in a manner that provides for sustained support of military operations for current and future generations; the INRMP is designed to integrate natural resources conservation and management efforts with military operations in a manner that is consistent with stewardship mandates and legal requirements (DOD Instruction [DODINST] 4715.03). It is used by persons planning and preparing installation-related project approvals, management actions, orders, instructions, guidelines, standard operating procedures, and other plans. The INRMP is an extremely important management tool to ensure military operations and natural resources conservation programs/measures are integrated and consistent with legal and stewardship requirements.

INRMPs provide for the management of natural resources, including fish, wildlife, and plants. To the maximum extent practicable, INRMPs incorporate ecosystem management principles and foster long-term sustainability of ecosystem services (DODINST 4715.03). Ecosystem services are those benefits obtained from ecosystems to include: "provisioning services such as food and water;

regulating services such as flood and disease control; cultural services such as spiritual, recreational, and cultural benefits; and supporting services such as nutrient cycling that maintain the conditions for life on Earth" (p. 36, DODINST 4715.03).

INRMPs allow for the multipurpose uses of resources, including public access necessary and appropriate for those uses, provided such access does not conflict with military land use requirements. Consistent with the use of military installations to ensure the readiness of the Armed Forces, the purpose of INRMPs is to assist installation commanders in their efforts to conserve and rehabilitate natural resources on military lands. To achieve this, management programs and actions in INRMPs must ensure natural resource utilization is: (1) sustainable, (2) in accordance with laws and regulations, and (3) optimally integrated with military installation plans and mission requirements. In this regard, implementation of the INRMP fulfills the Commanding Officer's stewardship responsibilities to implement the Secretary of the Navy Policy for Environmental Protection, Natural Resources, and Cultural Resources Programs (SECNAVINST 5090.8A; 30 January 2006).

An ancillary function of the INRMP is that it may preclude the need for the USFWS to designate critical habitat for federally listed threatened or endangered species. Section 318 of the National Defense Authorization Act (NDAA) of 2004 amended Endangered Species Act (ESA) Section 4 to state that the Secretary of the Interior shall not designate critical habitat on lands owned or controlled by DOD that are subject to an INRMP, if the Secretary determines that the INRMP in question provides a benefit to such species.

1.1.1 Legal and Regulatory Authority

This Integrated Natural Resources Management Plan was prepared for Naval Weapons Station Seal Beach Detachment Fallbrook to fulfill the requirements of the Sikes Act (16 U.S.C. §§ 670a-670o) and its amendment the Sikes Act Improvement Act of 1997 (SAIA) as well as the DOD and U.S. Department of the Navy (DON or Navy) implementing directives (see Section 1.1.2, Guidance and Required Elements). The Sikes Act requires the Secretary of each military department to prepare and implement INRMPs for each installation that contains significant natural resources.

Per the Sikes Act, each INRMP is to be prepared cooperatively with federal and state wildlife agencies in a manner that adequately covers applicable elements of natural resources management within the installation, including compliance with terms and conditions of relevant biological opinions. This INRMP was prepared in cooperation with the USFWS, the California Department of Fish and Wildlife (CDFW), and National Oceanic and Atmospheric Administration (NOAA) - National Marine Fisheries Service (NMFS) and reflects the mutual agreement of these parties concerning conservation, protection, and management of fish and wildlife resources on Detachment Fallbrook (see Appendix A for a list of contributors to the document preparation).

The Sikes Act does not supersede the authority of other environmental laws and regulations. On the contrary, as an overarching planning document the INRMP is designed to facilitate compliance with federal environmental laws and regulations such as the ESA and National Environmental Policy Act (NEPA); state laws and action plans, as applicable; as well as DOD, Navy, NAVWPNSTA Seal Beach, and Detachment Fallbrook policies (see Appendix B for more comprehensive list of environmental laws and regulations). In effect, this INRMP provides a blueprint for how Detachment Fallbrook's natural resource management program integrates compliance with the myriad of environmental laws and regulations with mission support.

1.1.2 Guidance and Required Elements

Guidance documents used in the development of this INRMP included: (1) DODINST 4715.03 Natural Resources Conservation Program, 18 March 2011; (2) DODM 4715.03 Integrated Natural

Resources Management Plan Implementation Manual, 25 November 2013; (3) SECNAV Instruction 5090.8A Policy For Environmental Protection, Natural Resources, And Cultural Resources Programs, 30 January 2006; (4) Integrated Natural Resources Management Plan Guidance For Navy Installations (USDON 2006a); and (5) Chief of Naval Operations Instruction [OPNAVINST] 5090.1D, 10 January 2014, and its implementing manual, OPNAV M-5090.1, 10 January 2014. These documents identify and provide detailed guidance on required elements to be included in the preparation and update of INRMPs. (See also Sections 1.4 and 5.8 for additional details on the coordination for the review and development of the INRMP.)

The Sikes Act (§ 670a(b)) states, "Consistent with the use of military installations to ensure the preparedness of the Armed Forces, each [INRMP]… shall, where appropriate and applicable, provide for:

- Fish and wildlife management, land management, forest management, and fish-and-wildlife-oriented recreation.
- Fish and wildlife habitat enhancement or modifications.
- Wetland protection, enhancement, and restoration, where necessary for support of fish, wildlife, or plants.
- Integration of, and consistency among, the various activities conducted under the plan.
- Establishment of specific natural resource management goals and objectives and timeframes for proposed actions.
- Sustainable use by the public of natural resources to the extent that the use is not inconsistent with the needs of fish and wildlife resources.
- Public access to the military installation that is necessary or appropriate subject to the requirements necessary to ensure safety and military security.
- Enforcement of applicable natural resource laws (including regulations).
- No net loss in the capability of military installation lands to support the military mission of the installation.

Such other activities as the Secretary of the military department determines appropriate."

Per DOD and Navy guidance (DODINST 4715.03, DODM 4715.03, and OPNAV M-5090.1), successfully implemented INRMPs will ensure the sustainability of all ecosystems within an installation and no net loss of the capability of installation lands to support the mission.

The following three criteria, consistent with USFWS (2015) and Navy (USDON 2006a) INRMP coordination and development guidance, are used to determine if an INRMP provides adequate benefit (management or protection) to relevant federally listed species such that critical habitat designation is unnecessary:

- The Plan provides a conservation benefit to the species.
- The Plan provides certainty that the management plan will be implemented.
- The Plan provides certainty that the conservation effort will be effective.

Detachment Fallbrook's INRMP was developed to comply with the guidance and required elements as described in this section. No critical habitat is currently designated on the installation, in part, because of the ongoing implementation of programs within this INRMP. This INRMP strives to maintain adequate management for listed species currently known, or that have future

potential, to occur on the Detachment, removing the need for future designation of critical habitat on the installation.

1.1.3 Mission and Land Use Drivers

Numerous laws, regulations, and guidance documents influence or drive natural resources management at Detachment Fallbrook (Appendix B). However, it is important to identify and understand the drivers behind land use activities to optimally integrate natural resource management with the Detachment's military mission and mission support services. Mission and land use drivers are needs or requirements that must be satisfied for the mission to be implemented or continue successfully.

The predominant drivers for the mission of ordnance storage, handling, and transportation (see Chapter 2) are rooted in physical security and safety requirements as defined in the following Navy instructions and regulations:

- Naval Sea Systems Command (NAVSEA) Ordnance Pamphlet 5, Volume 1 "Ammunition and Explosives Safety Ashore Regulations for Handling, Storing, Production, Renovation and Shipping," known as "OP-5", regarding management, site approval procedures, and standard forms for facilities with ordnance within Explosives Safety Quantity Distance (ESQD) arcs.
- OPNAVINST 5530.14E (Navy Physical Security and Law Enforcement Program, 28 January 2009).
- OPNAVINST 5530.13C, (Department of the Navy Physical Security Instruction for Conventional Arms, Ammunition, and Explosives (AA&E), 26 September 2003) provides guidance on how to safeguard warfighting assets and material from loss or theft.

Additional drivers that shape the mission and land use at Detachment Fallbrook are:

- Legal and regulatory compliance, as being out of compliance can be costly in terms of both time and money, and may adversely affect the mission.
- Cost effective solutions (e.g., footprint reduction, energy, and water saving initiatives, recycling).
- Regional involvement (e.g., coordination with neighboring Marine Corps Base [MCB] Camp Pendleton and the community of Fallbrook to address traffic and potential encroachment issues, coordination with regional fire and law enforcement entities for emergency response planning).

Mission drivers generate numerous infrastructure requirements (e.g., magazines, holding yards, intruder detection systems, extensive road network), land use practices (e.g., explosive safety quantity distance arcs, clear zones, development restrictions), and support services. Mission support services include physical security and law enforcement, explosives safety, facilities maintenance and grounds keeping, environmental management, fire management, and emergency planning. Since the Detachment no longer has a community of active duty personnel or their dependents, mission support involving morale, welfare, and recreation has been greatly reduced over the years.

Tenant organizations for which the Detachment provides support include:

- Expeditionary Systems Evaluation Division (ESED), Naval Surface Warfare Center, Crane Division, Detachment Fallbrook
- MCB Camp Pendleton Fire Department

- Marine Corps Air Station, Camp Pendleton (MCAS)
- Naval Supply Systems Command (NAVSUP) Fleet Logistics Center San Diego
- Navy Munitions Command CONUS West Division (NMC CWD)/Unit Seal Beach, Detachment Fallbrook
- Naval Facilities Engineering Command (NAVFAC)
- Naval Air Warfare Center, Weapons Division (NAWCWD), Detachment Fallbrook
- Naval Computer and Telecommunications Station (NTCS) San Diego

1.1.4 Detachment Fallbrook's INRMP

As the overarching planning document for natural resources management at the Detachment, this INRMP serves as a consolidated resource that:

- Establishes natural resources program management goals, objectives, and planned actions, and provides time frames for implementation of planned actions.
- Maintains baseline information and conditions that support daily decision-making and compliance with regulatory and planning processes, such as those required by NEPA, ESA, and Clean Water Act (CWA).
- Provides historical and regional context for the management of natural resources on the installation.
- Documents the results of environmental research and survey findings, including tracking potential trends over time, to assist with adaptive management and scientifically-based decision making.
- Facilitates integration with the Environmental Management System (EMS) and other environmental management programs.
- Reiterates commitments for compliance with all other natural resources management agreements (e.g., Wildland Fire Management Plan Biological Opinion).
- Provides the framework and processes for the integration of natural resources conservation and management with the military mission and other land use in support of the mission.

It is important to stress that this INRMP does not dictate land use decisions, but rather provides information to support sound land use and natural resources management decision making. The INRMP also does not obviate the need for project reviews and approvals.

Not covered under this INRMP is the management of other environmental programs such as hazardous materials, hazardous waste, air quality, water quality, installation restoration and munitions response, etc., except to the extent when these programs may have a nexus with natural resources management. For example, many of the Installation Restoration Program (IRP) and Munitions Response Program (MRP) sites occur in wildland areas where site investigations, monitoring, clean-up, and remediation actions may have impacts to natural resources. For this reason, the IRP/MRP sites are included in the INRMP; however, greater detail about the sites and their management are covered in planning documents associated with those programs. National Historic Preservation Act requirements are also not addressed in this INRMP. Cultural resources (archaeological and historical) management issues are addressed separately within Detachment Fallbrook's Integrated Cultural Resource Management Plan (ICRMP; USDON 2012).

Detachment Fallbrook has had three natural resources management planning documents prior to this 2016 document: the 1987 Comprehensive Natural Resources Management Plan (USDON

1987), the 1996 Integrated Natural Resources Management Plan (USDON 1996), and the 2006 Integrated Natural Resources Management Plan (USDON 2006b). In 2012, letters were signed by the USFWS and CDFW concurring with the review of the 2006 INRMP for operation and effect.

This 2016 INRMP is subject to future annual reviews with periodic updates. To facilitate document updates, material subject to greater frequency of change has been consolidated within tables and/or relegated to the appendices to the greatest extent feasible. The annual review includes an evaluation of key focus areas during the Navy's Natural Resources Conservation Metrics, often referred to as the "INRMP metrics", with findings reported on the Navy Conservation Website (see Chapter 5). Every five years, a complete review of the document will occur to determine if major revisions are appropriate and if operations and effects of the installation have changed (see Chapter 5).

The Environmental Assessment prepared for the 2006 version of the INRMP is still considered adequate to cover the implementation of this 2016 INRMP as there is no increase in potential environmental impacts, and revisions from the 2006 INRMP to the 2016 INRMP are not expected to result in biophysical consequences materially different from those anticipated in the 2006 INRMP and analyzed in existing NEPA documentation (Appendix C).

1.2 NATURAL RESOURCES PROGRAM GOALS

Natural resources management at the Detachment is guided by the overarching philosophy, directions, and instructions of the DOD and Navy, and reflects the unique mission, land use drivers, and ecological landscape of the installation. Natural resources management goals have been established at various levels of command and are incorporated into programs at the Detachment. Overarching program goals and objectives that are specific to individual natural resources management programs are presented in Chapter 4.

1.2.1 DOD and Navy Natural Resource Management Guidance

In a 1994 memorandum from the Office of the Under Secretary of Defense, the DOD established ecosystem management as the basis for the conservation and management of military lands and waters (USDOD 1994). The memorandum recognized the complexity of the environment and the importance of scale when implementing ecosystem management, social and economic viability within a functioning ecosystem, and effective partnerships among private and government agencies.

Ecosystem-based management, as defined in DODINST 4715.03 (Natural Resources Conservation Program), is a goal-driven approach to managing natural resources that supports present and future mission requirements; preserves ecosystem integrity; is at a scale compatible with natural processes; is cognizant of nature's timeframes; recognizes social and economic viability within functioning ecosystems; is adaptable to complex and changing requirements; and is realized through effective partnerships among private, local, State, tribal, and Federal entities. Ecosystem management is a process that considers the environment as a complex system functioning as a whole, not as a collection of parts, and recognizes people and their social and economic needs are a part of the whole (DODINST 4715.03).

DODINST 4715.03 (Enclosure 3, §3[a]) states that "ecosystem-based management will:

(1) Avoid single-species management and implement an ecosystem-based multiple species management approach, insofar as that is consistent with the requirements of the ESA.

(2) Use an adaptive management approach to manage natural resources such as [sic] climate change.

(3) Evaluate and engage in the formation of local or regional partnerships that benefit the goals and objectives of the INRMP.

(a) Due to policy and fiscal implications, partnerships involving external stakeholders or multiple Military Services require proper advanced coordination through DOD Component chains of command.

(b) Natural resources personnel must be included in the planning and implementation phases of all resulting agreements.

(4) Use the best available scientific information in decision-making and adaptive management techniques in natural resource management.

(5) Foster long-term sustainability of ecosystem services."

DODINST 4715.03 (Enclosure 3, §3[b]) also states "biodiversity conservation on DOD lands and waters should be followed whenever practicable to:

(1) Maintain or restore remaining native ecosystem types across their natural range of variation.

(2) Maintain or reestablish viable populations of native species on an installation, when practical.

(3) Maintain ecological processes, such as disturbance regimes, hydrological processes, and nutrient cycles, to the extent practicable.

(4) Manage and monitor resources over sufficiently long time periods to allow for adaptive management and assessment of changing ecosystem dynamics (i.e., incorporate a monitoring component to management plans)."

Additional guidance from DODINST 4715.03 (Enclosure 3, §3[c-f]):

- Use heritage and other natural resources database networks whenever appropriate;
- Implement conservation and management efforts to further the conservation of State-listed species when such action is practicable and does not conflict with legal authority, military mission, or operational capabilities;
- Identify, prioritize, monitor, and control invasive and noxious species and feral animals on its installations whenever feasible; and
- Use native species, where feasible, to restore any habitats from which native species are removed or controlled. DOD shall restore or rehabilitate altered or degraded landscapes and associated habitats to promote native ecosystems and land sustainability when such action is practicable and does not conflict with military mission or capabilities consistent with E.O. 13514.

Fundamentally, Navy policy (OPNAVINST 5090.1D, Environmental Readiness Program, and the implementing Manual OPNAV M-5090.1) reiterates and expands upon DOD guidance. OPNAV M-5090.1 confirms the need for INRMPs, outlines INRMP required elements, and identifies how to address endangered species on military installations.

1.2.2 Detachment Fallbrook Natural Resources Management Goals and Approach

Stewardship is defined as "the management of resources entrusted to one's care in a way that preserves and enhances the resources and their benefits for present and future generations" (p. 39, DODINST 4715.03). Consistent with DOD and Navy policy, Detachment Fallbrook's approach to managing natural resources provides mission support, facilitates compliance with applicable laws and regulations, and reflects the principles of ecosystem management. The natural resources program at the Detachment supports the military mission through the integration of mission drivers into natural resources planning, programmatic agreements with the USFWS, streamlined project review process, and individually tailored project solutions as necessary. This INRMP predicates natural resources management on multispecies and ecosystem-based planning within the framework of mission support and regulatory compliance.

The natural resource management goals for the Detachment are consistent with DODINST 4715.03 and OPNAV M-5090.1:

- **Ensure military mission sustainability and environmental compliance**. – Manage for no net loss of the capacity of Detachment Fallbrook lands to support mission operations, while meeting all environmental compliance responsibilities. Sustain the current and future military mission by providing stewardship of open space and natural resources that include land, water, and wildlife. Foster an ethic of compliance and stewardship through education, outreach, and awareness.
- **Manage, protect, and enhance sensitive populations and resources** – Provide ecosystem-based management to preserve, protect, and enhance natural resources and native biodiversity for long-term sustainability to include high-value, scarce, and at-risk species and habitats.
- **Provide the organizational support and develop partnerships necessary for effective planning and implementation of this INRMP.** – Provide sufficient staffing, funding, and capacity necessary for effective strategic planning and implementation of this Plan. Partner with others to realize management goals, inspire innovative solutions, and contribute to the regional community

Key to achieving overarching management goals, as well as program specific goals and objectives covered in-depth within Chapter 4, is ecosystem management. With numerous species at risk, including federally listed threatened or endangered species, known to reside on or transit through the installation, an ecosystem-based approach is more efficient than species-by-species management and is a means to achieve ecological integrity. Ecosystem management seeks long-term sustainability by considering the interrelatedness of biotic and abiotic systems and the processes that maintain native diversity. Moreover, an ecosystem approach balances the needs of all ecosystem components, including biological and ecological aspects as well as mission, economic, and other human elements.

Ecosystem management requires managers to operate at many different hierarchical levels. This allows Detachment managers to focus on the conservation of a federally listed species, for example, at the level of the installation's population, within a regional context, and even within the context of a global phenomenon such as climate change. Under ecosystem management, habitat enhancement such as weed control, disturbance events such as wildland fires, protection of wildlife corridors, and similar widespread considerations are defined by the issues and not jurisdictional boundaries. Detachment managers recognize such cross-boundary and landscape level initiatives often necessitate interagency cooperation and conservation partnerships among land owners and managers.

In the context of an ecosystem management philosophy, special emphasis is afforded to federally threatened and endangered species and their habitats to prevent "jeopardy" and to assist in the conservation and recovery of those species. The Federal ESA is a significant environmental law for the Detachment because much of the installation is occupied by, or provides potential habitat for, one or more federally threatened or endangered species. In compliance with ESA Section 7(a)(2), the Detachment established management programs, protocols, and procedures to avoid and minimize adverse impacts from base operations to federally listed species and their habitats, provide compensatory mitigation for known impacts, and ensure actions or operations do not jeopardize continued survival of the species. Under ESA Section 7(a)(1), the Detachment as a federal agency utilizes its management programs in furtherance of ESA purposes by including conservation measures to assist in recovery of threatened and endangered species.

A dominant theme of ecosystem management is adaptive management, which at its basic level simply means being able to adjust a management approach based on the outcomes of previously implemented strategies. Adaptive management recognizes that ecosystems are complex and dynamic and there is uncertainty in predicting future outcomes. For adaptive management to evolve in the direction of attaining management goals, such changes must be based on informed decisions. Ideally, management decisions would be informed by the results of quantitative findings derived from the scientific method of hypothesis testing. Although such rigor is not always feasible for every decision, central to Detachment Fallbrook's natural resources program is the maintenance of long-term, quantifiable, repeatable, and comparable monitoring data that inform resource managers of important population and ecological changes over time. Such data help evaluate the success or failure of management actions and decisions and contribute to a feedback loop of useful information.

The responsible acquisition, management, and use of data are critical for the success of an ecosystem management approach. Data collection on the Detachment ranges from habitat inventories and baseline assessments to population monitoring and long-term trends. Essential to ecosystem management is an understanding of the status of resources and influential factors outside of the installation's boundaries. The development and maintenance of such inventories is aided by information sharing among regional entities including other federal agencies (e.g., MCB Camp Pendleton, USFWS, U.S. Geological Survey [USGS]), state agencies (e.g., CDFW), local governments, and nongovernmental conservation organizations (e.g., Mission Resources Conservation District). The sharing of inventory data and research findings is often tremendously informative and beneficial to all involved stakeholders. Moreover, such collaborations typically provide a cost savings to the Navy.

The support of mission drivers and natural resources stewardship at the Detachment are largely compatible. The military mission of ordnance storage, for example, restricts land use and development within an estimated 75% of the installation that is encumbered by ESQD arcs. This relatively reduced level of human disturbance benefits the ecological integrity of the landscape. Nonetheless, mission and mission support activities still interface frequently with wildland areas and a significant component of natural resources management entails facilitation of avoidance and minimization measures.

Another mission driver with considerable influence on natural resources is wildland fire management. Driven by NAVSEA OP-5 fire control requirements for explosives safety, the threat of high ignition rates on neighboring MCB Camp Pendleton from live fire training and the proximity of the community of Fallbrook make the suppression and control of wildland fires of paramount interest to the Detachment's command. On this issue, mission interests and resources management objectives are largely compatible. Although wildland fires play an important role in the ecology of southern California under natural conditions, habitat loss and fragmentation from regional development have severely constrained natural processes. Natural resources management

at the Detachment seeks to balance the need for fire control with the ecological benefits of fire as a natural disturbance process. A central pillar of the natural resources program within this INRMP is the installation's Wildland Fire Management Plan (WFMP; USDON 2003a), and its associated BO (USFWS 2003a).

1.3 NATURAL RESOURCES MANAGEMENT ROLES AND RESPONSIBILITIES

The following is a list of major organizational components within the Navy that support Detachment Fallbrook Natural Resources Management and INRMP implementation. The list is consistent with OPNAV M-5090.1 and provides added regional and installation level details.

- *CNO*. – The Chief of Naval Operations (CNO) serves as the principal leader and overall Navy program manager for the development, revision, and implementation of this INRMP. The CNO provides policy, guidance, and resources for the development, revision, and implementation of the INRMP and associated NEPA documentation (Appendix C). The CNO approves all INRMP projects prior to submittal to regulatory agencies for signature.
- *CNIC*. – The Commander of Navy Installations Command (CNIC) reviews the entire INRMP. Their role is to ensure that installations comply with DOD, Navy, and CNO policy on INRMPs and their associated NEPA documentation. They also ensure the programming of resources necessary to maintain and implement INRMPs, participate in the development and revision of INRMPs, and provide overall program management oversight for all natural resources program elements (NAVFAC P-73). CNIC reviews and endorses projects recommended for INRMP implementation prior to submittal for signature, and evaluates and validates EPR-web project proposals.
- *Commander Navy Region Southwest (CNRSW)*. – Regional Commanders ensure that installations comply with DOD, DON, and CNO policy on INRMPs and their associated NEPA documentation. They ensure that installations under their control undergo annual reviews and formal five-year evaluations. They ensure the programming of resources necessary to maintain and implement INRMPs, which involves the evaluation and validation of EPR-web based project proposals and the funding of installation natural resources management staff. Navy Region Southwest maintains close liaison with the INRMP signatory partners (USFWS, NOAA - NMFS, and CDFW) and other INRMP stakeholders. The CNRSW provides endorsement of the INRMP through the Regional Commander signature.
- *Installation Commanding Officer (CO)*. – The installation Commanding Officer ensures the preparation, completion, and implementation of INRMPs and associated NEPA documentation. The CO has designated a Detachment Fallbrook Director to provide on-site command leadership and oversight. The installation Command's role is to: act as stewards of natural resources under their jurisdiction and integrate natural resources requirements into the day-to-day decision-making process; ensure natural resources management and INRMPs comply with all natural resources related federal regulations, directives, instructions, and policies; involve appropriate tenant, operational, training, or R&D commands in the INRMP review process to ensure no net loss of military mission; designate a Natural Resources Manager/Coordinator (see Conservation Program Manager) responsible for the management efforts related to the preparation, revision, implementation, and funding for INRMPs, as well as coordination with subordinate commands and installations; involve appropriate Navy Judge Advocate General or Office of the General Counsel legal counsel to provide advice and counsel with respect to legal matters related to natural resources management and INRMPs; and endorse INRMPs via CO signature.
- *Public Affairs Officer (PAO)*. – The PAO is involved in aspects of the environmental program at Detachment Fallbrook. This includes approving the INRMP for public release

and being informed of the public notice process required in various NEPA analysis processes.

- *Detachment Fallbrook Director*. – Detachment Fallbrook Director assists the Commanding Officer to discharge command stewardship responsibilities and is likewise responsible to ensure development, updating, and implementation of the INRMP.

Naval Facilities Engineering Command Southwest – NAVFAC SW

- *Public Works Officer (PWO)*. – The Public Works Officer for NAVWPNSTA Seal Beach and its Detachments oversees the management of the Public Works Department (PWD), which includes: Facilities Management Division, Facilities Engineering and Acquisition Division, Production Division, and the Environmental Division. The Environmental Division for NAVWPNSTA Seal Beach and its Detachments is referred to Environmental Programs and Services Office (EPSO or Environmental Office). The PWO and the Deputy PWO are accountable for life-cycle management of the NAVFAC / CNIC real property (land and facilities) and delivery of facilities projects and services. This includes the comprehensive oversight and planning of all land use issues relating to Detachment Fallbrook. The PWO's role for this INRMP is to ensure that it is aligned with the installation overall facilities "master" plan and also that facilities planning initiatives are consistent with and fully supportive of this INRMP. The PWO/DPWO are responsible to initiate environmental planning at the earliest stages of facilities planning and project development to include consideration of INRMP goals, objective, and requirements. The PWD is also responsible to implement portions of the INRMP and to ensure that facilities maintenance and operations are consistently performed in conformance to the INRMP requirements and objectives.
- *Installation Environmental Program Director (IEPD)*. – The Installation Environmental Program Director is the Head of the NAVFAC PWD Environmental Division (aka Environmental Programs and Services Office – EPSO) and provides overall environmental programs management on behalf of the installation CO. The IEPD, as delegated by command directive, is responsible for the preparation and implementation of this INRMP.
- *Conservation Program Manager*. – The Conservation Program Manager (aka Natural Resources Manager) reports to the IEPD and is designated in writing by the CO via command directive (see Appendix B). The Detachment Fallbrook Conservation Program Manager has the primary responsibility of managing the natural resources programs on the installation to include overseeing the development, update, and implementation of the INRMP; serving as the primary installation natural resources liaison with the USFWS, NOAA-NMFS, and CDFW; and conducting the annual Natural Resources Conservation Metrics.
- *Environmental Business Line Coordinator (BLC) / Environmental Regional Program Director (RPD)*. – Policy guidance, resources, implementation, and technical support is provided by the regional natural resources personnel located with NAVFAC SW under the direction of the Environmental BLC and Regional Natural Resources Manager. The Environmental BLC is dual hatted and also serves as the Navy Region Southwest Regional Environmental Director.
- *Office of Counsel*. – The Office of the General Counsel, NAVFAC Southwest, provides legal services to Detachment Fallbrook on a variety of environmental matters. Particularly pertinent to natural resources management, is their review of NEPA documentation and legal interpretations involving compliance with natural resources laws as they pertain to base operations.

Tenant Command

- *Naval Munitions Command CONUS West Division (NMC CWD)*. – As the primary mission tenant command aboard Detachment Fallbrook, NMC CWD provides ordnance logistics and intermediate maintenance support to the Navy's Pacific Fleet and other DOD entities. NMC CWD relies upon a network of magazines, roads, staging areas, and a few maintenance and operational buildings in order to store, transport, inspect, and ensure the security and safety of military ordnance. The installation command via the PWD coordinates all facilities planning matters with mission tenants such as NMC CWD, including the review of this INRMP to ensure mission support.

1.4 INRMP COORDINATION AND DEVELOPMENT

This INRMP was developed under the guidance of a working group comprised of internal and external stakeholders (see "WG" in stakeholder list below) who have a vested interest in natural resources management on the installation (see also Appendix A for a list of contributors). The INRMP reflects the review and involvement of a cross section of land users and land managers at Detachment Fallbrook, and includes the following representatives:

- NAVWPNSTA Seal Beach Command
- Detachment Fallbrook Director
- Environmental Program and Services Office (WG)
- Detachment Fallbrook Security Department
- Detachment Fallbrook Explosives Safety
- Detachment Fallbrook Facilities Department
- Naval Facilities Engineering Command (NAVFAC) Southwest (WG)
- Navy Munitions Command, Continental U.S. West Division
- Expeditionary Systems Evaluation Division
- Public Affairs Officer
- Office of the General Counsel, NAVFAC Southwest
- U.S. Fish and Wildlife Service (WG)
- California Department of Fish and Wildlife (WG)
- National Oceanic and Atmospheric Administration - National Marine Fisheries Service

The development and implementation of the INRMP is a continual process that does not end with the production of the document. Systematic program feedback and continual improvement, especially within the context of changing environmental conditions, are hallmarks of adaptive management. To the extent feasible, flexibility is built into the INRMP, to include processes and programs designed to address change. Adaptive management and INRMP implementation are further facilitated by an Environmental Management System (EMS) following the "Plan-Do-Check-Act" process, which has the goal of meeting environmental requirements through continual improvement, and achieving both mission support and environmental excellence.

The Sikes Act requires the review for operation and effect of an INRMP at least every five years, which is performed in collaboration by the military, USFWS, NOAA-NMFS, and CDFW. Section 101(b)(2) of the Sikes Act states that each INRMP "must be reviewed as to operation and effect by the parties thereto on a regular basis, but not less often than every five years." The Sikes Act

specifically emphasizes the review is intended to determine whether existing INRMPs are current and being implemented to meet the requirements of the Sikes Act, and therefore contribute to the conservation and rehabilitation of natural resources on military installations.

DOD and Navy implementing policy (DODINST 4715.03 and OPNAV M-5090.1) requires annual INRMP reviews to ensure management programs remain current and relevant. This is achieved, in part, through the annual Natural Resources Conservation Metrics meeting, which enlists the continued involvement of stakeholders and provides an opportunity to assess the efficacy of the natural resources management program. For additional information on the document reviews and the INRMP metrics, see Section 5.8.

INRMPs are to be revised or updated based on the results of the review process. A revision may not be warranted if no significant changes have occurred and the INRMP is meeting expectations. Document updates are appropriate to keep the information contained in the INRMP current and when there are no substantial changes in the way natural resources are managed.

INRMP reviews and updates, and revisions if necessary, are anticipated to follow the most current guidance. In 2013, a Memorandum of Understanding (MOU) was signed by the DOD, USFWS, and Association of Fish and Wildlife Agencies to further a cooperative relationship between the agencies in preparing, reviewing, revising, updating, and implementing INRMPs (USDOD et al. 2013). In June of 2015, the USFWS also produced Guidelines for Coordination of Integrated Natural Resources Management Plans (USFWS 2015), which provides updated guidance to USFWS personnel for reviewing INRMPs and implementing the Sikes Act as described in the 2013 tripartite MOU. Soon after, in a July 2015 memorandum from the Office of the Assistant Secretary of the Defense, the military provided "Guidelines for Streamlined INRMP Review" (USDOD 2015a). For greater detail on document revisions and updates, see Section 5.8.

1.5 INRMP RELATIONSHIP TO OTHER PROGRAMS, POLICIES, AND PLANS

This section documents the relationship of the INRMP with other federal, state, regional, and Navy-specific programs, policies, and plans. As the INRMP is expected to provide a conservation benefit to the species and ecosystems at Detachment Fallbrook, the Plan contributes directly or indirectly to many natural resources management objectives within federal (e.g., listed species recovery plans), state (e.g., State Wildlife Action Plans), and regional (e.g., Natural Communities Conservation Planning [NCCP] Program) environmental programs, policies, and plans. For the success of the INRMP and for mission integration at Detachment Fallbrook, this INRMP is also intended to be consistent with other Navy and installation-specific programs, policies, and plans as appropriate.

1.5.1 Federal, State, and Regional Programs and Plans

The natural resource management goals and objectives in this INRMP often directly and/or indirectly contribute to the conservation planning efforts at federal, state, and regional levels. The success of natural resource management at the Detachment is dependent upon processes at the ecosystem level. The underlying biological and physical processes of ecosystems occur independently of land ownership or management boundaries. Detachment Fallbrook seeks to achieve cooperative relationships with other federal, state, and local agencies, as well as non-governmental organizations. These partnerships are mutually beneficial when managing natural resources. The following federal, state, and regional wildlife conservation plans include guidance on the management of natural resources found on the Detachment. This INRMP will comply with any legally-applicable plans and will attempt to be consistent with the goals of other relevant plans to the maximum extent practicable.

1.5.1.1 FEDERAL

Endangered Species Recovery Plans

Endangered species recovery plans define federal recovery targets for downlisting or de-listing species. Specific plans exist for the following listed species on the Detachment.

- Southern California Steelhead (*Oncorhynchus mykiss*) (NMFS 2012)
- Arroyo Toad (*Anaxyrus californicus*) (USFWS 1999)
- California least tern (*Sterna antillarum browni*) (USFWS 1985a)
- Southwestern Willow Flycatcher (*Empidonax traillii extimus*) (USFWS 2002a)
- Least Bell's Vireo (*Vireo bellii pusillus*) (USFWS 1998a)
- Stephens' Kangaroo Rat (*Dipodomys stephensi*) (USFWS 1997a)

The implementation of recovery actions described within Recovery Plans is included as a key consideration to the implementation of management objectives for each species as described in Chapter 4.

USFWS Landscape Conservation Cooperative

Protecting the nation's natural and cultural resources and landscapes is essential to sustaining our quality of life and economy. Native fish and wildlife species depend on healthy rivers, streams, wetlands, forests, grasslands and coastal areas in order to thrive. Managing these natural and cultural resources and landscapes, however, has become increasingly complex. Land use changes and impacts such as drought, wildfire, habitat fragmentation, contaminants, pollution, invasive species, disease and a rapidly changing climate can threaten human populations as well as native species and their habitats.

Landscape Conservation Cooperatives (LCCs) are a network of public-private partnerships working in unison to ensure the sustainability of America's land, water, wildlife, and cultural resources. As a collaborative, LCCs seek to identify best practices, connect efforts, identify gaps, and avoid duplication through improved conservation planning and design. Partner agencies and organizations coordinate with each other while working within their existing authorities and jurisdictions. There are 22 LCCs that operate within a specific geographic area. Detachment Fallbrook lies within the California LCC.

North American Bird Conservation Initiative (2000)

The U.S. North American Bird Conservation Initiative (NABCI) is a coalition of government agencies, private organizations, and bird initiatives helping partners across the continent meet their common bird conservation objectives. NABCI fosters coordination and collaboration on key issues of concern within and beyond national borders, in conjunction with NABCI partners in Mexico and Canada. North America is subdivided into Bird Conservation Regions that are ecologically distinct with similar bird communities, habitats, and resource management issues. Detachment Fallbrook falls within the Coastal California Bird Conservation Region.

To encourage integrated bird conservation, NABCI facilities collaboration among avian conservation entities by consolidating the various initiatives and plans according to region. Some of the initiatives and plants that are applicable to the Coastal California Bird Conservation Region include the following:

- United States Shorebird Conservation Plan. Developed by a partnership of federal, state, non-governmental organizations, international groups, and researchers with the commitment

to conserve shorebirds that depend on wetland habitats through regional planning efforts and integrated management practices. The Plan identifies monitoring programs related to shorebird declines, and integrated management practices to protect shorebirds. Goals that cover the Southern California Coast are to (1) increase the area and quality of tidal wetlands along the coast, and (2) protect coastal wetlands from development.

- Sonoran Joint Venture Bird Conservation Plan (SJVTC 2006). This Plan covers the North American southwest and summarizes the status of avian species within four ecoregions, prioritizes these species, and lists Focus Areas for conservation action. Within the California Coast and Mountain Region, the Plan identifies 82 Continental Concern Species, 41 Regional Concern Species, and 12 additional Stewardship Responsibility Species.
- North American Waterfowl Management Plan 2012. Aims to restore waterfowl populations through habitat protection, restoration, and enhancement, with the help of partnerships and "joint ventures." Originally written in 1986 prior to the NABCI, and recently updated in 2012, the North American Waterfowl Management Plan is a joint plan of the United States, Canadian, and Mexican governments. There are no specific areas of continental significance mentioned in this plan for coastal southern California.
- California Partners in Flight (CalPIF) Conservation Plans. The CalPIF program has completed eight habitat and bioregion based Bird Conservation Plans for Riparian, Oak Woodlands, Coastal Scrub and Chaparral, Grasslands, Coniferous Forests, Sagebrush, Desert, and the Sierra Nevada Bioregion (available: www.prbo.org/calpif). The CalPIF program is described in greater detail below.

USFWS Spotlight Species Action Plans

Spotlight species action plans target specific actions for recovery of federally listed species. Action plans exist for two of the listed species on the Detachment.

- USFWS Spotlight Species Action Plan (2010-2014) for the Coastal California Gnatcatcher (*Polioptila californica californica*) recovery priority number 3C. Target is to improve the population status by improving habitat quality at sites burned in the past 10 years and creating more available habitat.
- USFWS Spotlight Species Action Plan (2010-2014) for the Least Bell's Vireo recovery priority number 9. Target is to downlist from endangered to threatened so that this species is no longer in danger of extinction throughout all or a significant portion of its range.

Partners in Amphibian and Reptile Conservation

Formed in 1999, Partners in Amphibian and Reptile Conservation (PARC; www.parcplace.org) is a coalition of federal and state agencies, conservation and research organizations, and other interested parties dedicated to conserving amphibians, reptiles, and their habitats through proactive and coordinated public/private partnerships.

The military participates in PARC through its subsidiary organization DOD PARC (www.dodnaturalresources.net/DOD-PARC.html). DOD became a signatory to the PARC Memorandum of Understanding (MOU) in 2007, and signed an updated Memorandum of Understanding (MOU) in 2012. A DOD PARC strategic plan was subsequently produced (Lovich et al. 2015). The DOD PARC program consists of a network of military installation biologists, natural resource managers, and professional herpetologists who work collaboratively to help avoid future mission restrictions while providing stewardship for herpetofauna. DOD PARC focuses on habitat and species management; inventory, research, and monitoring; and education, outreach, and training. The Detachment has contributed to and participated in DOD PARC initiatives, and as appropriate and applicable, will evaluate and incorporate the information provided in the PARC Habitat Management Guidelines for the southwest once it is published.

Partners in Flight

Partners in Flight (PIF; www.partnersinflight.org) cooperative program, an international effort started in 1990 involving partnerships among federal, state, and local government agencies, professional organizations, conservation groups, and all other interested parties to improve the monitoring, research, management, and education programs involving birds and their habitats. PIF's three mission priorities are: (1) keeping common birds common, (2) helping species at risk, and (3) fostering voluntary partnerships that benefit birds, habitats, and people.

In 1991, the DOD signed a Memorandum of Agreement (MOA) with other federal agencies to participate in PIF. The DOD PIF program (www.dodpif.org) consists of a cooperative network of natural resources personnel from military installations who work collaboratively to conserve migratory and resident birds and their habitats on DOD lands across the U.S. The DOD PIF policy is to promote and support a partnership role in the protection and conservation of migratory birds and their habitat by protecting vital habitat, enhancing biodiversity, and maintaining healthy and productive natural systems consistent with the military mission.

Detachment Fallbrook is in PIF Physiographic Region 90, Central and Southern California Coast and Valleys. A California Partners in Flight (CPIF) Plan contains relevant habitat subplans with recommendations and population targets for focus species of coastal sage scrub, chaparral, riparian, and oak woodland. DOD PIF recommends incorporation of these strategies into INRMPs (http://www.dodpif.org/plans/bcp/about.php). In 2014, the DOD also issued a *Strategic Plan for Bird Conservation and Management on Department of Defense Lands* (USDOD 2014a). Such conservation guideline and policy sources continue to help shape the avian management approach on the Detachment.

1.5.1.2 STATE

California State Wildlife Action Plan

California's State Wildlife Action Plan (SWAP) is part of a nationwide effort to develop comprehensive, statewide plans for conserving each state's fish and wildlife and their natural habitats for future generations (CDFW 2015). A revision of California's SWAP was completed by CDFW in 2015 and it is sometimes referred to as "SWAP 2015". The SWAP is to be updated every 10 years.

The SWAP uses a multi-species, ecosystem approach to conservation and maintains statewide goals to enhance California's ecosystems. The SWAP identifies and compiles information on wildlife species that are indicative of the state's biological diversity and have the greatest need for conservation, referred to as Species of Greatest Conservation Need (SGCN).To assess conservation needs at a manageable scale, California is subdivided in the SWAP, based on ecoregions, into conservation subunits. The conservation subunits are then grouped into 7 major geographic provinces. This approach facilitates discussion of ecosystems, natural communities, and species at a scale appropriate for regional conservation planning.

Detachment Fallbrook occurs within the "South Coast" province in California's SWAP. Although "military activities" and "livestock" grazing are listed in the SWAP as "pressures" that can cause ecological stress, many of the objectives and management actions within this INRMP are in direct alignment with the conservation actions and priorities of the SWAP. Examples of objectives and conservation actions for the South Coast province include: reduce the aerial extent of invasive species, reduce rodenticide use, advocate for appropriate grazing practices, conserve wetlands, improve data collection, conserve high functioning riparian habitat, increase riparian habitat function and protection where necessary, reduce channel incision and increase riparian vegetation in floodplains.

California Essential Habitat Connectivity Project

The California Essential Habitat Connectivity Project is a collaborative endeavor sponsored by CDFW and the California Department of Transportation (CalTrans) on a statewide habitat connectivity effort. The goal is to identify large remaining blocks of intact habitat or natural landscape and model linkages between them that need to be maintained, particularly as corridors for wildlife. Over sixty federal, state, local, tribal and non-governmental organizations collaborated in the creation of the statewide wildlife habitat connectivity map using a Geographic Information System (GIS) based modeling approach; an assessment of the biological value of identified connectivity areas; and a strategic plan that helps varied end users interpret and use the statewide map and outlines a methodology necessary for completing connectivity analyses at finer spatial scales. This Essential Connectivity Map identifies Natural Landscape Blocks and Essential Connectivity Areas within eight ecoregions. Detachment Fallbrook occurs within the South Coast Ecoregion, with the closest linkage being the Santa Ana – Palomar connection (see Luke et al. 2004, Spencer et al. 2010, and Section 3.11).

California Invasive Plant Council

The California Invasive Plant Council (Cal-IPC; www.cal-ipc.org) is an organization that was formed in 1992 to address one of California's top environmental threats: invasive plant species. Cal-IPC provides invaluable resources for land managers in the state, including education and outreach materials, training, management recommendations, and links to references and research articles. Two of the more valuable contributions by Cal-IPC are the Invasive Plant Inventory and CalWeedMapper. The Invasive Plant inventory lists and categorizes non-native, invasive plant species in California based on an assessment of the ecological impacts of each plant, facilitating the prioritization of plants for management and control. CalWeedMapper is an online resource that provides a repository for sharing geospatical data on over 200 invasive plants throughout the state.

California Weed Management Area Program

California's Weed Management Area (WMA) program was created by Assembly Bill 1168 (Frusetta) in 1999. The WMA program helps develop partnerships and encourages collaboration among stakeholders at more localized (county) levels. The California Department of Food and Agriculture typically administers the WMA program, in addition to other statewide pest management and invasive species control programs. Detachment Fallbrook participates in the San Diego WMA meetings and collaborates with the county and neighboring stakeholders on priority invasive plant management in the area surrounding the installation.

California Native Plant Society

Since 1965, the California Native Plant Society (CNPS; www.cnps.org) has worked to protect California's native plant heritage and preserve it for future generations. CNPS produce the Manual of California Vegetation, 2nd Edition (MCV; Sawyer et al. 2009), which provides a standardized, systematic classification and description of vegetation in the state. The method of vegetation classification in MCV meets the National Vegetation Classification System standards followed by federal agencies. Detachment Fallbrook has been recently developing a vegetation mapping protocol for the installation that follows MCV (see Chapters 3 and 4)

CNPS provides other great resources to help inform land managers, including the development and maintenance of the Online Rare Plant Inventory and Rare Plant Ranking System (see Chapter 3).

Audubon California - Important Bird Areas

There are approximately 145 important bird areas scattered geographically across the state. The Santa Margarita River, which borders Detachment Fallbrook to the north, has been designated as one of these areas.

1.5.1.3 REGIONAL

Multiple Species Conservation Program (MSCP)

The Multiple Species Conservation Program (MSCP) is a long-term regional conservation plan designed to establish a connected preserve system that protects the County of San Diego's sensitive species and habitats. The MSCP covers 582,243 acres over 12 jurisdictions. Each jurisdiction will have their own subarea plan to be implemented separately from one another. There are three large plans for the unincorporated areas of San Diego County: East County, North County, and South County. Detachment Fallbrook is adjacent to the North County MSCP. The North County MSCP is currently in preparation.

San Diego County General Plan

The San Diego County General Plan, adopted in August 2011, provides a framework for growth in the unincorporated areas of San Diego County that protects the environment and accommodates population growth by establishing future growth and development patterns across the unincorporated area of the county. The General Plan provides for a consistent framework for land use and development decisions consistent with an established community vision throughout the County. There are several Community Plans within the General Plan area, which are policy plans that specifically address the issues, characteristics, and visions of communities within the County. Community Plans are adopted as an integral part of the San Diego County General Plan but bound separately. Two plans listed below specifically address development in the Fallbrook community.

Fallbrook *Community Plan of the San Diego County General Plan*. This Community Plan is part of the Land Use Element, Section II, Part I of the San Diego County General Plan. A goal of this Community Plan is to preserve Fallbrook's good living environment ("perpetuate the existing rural charm and village atmosphere") while accommodating growth in such a manner that it will complement the environment of Fallbrook.

The Fallbrook Economic Revitalization Plan (22 March 2000). This is an action plan for the County of San Diego, developed by Fallbrook citizens, and intended to direct future development policy and capital expenditures in the Fallbrook Village area to enhance economic vitality while preserving and promoting the Fallbrook Village character and pedestrian-friendly environment.

MCB Camp Pendleton INRMP

The neighboring MCB Camp Pendleton has an INRMP that combines its Upland and Riparian consultation processes under Section 7 of the ESA, as well as internal Base Instructions and other legal mandates. Active training and maneuvers on MCB Camp Pendleton lands contrast with activity on Detachment Fallbrook lands. This is due to safety requirements associated with ordnance handling and storage which require significant separation between ordnance magazines and other activities and facilities which are not related to ordnance handling or storage. Although these neighboring installations have very different land uses and management challenges, the natural resources objectives are often in alignment. The Conservation Program Manager at Detachment Fallbrook often collaborates and shares data with counterparts within the Environmental Security Office on MCB Camp Pendleton on projects of mutual interest (e.g., invasive plant control, aquatic exotics control in the Santa Margarita River, data collection for the Game Wardens, climate change adaptation workshops).

MCB Camp Pendleton Wildland Fire Management Plan

MCB Camp Pendleton Fire Department provides fire-fighting and emergency response services for the Detachment. Station 9 of the MCB Camp Pendleton Fire Department is located on the Detachment. The Wildlife Fire Management Plans for both installations are operationally consistent because of this dual responsibility.

MCB Camp Pendleton Alternative Futures Project

A two-year research project entitled "An Alternative Future for the Region of Camp Pendleton, California and the Maintenance of Biodiversity" was organized to explore how urban growth and change forecasted for the next 20 years in the rapidly urbanizing area between San Diego and Los Angeles will influence both the current biodiversity of the region, and the habitat conditions present on the MCB Camp Pendleton property (Steinitz et al. 1996, Steinitz 1997). The research speculates on the impacts of the continuation of these trends to a 40-year horizon. The project assumes major stressors on biodiversity are regional urbanization and construction, maintenance, and land use plans/practices at MCB Camp Pendleton. As a consequence, the hydrological regime will be altered to one of shorter and more intense floods, but with lower stream flow and lower available soil moisture most of the year. Detachment Fallbrook environmental staff have participated in this plan's creation and will use it to predict habitat changes due to different development scenarios, which will allow assessment of more appropriate regional policies and plans for biodiversity maintenance.

Regional Water Quality Control Board Policies and Plans

Detachment Fallbrook falls under the jurisdiction of the San Diego Regional Water Quality Control Board (RWQCB) for many state and federal water quality regulations. This RWQCB prepared both a Basin Plan and a Watershed Management Initiative (WMI) for the region encompassing the Fallbrook area. The Basin Plan designates beneficial uses for surface and groundwaters; sets narrative and numerical objectives that must be attained or maintained to protect beneficial uses and conform to the state's anti-degradation policy; and describes implementation programs to protect waters in the region. The WMI outlines an expected schedule for development of Total Maximum Daily Load (TMDL) regulations for impaired water bodies.

1.5.2 Navy Region and Detachment Fallbrook Policies and Plans

Consistent with DOD policy, INRMPs are prepared in coordination with installation master plans, range plans, training plans, Integrated Cultural Resources Management Plans, pest management plans, installation restoration plans that address contaminants covered by Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) and related provisions, and other appropriate plans and offices. Numerous DOD and Navy policies and guidance documents for land use (see mission drivers in Section 1.1.3) and land management (see guidance documents in Section 1.1.2) have been integral to the development of Detachment Fallbrook's INRMP. Other Navy plans reviewed to ensure consistency with the Detachment Fallbrook INRMP include:

- *Wildland Fire Management Plan and its associated Biological Opinion*. – The WFMP is a core component of the Detachment's natural resources program and wildland fire management is of paramount importance to both the mission and natural resources.
- *NAVWPNSTA Seal Beach Complex Master Plan*. – The 1989 Master Plan Update (USDON 1989) and the revised Master Plan currently in development (USDON, in prep) document the existing and projected conditions at all sites (including Detachment Fallbrook) that comprise NAVWPNSTA Seal Beach. The Master Plan also seeks to identify major future needs projected by NAVWPNSTA activity, and to make provision for accommodating those needs in the facilities and operations under the activity's direction.

- *Regional Shore Infrastructure Plan*. – The Navy is taking a comprehensive regional approach to plan how resources, facilities, and infrastructure are managed to carry out the mission of the Navy. The objectives for regional planning are to reduce footprints and costs, increase existing capabilities and sustainability, and maximize efficiencies.
- *Storm Water Discharge Management Plan*. – The Storm Water Discharge Management Plan serves to meet federal and state regulatory requirements to discharge storm water associated with industrial facilities at NAVWPNSTA Seal Beach including Detachment Fallbrook.
- *Integrated Environmental Response Plan (IERP)*. – This plan for NAVWPNSTA Seal Beach (including Detachment Fallbrook) is designed to consolidate the initial spill response and notification procedures from a variety of environmental plans required by federal, state, and local authorities. The Plan provides guidance for discovery, identification, and notification of a spill; immediate action and on-scene coordination; containment and control; clean-up and decontamination; disposal; and documentation.
- *Integrated Pest Management Plan*. – The Integrated Pest Management Plan identifies overall regulations on pest management for NAVWPNSTA Seal Beach including the Detachment. The plan contains a review of existing pest control management systems (e.g., contracts, pesticide storage and application data), includes data analysis, and database development and implementation.
- *Integrated Cultural Resources Management Plan*. – The ICRMP (USDON 2012) provides guidance and support for managing cultural resources at Detachment Fallbrook. Chief among cultural resources requirements are the National Historic Preservation Act (NHPA); the Archaeological Resources Protection Act (ARPA); and the Native American Graves Protection and Repatriation Act (NAGPRA); as well as DOD and Navy implementing regulations. The NEPA project review process (see Chapter 5) facilitates integration of natural and cultural resources management at Detachment Fallbrook. Where necessary and appropriate, consultations with the State Historic Preservation Officer are conducted to ensure natural resources management programs are not adversely affecting cultural resources.

CHAPTER 2
MISSION, LAND USE, AND REGIONAL SETTING

The components of how the military mission and mission support requirements are accomplished on Detachment Fallbrook are described in this chapter. To better understand natural resource values observable on the landscape today, this chapter also provides a historical and regional context of land use.

2.1 LOCATION

Detachment Fallbrook occupies approximately 8,852 acres (Appendix D) and, along with Marine Corps Base (MCB) Camp Pendleton, forms a U.S. Department of Defense (DOD) enclave stretching from the coast of northern San Diego County approximately nine miles inland (Map 2-1, Photo 2). The major metropolitan areas of San Diego and Los Angeles are located approximately 40 miles south and 70 miles north of Detachment Fallbrook, respectively. The Detachment is immediately adjacent to the unincorporated village of Fallbrook and is bordered on the north, west, and much of the south by MCB Camp Pendleton (Map 2-1). The eastern and a portion of the southern border is adjacent to the residential and commercial areas of Fallbrook, the Fallbrook Air Park, and semi-rural agricultural lands that include plant nurseries, avocado and citrus groves, and vineyards.

Detachment Fallbrook, along with its neighboring properties such as MCB Camp Pendleton, the Santa Rosa Plateau, the Palomar Mountain complex, and San Mateo Wilderness Area of the Cleveland National Forest, comprise the largest remaining open space and wildlife habitat in coastal southern California. Detachment Fallbrook lies within the watersheds of two coastal drainages. The Santa Margarita River forms the northern boundary and the San Luis Rey River is located nearby to the south.

Photo 2. Located in northern San Diego County, California, administrative buildings at Detachment Fallbrook are seen here with the backdrop of the San Bernardino Mountains and cattle grazing in the foreground. (Photo by C.M. Wolf)

2.2 MISSION

Detachment Fallbrook is the primary West Coast supply point for amphibious warfare ships and acts together with Naval Weapons Station (NAVWPNSTA) Seal Beach as the major Navy ordnance storage, maintenance, production, and distribution facilities for the western United States. As the primary West Coast provider of air launched missiles for the Pacific Fleet, Detachment Fallbrook also has the only West Coast maintenance facility for these missiles, and the capacity to expand to meet increasing challenges. The Sidewinder and Maverick are inspected, maintained, and recertified here. Detachment Fallbrook is a critical safe haven for explosives laden vehicles.

2.3 HISTORIC LAND USE

In 1941, the U.S. government authorized the purchase of a portion of the Rancho Santa Margarita y Las Flores land in Fallbrook for a Naval Ammunition Depot. Actual facilities construction began in 1941. By the beginning of the following year land acquisition was completed and the facility that is known today as NAVWPNSTA Seal Beach Detachment Fallbrook was commissioned and began operation on 2 February 1942. Prior to this, there was a long history of occupation of the land first by Native Americans and then by European settlers. (Clevenger & Crawford 1997)

2.3.1 Pre-Military Land Use

The basic cultural sequence for San Diego County was established by Malcom J. Rogers. Subsequent scholars have refined it in various ways, by subdividing, combining, or re-naming the units of analysis (periods, complexes, horizons, cultural, and so on). This context discusses the regional prehistory in terms of three general periods: the terminal Pleistocene/early Holocene, the long middle Holocene, and the late Holocene (USDON 2012). The terminal Pleistocene/early Holocene (10,000–6,000 B.C.) was thought to consist of bands of hunter-gatherers that immigrated from the Great Basin. The middle Holocene (6,000 B.C.–A.D. 700) consisted of milling and shellfish-gathering tribes that appeared to have a relatively stable, sedentary, hunting and gathering complex in the area. In the late Holocene (A.D. 700–1700) the groups that occupied the area were speakers of the Yuman language or languages when the Spanish arrived and were named Luiseño after the Spanish mission at San Luis Rey de Francia.

Detachment Fallbrook, which is part of a larger area known as the land between two rivers, was entirely within the boundary of the Luiseño territory (Bean & Shipek 1978, cited in USDON 1997). The Detachment's location between the Santa Margarita and the San Luis Rey Rivers as well as its downward sloping topography, from the inland mountain ranges to the coast, resulted in its use as a passage for Native Americans from the desert and mountains in the east to the Pacific Ocean (Yamaguchi 2002; see Map 2-1 for regional location). As a corridor to the ocean, campsites were often located along banks of the Santa Margarita River (Shapiro 1991).

According to mission records of 1820 and archaeological excavations by San Diego State University (SDSU), Native American land use along the Santa Margarita River, San Luis Rey River, and the Fallbrook ridge included village sites, special use areas, and campsites. The settlement pattern of the Luiseño generally included two or more permanent base camps with a number of associated special purpose sites for quarrying, hunting, food production and milling that were used seasonally. By the 16th century, the population of Native Americans in the Santa Margarita Watershed was approximately 10,000 people (Shapiro 1991).

The property now encompassed by Detachment Fallbrook has a long history of livestock grazing dating back at least to the early 1800s. During the Rancho Period (early- to mid-1800s), Europeans arrived in southern California, changing land use along the San Luis Rey and Santa Margarita River to a livestock grazing and agricultural base. Originally one of six ranches, the land that now comprises Detachment Fallbrook was then called "Rancho San Onofre y Santa Margarita," belonging to the San Luis Rey Mission (Brackett 1951). In 1841, the 89,742 acres of land was granted to the Pico Family, and in 1844 the Las Flores property was also granted resulting in Rancho Santa Margarita y Las Flores, covering a total of 133,440.78 acres (Brackett 1951). The rancho prospered under the Pico Family, with descriptions of the Rancho supporting 10,000 cattle, 2,000 horses, and 15,000 sheep (Brackett 1951).

In the 1860s droughts and floods resulted in the Pico family selling the Rancho Santa Margarita y Los Flores to Juan Forster who also had control of large land holdings within the San Juan Capistrano District resulting in a massive rancho approximately 230,000 acres in size spanning

three counties (Brackett 1951). From 1864 to 1882, the rancho was controlled by Forster until it was sold jointly to Richard O'Neill and James Flood to settle debts (Brackett 1951, Herbert 1961).

While in the hands of the Flood and O'Neill families, the immense property was a working ranch with estimates of 15,000 head of cattle grazing the land (Hebert 1961). During this time, cattle grazing was continuously practiced although the stocking rates were lower at times; other enterprises including animal husbandry and dryland farming were also practiced (Hebert 1961). The property now encompassed by Detachment Fallbrook witnessed a shift from intensive grazing to dryland farming in the late 1800s, and to animal husbandry from the 1900s until the 1930s, due to droughts, floods, and other land changes. Aerial photos from the 1930s show that grains were planted in flat to moderately steep areas of the Detachment (Photos 3 and 4). This farming had a profound effect on the vegetation of Detachment Fallbrook and is believed to be responsible for the majority of gullying and incised stream channels found on the property (Kellogg & Kellogg 1990).

In the region surrounding the ranchos, American settlement was progressively increasing and changing land use patterns had a greater impact on the environment than natural disasters (Shapiro 1991). The first Anglo-American family settled in Fallbrook in 1869 in the Live Oak Park area and in the 1870s, non-rancho land was opened for homesteading. The growth of the area and its main industry, agriculture, resulted in contention over water rights, water storage, and diversion in the Santa Margarita River basin. Adding to the contention was the Vail Company which began drawing increasing amounts of water from the upper Santa Margarita River around 1904 to support another large rancho, and therefore diminished the flow to Rancho Santa Margarita. In 1926 the Santa Margarita Rancho sued the Vail Company to establish water rights over the Santa Margarita River basin (Brackett 1951). The case continued for years with courts eventually awarding the lower basin users two-thirds of the river's flow and the upper basin, one-third; the lower basin was further subdivided with 60% going to Rancho Santa Margarita and 40% to the Fallbrook Public Utilities District around 1940, prior to the military purchasing portions of the Rancho Santa Margarita (FHS 2001 Vol 7). However, the settlement of water rights still has yet to be fully resolved.

Another important influence on society in the area in the late 1800s to the early 1900s was a railroad line that extended from National City to north of Lake Elsinore. In 1882, the California Southern Railroad Company built a railroad line up the coast from National City to the Santa Margarita River north of Oceanside, then to Temecula and northward past Lake Elsinore. Railroad stations were established in the Santa Margarita River Canyon at De Luz, Fallbrook, and Ranchita. In 1884, heavy rains washed out thirty miles of track along the Santa Margarita River, closing the railroad for nine months. After reconstruction, the segment between Fallbrook and Temecula was kept in operation until 1891 when winter rains again caused severe damage and the segment was abandoned (FHS 2000 Vol 3). In 1916, heavy rains washed out roads and bridges resulting in the closure of the Fallbrook Branch Line, which extended from Oceanside to Fallbrook. A new railroad route was built from Oceanside into downtown Fallbrook in 1916, and Fallbrook relied on this new line for transporting produce. Cattle and all agricultural industries benefited. After the purchase of Detachment Fallbrook, ammunition was also shipped via this railroad (FHS 2000 Vol 3).

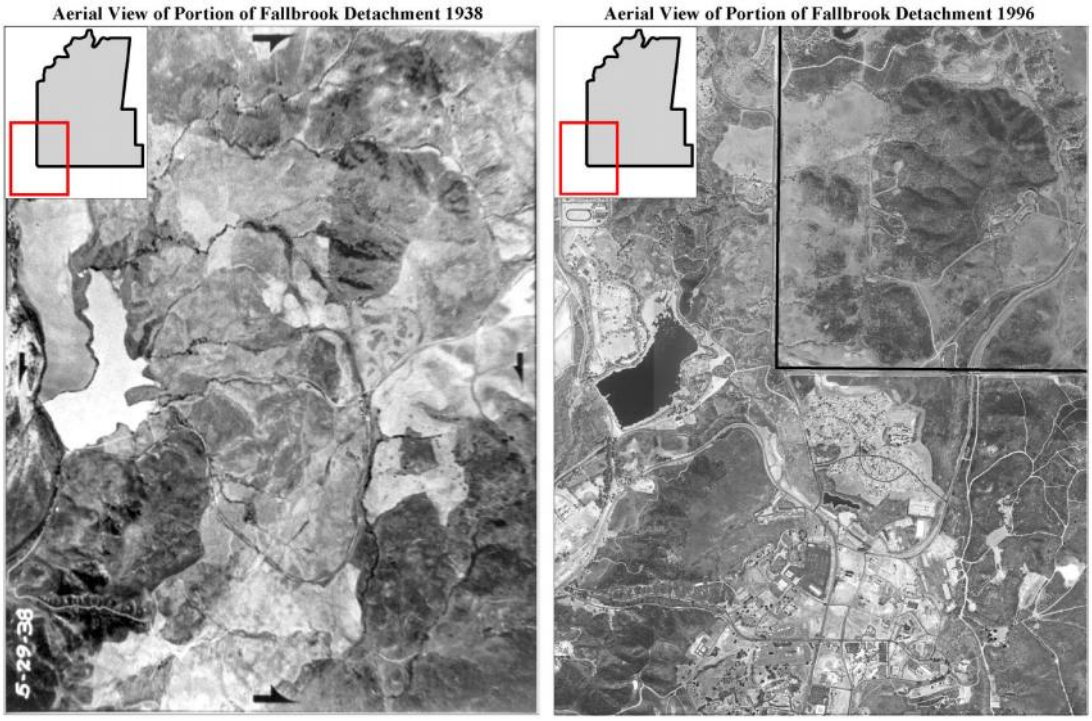

Photo 3. Aerial photos of southwest Detachment Fallbrook, 1938 and 1996, showing Lake O'Neill. Lighter tones in the 1938 photo are disked grain fields.

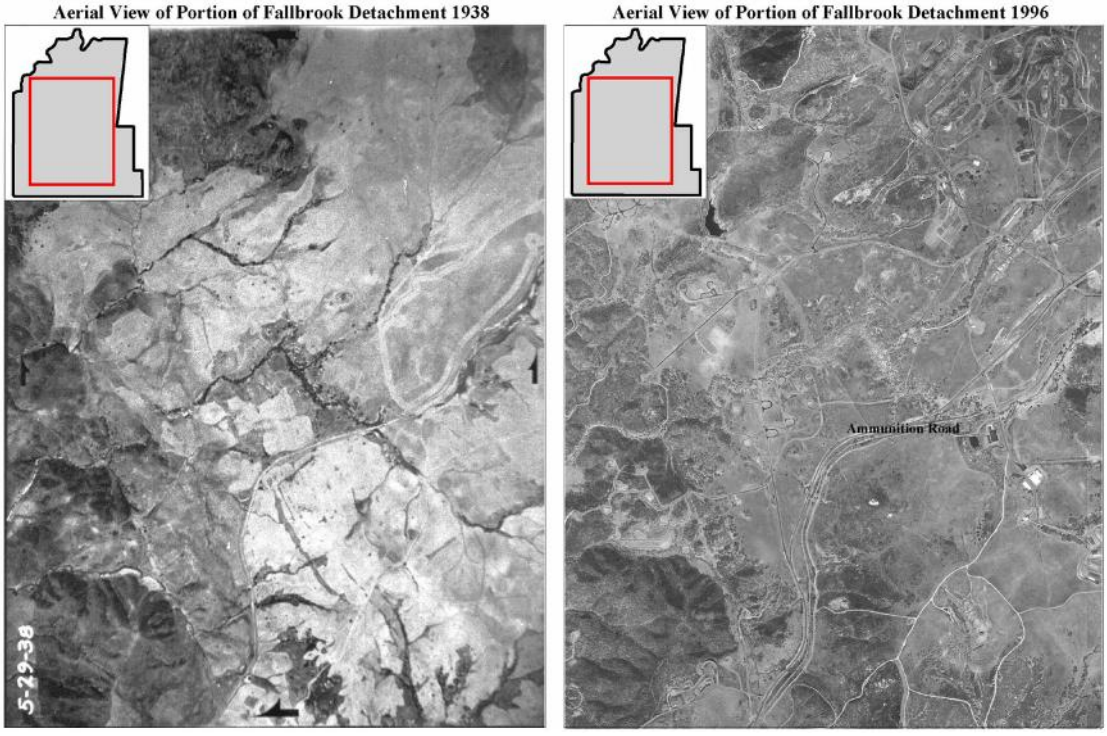

Photo 4. Comparison of 1938 and 1996 aerial photos of central portion of Detachment Fallbrook. Lighter tones in the 1938 photos are disked grain fields.

2.3.2 Early Military Navy Use

During World War II (WWII) the region experienced substantial changes. With Southern California being a major supplier for ships heading into the Pacific theater, the problem of safely handling ammunition in and around the San Diego area became very important. Some storage was afforded by ships' magazines; however, the only other ordnance storage was at several small sites on North Island and 13 magazines associated with the fuel annex on Point Loma. All of southern California Naval ordnance was dependent on rail shipments from ammunition depots near Mare Island, close to San Francisco, or Hawthorne, Nevada. These shipments could be adversely affected by wartime shortages of rolling stock or by congestion at wartime shipping sites. There were also safety concerns for transporting explosives long range. (Linder 2001)

The Fallbrook site was selected in April 1941 following approval from Congress for the building of an ammunition storage facility in the San Diego area, and construction commenced soon after that same year. The property at the Fallbrook site had changed hands several times and had been abandoned by the owners by the late 1930s after they quit their farming operations. In January 1942, the land at the Fallbrook site was formally acquired the Federal Government and the ammunition depot, first known as the Naval Ammunition Depot (NAD) Fallbrook, was commissioned on 3 February 1942. The purpose of the depot was to receive, store, and guard large quantities of explosives and ammunition and to deliver the kinds and quantities required for use. Deliveries were made by trucks under station convoy and shipments to the depot were by railroad. (Clevenger & Crawford 1997)

Although the military had shown interest in the area and had even commenced construction prior to the Japanese attack on Pearl Harbor in December 1941, this event and subsequent developments in the war had a profound effect on the developing ammunition depot. Operations at NAD Fallbrook began in 1942 with 26 high-explosives magazines completed and other facilities under the original contract nearing completion. The original concept for the operations at NAD Fallbrook had envisaged a small organization of a few key officers and civilian personnel and a complement of Marine guards, with no more than 125 people attached to the activity. The original construction contract called for 73 magazines and housing for 56 people among other facilities, such as additional buildings, roads, railway tracking, a boundary fence, and associated utility services. To meet increasing demands, contract scopes were expanded to include additional magazines, barracks, and buildings, and a corresponding increase in roads and services. By the end of the war, the installation had over 160 magazines and a complement of more than 1,200 people; sailors were housed in circus tents when housing was not available. (Clevenger & Crawford 1997)

After WWII, NAD Fallbrook was placed in a reduced operational status until the beginning of hostilities in Korea in 1950 (Clevenger & Crawford 1997). In 1958, a few years after the Korean War, NAD Fallbrook was disestablished and annexed to the Naval Weapons Station Seal Beach (Clevenger & Crawford 1997). This relationship between the parent Naval activity at Seal Beach and its Annex or Detachment at Fallbrook has endured many name changes. Since 1998, the official names of the two installations have been Naval Weapons Station Seal Beach and Naval Weapons Station Seal Beach Detachment Fallbrook.

After the Navy acquired the property in 1942, a grazing lease was established as a fire management tool to reduce vegetative fuel load (USDON 2012). The exact prescriptions of the grazing lease have changed over time. From the 1940s to the 1970s, grazing was seasonal, firebreak maintenance was the Navy's responsibility, brush removal activities were practiced, and extensive water impoundment construction projects (e.g., troughs, wells, dams, tanks) were completed. Year-long grazing was practiced from the 1970s until 1986. A 1986 lease modification allowed seasonal grazing and incorporated firebreak maintenance by the lessee.

Early military land use at Detachment Fallbrook left its mark on the landscape, aspects of which are still present today (Map 2-2; Photos 5 and 6). In addition to the livestock grazing and development of magazines and roads, mechanical brush control was rigorously practiced with firebreaks encircling every magazine, the installation's perimeter, and strategic ridgelines as well as interior mechanical brush removal and prescribed burning to reduce fire fuel loading and improve range forage (USDON 1994). While the number of firebreaks on the installation has steadily decreased and mechanical brush removal largely halted in 1985, evidence of these activities can still be seen in some areas in the form of visible ruts and soil berms.

Other historical military impacts that left their marks on the landscape include the maintenance of a munitions disposal and test site (Quality Engineering or "QE" test site) that was operational until the late 1980s, the storage of nearly 35,000 canisters of Vietnam-era napalm for roughly 30 years, a skeet and trap range, a landfill and several other disposal sites that are now included as part of the Navy's Installation Restoration and Munitions Response Program (see Section 2.4.4 for additional details about each site). At several of these sites, disking and dragging had been conducted to maintain the areas clear of vegetation for fire control.

Photo 5. Numerous historic firebreaks that are no longer maintained are exposed after wildland fires. (Photo by MC1 Eli J. Medellin)

Photo 6. Aerial photos of Detachment Fallbrook and vicinity in 1946 (top) and 1947 (bottom; oblique view looking west).

2.4 CURRENT OPERATIONS AND LAND USE

Military operations and activities at Detachment Fallbrook necessitate low levels of development and restricted access for explosives safety and security considerations. This has translated to the relatively low impact contemporary land use that contributes to natural open spaces on the installation which support a range of native communities today. As a result, mission operations, facilities maintenance, and land use activities that currently occur are often within, or in close proximity of, species and resources that are protected or regulated by today's environmental laws.

The current operations and land use described in this section are guided by standard operation controls presented in Appendix E that help avoid and minimize adverse environmental impacts. Chapter 4 also lists avoidance and minimization measures that benefit specific natural resources. Chapter 5 highlights the processes (e.g., NEPA and ESA consultations) that help integrate land use and natural resources management/compliance. Appendix F provides a list of actual ESA consultations and mitigation tracking for Detachment Fallbrook.

2.4.1 Military Land Use Overview

Roughly 330 acres (4%) of Detachment Fallbrook consists of developed areas, including facilities, buildings, roads, and landscaping, for mission support land use. Map 2-3 shows current land use designations.

The following functions for Detachment Fallbrook, which were identified in the NAVWPNSTA Seal Beach Complex Master Plan Update (USDON 1989), are still relevant today:

- Provide missile, bomb, and U.S. Marine Corps conventional ammunition receipt, storage, and issue;
- Serve as an Intermediate Level Maintenance facility for air launched missiles; Perform stockpile evaluation for Navy, Marine Corps, and Air Force munitions (by Naval Surface Warfare Center Crane: Expeditionary Systems Evaluation Division [ESED]);
- Stock and package Landing For Operations Readiness Munitions (L-FORM), and
- Perform Failure Analysis of Fleet Return ordnance.

Photo 7. Vertical Replenishment.

A key activity to achieve the weapons supply mission is vertical replenishment (VERTREP). This operation is designed to load and unload ships offshore, via helicopters. Ammunition is taken by truck from a Detachment Fallbrook magazine to a helicopter pad at MCB Camp Pendleton located on the west (ocean) side of Interstate-5. Ammunition is then transferred from the pad by a MH-60 helicopter to a ship waiting a few miles offshore (Photo 7). This truck-to-helicopter pad- to-ship process is used due to a prohibition of flying ordnance slung underneath a helicopter across a public transportation route (i.e., Interstate-5). Also, large vessels, such as amphibious assault ships, can be loaded without leaving their primary southern California operating and training areas.

Owing to the ordnance handling, transport, and storage operations at Detachment Fallbrook, explosives safety and physical security are paramount. Many aspects of land use are related to safety and security requirements, such as vegetation clear zones for visibility and fuels reduction and firebreaks to reduce fire risk.

Nighttime activities are almost exclusively limited to security patrols and the occasional nocturnal environmental surveys. Nighttime lighting is limited mainly to the Administrative Area and certain explosives ordnance facilities as dictated by security requirements (Section 2.4.1.2).

2.4.1.1 SAFETY REQUIREMENTS AND ESQD ARCS

Safety requirements as well as processes, rules, and regulations for operating ordnance facilities are described in the manual Naval Sea (NAVSEA) Systems Command Ordnance Pamphlet 5, Volume 1 (Ammunition and Explosives Safety Ashore–Regulations for Handling, Storing, Production, Renovation and Shipping), or NAVSEA OP-5. The explosives safety policies of DON emphasize safe and efficient operating procedures while providing maximum possible protection to personnel and property from the damaging effects of potential accidents involving ammunition and explosives and limiting exposure.

The safety hazard from the actual handling of ordnance is greater than from its storage, and safety zones are designed to accommodate both. Not displayed graphically in this document, but a key component of OP-5 that greatly affects land use on the installation, is the presence of Explosives Safety Quantity Distance (ESQD) arcs. The ESQD arcs originate from magazines, ordnance handling buildings, and holding yards and encumber over 6,600 acres of land on Detachment Fallbrook. The ESQD arcs are critical to the mission; the Navy will not compromise on preserving the integrity of the safety distances. The presence of these arcs results in numerous land use and development restrictions.

OP-5 identifies mandatory separation distances between operational or ordnance buildings using a secondary radius within the larger ESQD arc determined by the amount of explosives weight within the buildings, including a buffer zone. As such, development of arc-encumbered land for non-ordnance related functions is severely constrained as any project proposed within ESQD arcs could affect the capacity for handling and storing ordnance. Moreover, OP-5 specifies that only mission-essential personnel are allowed within ESQD arcs and limits the placement of buildings that may be inhabited by personnel within those arcs. This reduces the number of people within arcs in a given time period. (The Administrative Area occurs outside if the ESQD arcs.)

Land use within the ESQD arcs that is not a part of general ordnance operation and facilities maintenance activities is controlled by a Site Approval process. Site Approvals are required for new construction or modification of existing structures that involve explosives quantity-distance (NAVSEA OP-5, paragraph 8-1.2.1). Site Approval requests go to Naval Ordnance Safety and Security Activity (NOSSA) for review. NOSSA will either approve the package or endorse the package and forward it to Department of Defense Explosive Safety Board (DDESB). Activities that cannot comply with the rules and regulations as identified OP-5 must obtain exceptions or waivers through a formalized process. Deviations (waivers and exemptions) from Explosives Safety requirements must be approved through Chief of Naval Operations (CNO) (NAVSEA OP-5, paragraph 1-6).

2.4.1.2 SECURITY REQUIREMENTS

Security requirements provide guidance on how to safeguard assets and material from loss or theft and include but are not limited to physical barriers, access control, grounds keeping practices, intruder detection systems, nighttime lighting, and guard patrols. The CO, Detachment Director, and Security Officer are responsible for ensuring the physical security of Detachment Fallbrook as instructed in Navy regulations including Chief of Naval Operations Instruction (OPNAVINST) 5530.13C Department of the Navy Physical Security Instruction for Conventional Arms, Ammunition, and Explosives (AA&E) (26 September 2003), OPNAVINST 5530.14E Navy Physical Security and Law Enforcement Program (28 January 2009, with Change Transmittals in

2010 and 2014), and Navy Tactics, Techniques, and Procedures (NTTP) 3-07.2.3, Law Enforcement and Physical Security (August 2011).

Appendix O of NTTP 3-07.2.3 specifies the establishment of physical barriers along the designated perimeters of all restricted areas. Federal standards for chain link fencing are also outlined (NTTP 3-07.2.3). Security fencing should be kept clear of visual obstructions such as vines, shrubs, tree limbs, etc., which could provide concealment for an intruder. The height of vegetation is restricted so that intruders can be detected and a clear line of sight is available to Security personnel. Vegetation height restrictions are described in Sections 2.4.2 and 2.4.3.

For secure holding areas for arms, ammunition, and explosives, security standards in OPNAVINST 5530.13C specify protective lighting that extends 25 feet beyond the holding area. In the case of the "Upper Truck Holding Yard" (facility 363), compensatory security measures allowed a permanent exception to the lighting requirement to avoid adverse impacts to federally listed threatened and endangered species within the vicinity of this facility (see agency endorsement letters, including Naval Ordnance Safety and Security Activity recommendation, 14 May 2014, Ser N5AAE/761 and Office of the Chief of Naval Operations approval, 25 Jul 2014, Ser N46/14U133396).

2.4.1.3 AIRSPACE RESTRICTIONS

The Federal Aviation Administration (FAA) has designated Restricted Area R-2503 airspace over the DOD enclave that includes MCB Camp Pendleton, Marine Corps Air Station, and Detachment Fallbrook to provide the DOD with the sole approval and scheduling authority for all users and activities within this airspace (USMC 2008). The portion of airspace over Detachment Fallbrook, R-2503B, is restricted between ground level and 15,000 ft (USMC 2008). Overfly restrictions are also included in OP-5, specifically, aircraft, including helicopters, are not permitted to fly at an altitude of less than 500 feet over magazines or ammunition staging areas while ammunition handling is in process or ammunition is staged, or in explosives production areas.

2.4.2 Infrastructure and Maintenance

2.4.2.1 BUILDINGS, ADMINISTRATIVE AREAS

Detachment Fallbrook contains over 100 buildings. The majority of which occur within the in Administrative Area and outside of the ESQD arcs. Buildings associated with the handling of ordnance require additional security and safety measures such as perimeter fencing, clear zones, and lightning protection.

Although there was historically a small housing area on the installation (approximately 14 structures including main quarters, guest houses, and garages), the buildings were demolished in 2011. This demolition provided an opportunity for the MCB Camp Pendleton Fire Department to host structural firefighting training courses (Photo 8). For several days, fire departments from throughout the region participated in training rotations to learn the concepts of positive pressure attack, simulate search and rescue, practice how to vent rooftops, and develop other fundamental fire control skills. Currently, and for the foreseeable future, there is no housing on the installation.

Photo 8. Structural firefighter training prior to demolition of old housing buildings, 2011.(Photos by C.M. Wolf)

2.4.2.2 MAGAZINES AND HOLDING YARDS

Central to the mission of explosives storage are magazine bunkers designed to protect their contents and minimize the risk of propagation of an explosion that may occur in an adjacent magazine. Holding yards are areas designated for the temporary storage of vehicles containing explosives and/or other dangerous materials prior to shipment (e.g., for VERTREPs) or transfer to a more permanent storage area.

Approximately 200 earth-covered magazines of various types for the storage and handling of ordnance occur on the hilly terrain of Detachment Fallbrook with many set into the incline of hillsides (Photo 9). The number of magazines is designed to accommodate built-in reserve capacity; not all magazines are expected to be in use at a given time. The majority of the magazines were constructed between 1942 and 1945 (Photo 6) with an additional eight constructed in the 1950s, and another eight missile magazines constructed between the 1960s and the early 1990s. The newer magazines were built to accommodate more contemporary weapons systems that did not fit in the earlier magazine designs.

Photo 9. Aerial view of ordnance storage system, circa early 2000s.

Most of the magazines are made of steel-reinforced concrete that are designed to support the OP-5 requirement of a minimum of 24 inches of native soil cover. Some vegetation on top of the

magazines and on the steep road cut slopes often associated with the magazines helps stabilize soil from erosion (USDON 2002, Photo 10). However, for the purpose of fuels management to reduce fire risk, NAVSEA OP-5 Rev. 7 specifies height of vegetation on the earthen magazines and within 50 feet (ft) of any potential explosives structure is restricted to 18 inches or less overall, except where topography and other physical characteristics make this impossible. See also Section 2.4.3 for vegetation management.

The missile magazines have a crushed rock cover over earth on the top, side, and rear embankments. The rock is separated from the earth cover by a non-woven filter fabric. Concrete swales were constructed around the base of each magazine to intercept runoff from the rock embankments and reduce erosion. Significant erosion on the missile magazines has not been observed. However, in some relatively small areas on the side and rear embankments of these magazines, the rock cover and filter fabric have shifted to expose the underlying soil, increasing erosion potential in these locations (USDON 2002). Even on these gravel-covered magazines, vegetation eventually becomes established on the surface. Vegetation growth is controlled through spot spraying.

Current vegetation maintenance practices are generally successful in sustaining the OP-5 two-foot soil coverage requirement on the magazines; however, erosion diminishes soil coverage over time, necessitating occasional maintenance. Detachment Fallbrook conducts periodic surveys to determine the extent of erosion on the magazines and performs maintenance on a priority basis. Repairs typically consist of placing and compacting new soil on areas that have severely eroded. Native soil from the Detachment is used to re-cover the magazines where the cement cover of the structure is exposed. Some areas of exposed soil on the magazines have been replanted with native vegetation, which has established with limited success (USDON 2002).

Photo 10. Archive photos of excessive magazine erosion due, in part, to lack of vegetation, circa 1950s-60s.

The cause and severity of erosion varies. Most erosion on the magazines is thought to be initiated by burrowing animals. Grazing by cattle, while not a significant primary cause of erosion, contributes to erosion on already exposed or destabilized embankments (USDON 2002). Based on the height of the cover relative to the front revetment walls, there does not appear to be a significant loss of soil on the top of most of the magazines. However, in a number of instances, there has been at least some loss of top cover, as evidenced by the height of the soil relative to revetments and/or roof ventilator flashing. In some cases, especially on the flattop tripartite magazines, it is not clear whether this loss is from surface erosion or from settling of the soil layer over a 60-year period. The most prevalent erosion appears to occur on the side embankments of magazines adjacent to the front revetment walls (USDON 2002).

A study funded by USDON (2002) considered several measures to address erosion control on the magazines. These included the maintaining the status quo of minor mowing and soil maintenance, re-establishment of vegetation, the addition of soil cover to increase coverage depth, decreasing the side slope angle of repose, adding crushed rock, adding Gunite covering, adding a soil binder, and/or incorporating a cellular confinement system known as Geoweb. An economic analysis of alternatives, which included the expected level of maintenance of each, resulted in a ranking of solutions by cost. Although the status quo was ranked as the “least costly” alternative, it was

considered to be a non-viable solution as current soil depth levels do not meet the OP-5 minimum criteria. However, instead of pursuing the other more costly and environmentally detrimental alternatives, the recommendation for Detachment Fallbrook was to implement a sustained program of magazine rehabilitation wherein magazine soil cover is replenished in an effort above and beyond the regular maintenance activities. It was assessed that a regular rehabilitation program would "minimize the annual capital outpay, yet provide good erosion control in a relatively condensed time frame" (USDON 2002).

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2.4.2.3 ROADS, TRANSPORTATION, AND CIRCULATION

Well planned physical access to magazines and traffic circulation configurations permit the efficient and safe operation of the ordnance mission and emergency response situations. These systems must be capable of responding to significant changes or increasing demands that might be placed upon them during times of military mobilization. Approximately 60 miles of paved roads, 45 miles of unpaved roads, and an unknown length of unmaintained trails are found within Detachment Fallbrook (Map 2-3). Historically, a railroad line traversed the installation and provided access to the magazines; however, this no longer exists. The remnants of railroad tracks that remain today are not maintained and not subject to clear zone and other transportation requirements.

Transportation systems on Detachment Fallbrook (Map 2-3) primarily function to move ordnance to and from its storage facility; allow access for security patrols, fire fighting, and other mission support operations; and provide transit routes for personnel from the main gate to their places of employment. One noteworthy transit route is Ammunition Road, which traverses the installation and serves as a main artery for more than 10,000 DOD personnel, contractors, and official visitors daily travelling from inland communities to MCB Camp Pendleton. Traffic on Ammunition Road has increased over the years and has been the subject of improvement initiatives aimed at increasing vehicle throughput (e.g., processing rate at the gate) to relieve congestion problems during peak hours for commuters and residents in the community of Fallbrook (MSDDCTEA & Gannett Fleming 2014). One such initiative, the Main Gate improvement project, was implemented in 2012.

Road construction and maintenance are the responsibility of the Facilities Maintenance Department. Paved, or improved, roads are generally maintained on an as-needed and priority basis, funds permitting. Some less-travelled roads, such as River Road, are in disrepair. For maintaining unimproved roads, which is typically performed annually in late April or early May, the current scope of work contains the following requirements:

"Roads are graded to maintain proper crown and proper water run off (e.g., water bars) to minimize future erosion caused by rain. Using a road grader, the surface is scraped/graded with the blade tilted from centerline of the road out to the shoulder removing approximately one-half inches in the center to 1-½ inches on the shoulder. This is done to create a crown in the center of the roadway allowing the water to shed from the center of the roadway out to the road shoulder. Eroded soils and ruts are filled using native soil stockpiles, with approximately 200 yards of eroded soils having to be replaced annually. Approximately 173 culverts, 543 water diversion ditches and 4 Arizona type concrete crossings are maintained. These culverts, ditches and crossings are located throughout the Detachment along unimproved roads and in magazine areas. Annual reshaping of the ditches and removal of debris and soil that would prevent proper flow is the standard method. Additionally, riprap material is placed as needed in these ditches in order to slow and disperse the water runoff, minimizing the erosion to these areas. All effort is used to minimize ground disturbance in and around these ditch areas leaving as much existing vegetation in place to bind the soils."(K. Bourelle, pers. comm 2002)

For vehicular and pedestrian safety, vegetation clear zones along roadsides are maintained following Federal Highway Administration recommendations, as appropriate, for the speed and volume of traffic as well as terrain. For the low speed, low volume roads within the magazines, clear zones are generally up to 7 to 10 feet. Less may be necessary if visibility is good, e.g., level terrain and low vegetation heights.

2.4.2.4 UTILITIES

A properly maintained utility system, including gas, electrical, telecommunications, potable water and sewer, is essential for the administrative functions of the Detachment as well as the safe operation of the ordnance mission. The utility system footprint on Detachment Fallbrook is relatively small but is designed to be both cost effective and efficient. In addition to the Navy's own utilities, there are third party utility easements that traverse Detachment Fallbrook. Each utility company or easement holder is responsible for maintaining their utility line. For example, Sempra Energy, the parent company of San Diego Gas and Electric, conducts pole line maintenance (trimming grasses and other vegetation) and they wash the top conducting elements of their utility poles. The following is a list of utility systems and providers:

- Electricity: San Diego Gas and Electric (SDG&E)
- Natural Gas: SDG&E
- Potable Water: Fallbrook Public Utilities District (FPUD)
- Local Telephone Service: AT&T
- Fire Alarm System: Detachment Fallbrook
- Distributed Information System (Security Intrusion Detection System [IDS]): Detachment Fallbrook
- Solid Waste Disposal: Private licensed contractor
- Hazardous Waste Disposal: Defense Reutilization Management Office (DRMO)
- Sanitary Sewer: FPUD; The Detachment currently generates 37,000 gallons per day (gpd) of sewage, which is collected and transported to FPUDs allotment to send up to 50,000 gpd to FPUD. Detachment Fallbrook also maintains two septic/leach fields to serve remote facilities.

2.4.2.5 FENCES

Within the installation there are approximately 50 miles of fencing (Map 2-3), including about 16 miles of chain link fence topped with barbed wire around the perimeter of the installation. Except for the perimeter fence and certain facility enclosures, all other fences on Detachment Fallbrook tend to be three- to five-strand barbed wire fences. The barbed-wire fences function primarily to control cattle movement, e.g., segregating cattle among four grazing pastures and restricting cattle access from certain parking lots, riparian corridors, etc. (see Livestock Grazing, Section 2.4.3.4).

Maintenance of chainlink and perimeter fences is the responsibility of Public Works Maintenance Department, whereas maintenance of cattle fencing is primarily the responsibility of the cattle grazing lessee.

2.4.2.6 HAZARDOUS MATERIALS

The installation manages hazardous materials (HAZMAT) through multiple organizations primarily Naval Supply Systems (NAVSUP), NAVFAC Environmental, and each organization's hazardous materials coordinator. HAZMAT is largely supplied through the San Diego NAVSUP HAZMIN Center or the MCB Camp Pendleton Servmart. Each organization is responsible for maintaining an updated approved HAZMAT list, e.g. Authorized Use List (AUL), of materials reviewed by Environmental and Safety. The objective of the installation EMS is to maintain minimal quantities to ensure enough HAZMAT to support mission but reduce excess waste of expired or unwanted materials.

The management of hazardous materials excludes pesticides which are managed separately. The Integrated Pest Management Plan (IPMP, USDON 2011) outlines the protocols and use of pesticides and herbicides as a part of the exotic invasive management program under the umbrella of natural resources management. The installation does not permit pesticides or herbicides to be stored on base and the applicator is required to remove all materials at the end of the day. No pesticides or herbicides are turned into the base for disposal and the applicator is responsible for proper disposal per federal, state, and local regulations. All applied pesticides must be pre-approved before application.

Detachment Fallbrook is currently considered a Small Quantity Generator for hazardous waste, with majority of waste classified as universal. The generation of hazardous wastes is generally limited to the industrial areas aboard the installation and construction sites. The handling and disposal of hazardous waste is regulated under the federal Resource Conservation and Recovery Act (RCRA) of 1976, as amended, and state regulations pursuant to the Health and Safety Code and Title 22. The Hazardous Waste Media Manager is in charge of managing the hazardous waste received from on-site buildings and transported from Detachment Fallbrook to designated Treatment, Storage, and Disposal Facilities (TSDF). The Environmental Office signs all legal hazardous waste documentation and retains records of disposal.

2.4.3 Vegetation Management

2.4.3.1 LANDSCAPING

Interspersed throughout the structures and parking lots at Detachment Fallbrook, especially the Administration Area, are landscaped areas. Landscaping practices are currently managed through the NEPA approval process and grounds-keeping contracts. Landscaping along the perimeter of Detachment Fallbrook must conform to security standards for maintaining clear zones along restricted area fencelines.

Existing landscaped areas make conventional use of non-native ornamentals due to their appearance, availability, and ease of care. The majority of species are not invasive and even provide a secondary habitat for use by some wildlife. The following discussion summarizes existing landscaping policy ranging from the federal directives to the Detachment's grounds-keeping contract. See also Appendix E for base rules and standard operating procedures associated with landscaping.

Executive Order (EO) 13148 "Greening the Government through Leadership in Environmental Management" requires that federal landowners provide for environmentally and economically beneficial landscaping. "Each agency shall strive to promote the sustainable management … through the implementation of cost-effective, environmentally sound landscaping practices, and programs to reduce adverse impacts to the natural environment." Sustainable management goals can be met by innovative landscaping that includes water-efficient practices, and energy reduction practices.

Other EOs also apply to landscaped grounds including: (1) EO 11987 which restricts the use of exotic plant species in landscape and erosion control measures; (2) EO 12856 which aims to reduce the use of toxic chemicals in facilities management; and (3) EO 13101 which established goals to prevent pollution by reducing fertilizer and pesticide use, using integrated pest management techniques, recycling green waste, and minimizing runoff.

To implement these directives, OPNAV M-5090.1 states:

> *"Navy installations shall comply with the goals of [Executive Order 13148, Greening the Government Through Leadership in Environmental Management] on all new or extended landscaped areas and shall use native plants to the maximum extent practicable, when replacement or rejuvenation of existing landscaping is required." (§ 12-3.8.e)*

The last formal review of Detachment landscaping was in the Base Exterior Architecture Plan (BEAP; USDON 2005a), which recommended several design concepts, themes ("Spanish Rancho" in a "bucolic" setting), and landscaping projects, some of which are still incomplete. These include solar insulation/winter heat-gain screening with deciduous trees for several buildings that currently depend on air conditioning. The BEAP also recommended mitigation of negative views to Detachment Fallbrook from key areas, and landscaping of an eroded slope south of Ammunition Road, behind Public Works buildings.

The tables in Appendix G of this INRMP provide a list of plants, trees, and shrubs approved for use at Detachment Fallbrook (Table G-1) and those plants not permitted for use on the Detachment (Table G-2).

Landscaping is also managed through specifications of selected portions in the Grounds Maintenance Contract in regard to Maintenance Level I Management Areas (landscaped and other areas near structures). A tree/shrub-trimming policy was added to grounds-keeping guidelines by the Environmental Programs and Services Office to ensure compliance with the Migratory Bird Treaty Act (MTBA) as well as promote practices that are friendlier to bird species.

2.4.3.2 MOWED CLEAR ZONES

Mowing of clear zones is conducted for both security and safety reasons. Security guidance for clear zones as provided in Appendix O of NTTP 3-07.2.3 include the following:

- O.10.5.1: Unobstructed areas or clear zone shall be maintained on both sides of the restricted area fence. Vegetation or topographical features that must be retained in clear zones for erosion control or for legal reasons shall be trimmed or pruned to eliminate

concealment of a person lying prone on the ground. Additionally, the vegetation should not be more than 8 inches in height.

- O.10.5.2: An inside clear zone shall be at least 30 ft. Where possible, a larger clear zone should be provided to preclude or minimize damage from incendiaries or bombs.
- O.10.5.3: The outside clear zone shall be 20 ft or greater between the perimeter barrier and any exterior structures, or obstruction to visibility.

Vegetation height restrictions call for eight inch vegetation along fence lines for 30 ft inside the fence and 20 ft outside. Plantings along the Detachment Fallbrook perimeter must conform to these height restrictions. In addition, if a tree is planted outside the 20-ft buffer, its branches still may not span the fence line so that people might climb across.

For the purposes of fuel management for fire control, NAVSEA OP-5 specifies height of vegetation on the earthen magazines and within 50 feet (ft) of any potential explosives structure is restricted to 18 inches or less overall, except where topography and other physical characteristics make this impossible (Photo 11). Once vegetation reaches 18 inches within these clear zones at Detachment Fallbrook, the area is mowed to a maximum height of three inches. Mowing usually occurs between two and four times a year, depending on rainfall and vegetation growth. Mowing generally occurs from the middle of March to beginning of June, and sometime after November. The Facilities Department contracts the mowing around magazine perimeters, roadsides, and other improved and unimproved areas through the grounds maintenance contract task order process.

Photo 11. Mowed clear zones on and around magazines exhibited low burn rates and intensity following May 2014 wildland fires. (Photo by C.M. Wolf)

2.4.3.3 FIREBREAKS AND FUELBREAKS

Firebreaks and fuelbreaks function as a means to stop or slow the progression of a fire by removing or greatly reducing the fuels along a narrow strip, increasing the chances of successful suppression. A firebreak is any gap in combustible material that acts as a barrier to slow or stop wildland fires, often providing access routes for fire suppression and a place from which to set backfires. Firebreaks can be natural or constructed barriers and include things like improved or unimproved roads (see section 2.4.2.3), lakes, and rivers. In addition to such features, Detachment Fallbrook maintains a system of firebreaks in the form of linear strips of land that are disked annually to create bare mineral soil conditions (Photo 12). Fuelbreaks, which are often used in conjunction

with firebreaks, are zones of reduced or modified vegetative fuels to decrease flame length, intensity, and rate of speed of a fire.

The methods used to install and maintain firebreaks have evolved considerably over the years. Historically, firebreaks encircled each magazine and ran along both the perimeter of the installation and at strategic firefighting locations; they were maintained by disking, blading, and soil sterilants. With the change in operations and land use requirements, many of the historic firebreaks have been abandoned. Though no longer maintained, the effects of many of these historic firebreaks can still be seen (Photo 5; Map 2-2).

In addition to a reduction in the number of firebreaks, efforts were made to improve the quality of firebreaks over the years. To minimize soil erosion, disking replaced blading, as the rougher soil surface left by the furrows from disking are less erosive than blading. A flail mower was purchased in 1991 to minimize disturbance to Stephens' kangaroo rat burrows, but it did not work well in Detachment Fallbrook's rough terrain (K. Bourelle, pers. com. 2015). In 1993, after informal consultation with the U.S. Fish and Wildlife (USFWS) to ensure protection of the Stephens' kangaroo rat, a "dragging" method was attempted. This involved a set of rails pulled across the ground by a heavy-duty tractor or dozer, knocking down shrubs without destroying Stephens' kangaroo rat burrows. The Fire Department concluded that the resulting break did not meet fire control standards in that too much flammable brush remained behind (D. Cross, pers. comm. 2001).

Photo 12. Disked condition of perimeter fuelbreak. (Photo by V.M. Shoblock)

Currently, approximately 20 miles of firebreaks are maintained annually on Detachment Fallbrook via disking, with the exception of firebreaks that run down the Santa Margarita River drainage that are bladed by MCB Camp Pendleton. The perimeter firebreak and some minor extensions into the interior of the Detachment are the only remaining firebreaks of a system that used to encompass most ridges.

Fuelbreaks that currently exist on Detachment Fallbrook include the mowed areas (e.g., clear zones for ordnance buildings and magazines, along Ammunition Road, and other landscaped areas), grazed pastures, and locations of recent burns. Mowed areas are described in previous sections. Livestock grazing has long been used by the Navy as a fire management tool to reduce fuel loads, and more recently prescribed grazing has also been applied for wildlife habitat management benefits (see section 2.4.3). Wildland fires and prescribed burning, although not implemented since the completion of the Wildland Fire Management Plan (WFMP) (USDON 2003a), is another potential means of providing fuelbreaks on the Detachment.

The location, guidelines, and best management practices for fire/fuelbreak construction and maintenance are provided in the WFMP (USDON 2003a) and its associated Biological Opinion (BO) (USFWS 2003a). The essential elements of the WFMP and its associated BO are incorporated into this INRMP. The main objective for fire/fuelbreak maintenance is to keep these structures in operational condition following their original design standard or better, while protecting wildlife habitat, sensitive species, soil productivity, watershed functioning, and water quality.

2.4.3.4 LIVESTOCK GRAZING

Livestock grazing is a fundamental component of the fuels management program associated with the safe handling and storage of ordnance at Detachment Fallbrook (Photo 13). The Navy is authorized to outlease lands when it is compatible with the military mission under U.S. Code Title 10 Section 2667. Also:

> "*USDOD and USDON policy is to aggressively promote agricultural outleases (as defined in DODDIR 4700.1), along with other multiple land uses, to the maximum degree compatible with operational requirements. However, a balanced, multiple-use natural resource program through professional management is the Navy's ultimate goal. The benefits of unimproved land used alternatively for other soil and water conservation programs, wildlife habitat, forest production, and quality of life enhancement through outdoor recreation must receive full consideration." (NAVFAC P-73 Vol. II, Chapter 2)*

In addition, DOD and DON policy allows leasing of lands to reduce maintenance costs. In the case of the grazing lease, this is reflected in the cost of reducing fuel loads through grazing rather than other means.

In accordance with OPNAV M-5090.1, lands that are suitable for agricultural uses that compatible with the installation mission may be identified for agricultural outleasing. Each outlease must have a conservation plan that details best management practices to protect natural resources and government interests under the lease. Naval Facilities Engineering Command (NAVFAC) provides the technical and administrative functions of this program.

Although the land that now comprises Detachment Fallbrook has a long history of livestock grazing dating back to the early 1800s (see Section 2.3), by the 1990s cattle grazing became progressively integrated into the Navy's natural resource management program, including habitat management for the Detachment's federally listed threatened and endangered species. Cattle grazing also has become adaptively managed to help ensure that potential adverse effects of grazing on natural resources are outweighed by the benefits that grazing provides. In 1994, the grazing lease was re-evaluated and modified with the overall stocking rate reduced, changes in the start date of the lease, and restrictions and exclusions placed on riparian pastures to assist in natural resource management. Today, the practice of cattle grazing is considered an important land management tool, which was consulted on with the USFWS for its potential effects to federally listed species under the Detachment's WFMP BO (USFWS 2003a).

From 2005 to 2010, there was a hiatus in the grazing on Detachment Fallbrook after the lessee had requested an early termination of the lease in 2004. During the review process for reinstatement of a grazing lease on the Detachment, health and safety concerns were raised with respect to the utilization of forage within Installation Restoration Program (IRP)/Munitions Response Program (MRP) sites. Although adverse effects to livestock, or human consumers of the livestock, is considered a remote and low risk, the Navy fenced off portions of pasture areas that have been identified as IRP/MRP sites and conducted down gradient water testing prior to initiating a new lease arrangement. The absence of cattle grazing for five years coincided with a subsequent buildup of fuel, increased costs associated with firebreak maintenance, and a marked decline in the

federally endangered Stephens' kangaroo rat population (Montgomery 2014, SJM Biological Consultants 2014). A new grazing lease was awarded in 2010. For several reasons, firebreak maintenance was removed from the lease requirement and now remains the Navy's responsibility.

Photo 13. Ordnance magazines showing desired low-fuel vegetation condition. (Photo by MC1 Eli J. Medellin)

Currently, cattle grazing is permitted within 4 pastures on a majority (>80%) of the 8,852-acres that Detachment Fallbrook encompasses (Map 2-3). Within these areas, the goal of the grazing program is to allow for cattle to annually graze down the grasses to create natural fuel breaks throughout the installation. The annual start and stop dates for the grazing season, the number of head of cattle, and the pasture rotation order and schedule are subject to change. Factors that influence the grazing prescription for the year include, but are not limited to, rainfall and the projected length of the growing season, range conditions and natural resources management objectives, potential mission related drivers or other land use requirements.

NAVFAC SW manages the agricultural lease for cattle grazing at Detachment Fallbrook. It is the responsibility of the NAVFAC SW Range Conservationist to ensure changes, modifications, and any item with potential to impact the ability of the Detachment Command to fully meet its military mission is brought to the attention and coordinated up front and fully with the Conservation Program Manager. The NAVFAC SW Range Conservationist also works with the Detachment Conservation Program Manager to determine total cattle numbers allowed, on/off dates, and sequence and duration of grazing for each pasture. The Grazing Management Plan outlines Standard Operating Procedures and tasks to coordinate between the Range Conservationist and the Detachment Conservation Program Manager.

2.4.4 Historical Contamination Cleanup Activities

Historic land use on the installation has resulted in several sites that require investigation and cleanup under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA, 42 USC 9601). CERCLA, commonly referred to as Superfund, authorizes the federal government to assess and/or clean up contaminated sites and provides authority for emergency response involving hazardous materials. Within the Navy, this cleanup is coordinated via the Installation Restoration/Munitions Response Programs (IRP/MRP). The installation Commanding Officer is accountable for the IRP/MRP at his/her installation. However, NAVFAC is responsible for execution of the restoration programs. Each CO assigns an IRP/MRP Coordinator to ensure all work is accomplished in accordance with regulatory and DON policy. When appropriate, the Region or installation's natural resources management staff will assist the IRP/MRP Coordinator to identify potential impacts to natural resources caused by the release of these contaminants and/or

the cleanup response actions. Natural Resources staff also assists in IRP/MRP document reviews (e.g., Remedial Investigation, Ecological Risk Assessment) and ensure that the impacts to natural resources can be minimized, to the maximum extent practicable, during the execution of a response action.

Aboard Detachment Fallbrook, all IRP/MRP sites have been inventoried, scheduled, and prioritized for further evaluations and clean-up based on the assessed risk. All of the IRP/MRP sites at Detachment Fallbrook are considered low to medium risk. It has also been determined that there is no sufficient community interest in establishing a Restoration Advisory Board (RAB) for Detachment Fallbrook. A RAB is a community citizen-based committee that reviews and provides input to the Navy's cleanup plans and reports.

2.4.4.1 INSTALLATION RESTORATION SITES

The purpose of the IRP is to identify, assess, characterize, and clean up or control contamination from past hazardous waste disposal operations and hazardous material spills. The IRP is responsible for providing guidance and funding for the activities required under CERCLA (42 USC 9601). Such activities, including risk assessment for human health and the environment (including impacts to endangered species, migratory birds and biotic communities), as well as the development and selection of cleanup actions, are administered by NAVFAC SW. Regulatory oversight for the IRP is provided by the State of California Environmental Protection Agency (Cal/EPA), Department of Toxic Substance Control (DTSC), and San Diego Regional Water Quality Control Board (RWQCB). Aboard Detachment Fallbrook, the IRP has proceeded past the identification phase and is in the characterization/cleanup phase for the eleven identified sites (Map 2-3; Table 2-1). Of these sites, three sites have been recommended for no further action based on the site investigation and one site (three separate former napalm storage areas) has been cleaned up and closed.

2.4.4.2 MUNITIONS RESPONSE PROGRAM

The purpose of the MRP is to address the potential explosives safety, health, and environmental issues caused by past Department of Defense munitions related activities. The MRP is a relatively new (2002) element of the Secretary of Defense's Defense Environmental Restoration Program. Munitions response actions will be conducted under the process outlined in the National Contingency Plan (NCP) (40 CFR 300) as authorized by CERCLA.

Administered by NAVFAC SW, regulatory oversight for the MRP is provided by the State of Cal/EPA, DTSC, and San Diego RWQCB. Aboard Detachment Fallbrook, the MRP has proceeded past the identification phase and is in the characterization/cleanup phase for its eight active sites (Map 2-3; Table 2-2).

Table 2-1. Installation Restoration Program sites at Detachment Fallbrook.

IR Site	Status and Description
IR 27: Eucalyptus Grove Landfill	IN PROGRESS. This site was used from the late 1960s to 1974 as a garbage disposal site, and is approximately 24,000 cubic yards large. Small quantities of hazardous wastes were dumped with regular trash as well as metal banding and pallets. A proposed plan is being prepared to invite public comments on the recommended remedy for this site.
IR 28: PCP Dip Tank Area	CLOSED. From 1971 to 1975, a tank containing the wood preservative pentachlorophenol (PCP) was present and about 30 gallons per year of PCP may have dripped onto the paved area near the tank. Additionally from 1975-late 1983 a storage area was used for 42 55-gallon drums of PCP. The site has been evaluated and it has been determined that no further action is required.
IR 29: Incinerator Landfill	CLOSED. From the mid-1940s to 1970, an incinerator was used to dispose of refuse. Following the incinerator's shut-down, approximately 1,000 cubic yards of refuse including hazardous materials was placed in a landfill next to the incinerator. The site has been evaluated and it has been determined that no further action is required.
IR 30: Oil Switch Spill	In February 1984, several ounces of oil potentially containing PCB were spilled from one or more oil switches in the far southeast end of Building 230. In 1984, the potentially contaminated asphalt was removed and disposed of through DRMO. This site is currently investigated under a site inspection (SI).
IR 31: Battery Shop Disposal Areas	IN PROGRESS. From the mid-1940s to 1955, the Building 203 battery shop discharged about 2,000 gallons of potentially non-neutralized waste electrolyte from lead acid batteries into a septic tank. The exact location is unknown. From 1955-1983 the battery shop was in Building 352, where an unlined sump was used to dispose of approximately 4,000 gallons of potentially non-neutralized waste battery electrolyte. The site is currently investigated under an SI.
IR 32: Paint Shop Disposal Area	IN PROGRESS. From the mid-1950s to 1983 about 2,800 gallons of waste caustic soda solution containing paint sludge was drained from a tank and discharged to the ground behind Building 351. The site is currently investigated under an expanded SI.
IR: 34: Dunnage Disposal Site	IN PROGRESS. This 9 acre site is grouped with the other IR34 sites and located in the center portion of the installation and was used as a disposal or burial area for dunnage from 1942 until 1978. The site is currently investigated under a remedial investigation (RI).
IR 34d: Dunnage Disposal Site	IN PROGRESS. This 1.8 acre site is grouped with the other IR34 sites and located in the central portion of the installation along the south side of the Fallbrook creek drainage and immediately north of Ammunition Road and was used as a burial area for dunnage from 1942 until 1978. The site is currently investigated under an RI.
IR 34e: Dunnage Disposal Area	CLOSED. This 0.7 acre site is grouped with the other IR34 sites and is a road embankment at the intersection of Ammunition Road and Harm Road. The site was reportedly used for dunnage disposal from 1942 until 1978. The site has been evaluated and it has been determined that no further action is required.
IR 52: Napalm Storage Areas	CLOSED. In the early 1970s, 35,000 napalm canisters packaged in wooden crates were brought to Fallbrook Annex and stored outside where some leaks occurred. This site was completely cleaned up and closed in 2001 following the recycling and disposal of the napalm canisters and wood crates.
IR 53: Diesel Fuel Site	IN PROGRESS. In the fall of 2004 the odor of diesel fuel was detected during trenching near Building 41. Several cubic yards of soil suspected of possible diesel fuel contamination was removed. The site is currently being investigated under a preliminary sites assessment program.

Table 2-2. Munitions Response Program sites at Detachment Fallbrook.

MRP Site	Description
UXO1: Ordnance Burn Pits and Burial Pits, also known as Fallbrook Quality Evaluation Test Area	Navy Munitions Response Program Site. The site occupies approximately 60 acres and has been used as a burning/disposal area, a powder disposal area, a drop test/munitions test site, a rocket fuel disposal site, and a munitions burn/disposal site from 1942-1989. In the past cattle were used to reduce the vegetative fuel load, however, the area is now completely fenced and is being evaluated under an RI.
UXO2: Fallbrook Security Forces Small Arms Training Range/ Fallbrook Skeet Trap Range	Navy Munitions Response Program Site. The Fallbrook Security Forces Small Arms Training Range is located to the southwest of Building 315. The range occupied approximately 0.3 acres, was used from 1945 to 1991, and was closed due to encroachment. The adjacent Skeet Trap Range is approximately 1.5 acres and was used from 1950 to 1987. No sign of lead shot or clay targets has been identified. In the past cattle were used to reduce the vegetative fuel load at these sites, however, the area is now completely fenced and being evaluated under an SI.
UXO3/IR 34a: Dunnage Disposal Site	IN PROGRESS. This site is located in the north-central portion of the installation and occupies approximately 3.3 acres. The site was used for surface disposal and burial of dunnage and munitions from 1942 until 1978 and could contain munitions of explosive concern. In the past cattle were used to reduce the vegetative fuel load but now the site is completely fenced and being evaluated under an RI.
UXO4/IR 34c: Dunnage Disposal Site	IN PROGRESS. This 1.5 acre site is located in the central portion of the installation, just south of Terrier Road, was used from 1942 until 1978 and may contain munitions of concern. Numerous cases of dummy rifle-propelled grenades were buried in the area. The site is completely fenced and being evaluated under an RI.
UXO5: Salvage Yard Landfill	IN PROGRESS. The Salvage Yard Landfill near Building 307 (IRP Site 33) contains a burial area for munitions and dunnage and was used as a disposal area from approximately 1952-1960. The area is not currently in use, is completely fenced, and is being evaluated under an RI.
UXO6: Depot Lake	IN PROGRESS. This approximately 12-acre man-made lake was identified as a possible disposal site for munitions. The lake is fenced and is used to provide water for cattle in the grazing program under certain restrictions. An RI is recommended for this site.
UXO7: Lower Lake	IN PROGRESS. This approximately 3-acre man-made lake on the southwestern part of the installation is a possible disposal site for munitions. The lake is fenced and is used to provide water for cattle in the grazing program under certain restrictions. An RI is recommended for this site.
UXO8: Gully with Munitions Debris	IN PROGRESS. This is a disposal site exposed after Tomahawk Fire of 2014. This site is being fenced off for exclusion from the grazing program. An SI is planned for the future.

2.4.5 Protected Resources and Critical Habitat

2.4.5.1 CULTURAL RESOURCES

Categories of property subject to management as cultural resources under the stewardship of Detachment Fallbrook include properties listed in, or eligible for, listing in the National Register of Historic Places (National Register), or that may be eligible for the National Register but have yet to be evaluated. Defined broadly as "historic properties," these may include prehistoric and historical archaeological sites, cultural landscapes, buildings, structures, and objects meeting or potentially meeting the Criteria of Eligibility for listing in the National Register (36 CFR Part 60). Additional stewardship responsibilities may be applicable for important historical documents; Native American sacred sites and properties of traditional, religious, and cultural significance; and previously collected prehistoric and historical artifacts.

Approximately 125 archaeological sites have been recorded within the boundaries of Detachment Fallbrook (Photo 14). Four of the sites have been evaluated as eligible for listing in the National Register in consultation with the State Historic Preservation Officer. Seven have been determined as not eligible for the National Register. The remaining sites have not been evaluated for the National Register, as of yet. Detachment Fallbrook contains over 300 historic-period buildings and structures, all of which have been evaluated and determined not eligible for listing in the National Register.

For further discussion of cultural resources and their management at Detachment Fallbrook, refer to the Integrated Cultural Resources Management Plan (USDON 2012).

Photo 14. Archaeological sites such as this prehistoric bedrock milling feature are among the legally protected resources at Detachment Fallbrook.

2.4.5.2 NATURAL RESOURCES AND CRITICAL HABITAT

Most of the plant communities on Detachment Fallbrook are subject to some level of federal regulation, mainly because they support federally listed threatened or endangered species protected under the ESA and/or are jurisdictional wetlands or waters regulated under Section 404 of the Clean Water Act (CWA) (see Section 3.7.4.4, Waters of the U.S. and Jurisdictional Wetlands, for definitions).

The U.S. Army Corps of Engineers' (USACOE) jurisdiction in fresh waters includes the channel itself for waters (defined by the Ordinary High Water Mark), to the outer edge of adjacent wetlands. Some water bodies are specifically exempted from regulation, such as irrigation ditches

or drainage ditches excavated in uplands. All waters of the U.S. require permits for ground disturbing activities and possible mitigation. Questions about site-specific impacts must be addressed to the USACOE. On Detachment Fallbrook, jurisdictional waters include but may not be limited to the Santa Margarita River, Fallbrook Creek, and tributaries to those waters.

Federally listed species and their habitat are protected by the ESA. (See Section 3.10 for a list federally listed threatened and endangered species that have been documented on Detachment Fallbrook). When a species is listed as threatened or endangered, it is protected from unauthorized "take" and being traded or sold. Section 3(18) of the Federal ESA defines "take" to include "harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct." The law also protects against interfering in vital breeding and behavioral activities of threatened or endangered species. Under the ESA, the USFWS is authorized to develop recovery plans for listed species, which outline criteria for species recovery and eventual removal from the ESA, and to provide added protection to the species by designating "critical habitat."

Critical habitat is a geographic area(s) deemed essential for the species conservation and that may require special management. The National Defense Authorization Act for Fiscal Year (FY) 04 (Pub. L. 108-136) states that critical habitat shall not be designated on lands owned or controlled by DOD that are subject to an INRMP, if the INRMP in question provides a benefit to such species. The USFWS may also exempt critical habitat on DOD land due to impact on national security (National Defense Authorization Act for Fiscal Year 2004: SEC. 318. Military Readiness and Conservation of Protected Species amended Section 4(b)(2) of the ESA of 1973 (16 U.S.C. 1533(b)(2)).

Currently on Detachment Fallbrook, there is no designated critical habitat. However, designated critical habitat for several species does occur in the vicinity of the installation (Map 2-4). Specific justification for the exemptions from designated critical habitat on Detachment Fallbrook depends on the species and time period of the critical habitat evaluations, but the underlying basis for exemption is generally that the Navy's land use and management provides sufficient benefit to the species to preclude critical habitat designation. In some instances, critical habitat was initially designated but later removed after the FY04 amendments to the ESA.

For the arroyo toad, critical habitat was designated along the Santa Margarita River and on the adjacent lands in 2001, but was remanded in 2002 for further review. Since then, critical habitat for the arroyo toad was issued in 2005 (USFWS 2005a) and again in 2011 (USFWS 2011a). Detachment Fallbrook was exempted both times.

For the California gnatcatcher, critical habitat was designated on Detachment Fallbrook in an early ruling (USFWS 2000); however, a revised final ruling in 2007 exempted Detachment Fallbrook from critical habitat designation (USFWS 2007). The Detachment is also excluded from critical habitat designations for least Bell's vireo (USFWS 1994a), southwestern willow flycatcher (USFWS 2005b), Southern California steelhead (NMFS 2005) and thread-leaved brodiaea (USFWS 2005c, 2011b). To date, the USFWS has not proposed critical habitat for the Stephens' kangaroo rat.

When actions on the installation have been identified to potentially affect federally protected species and/or habitats, the action must be consulted on with the USFWS as outlined in Section 7 of the ESA (see Appendix F for a list of ESA consultations). Avoidance and minimization of potential effects in the form of habitat improvement and/or species relocation can be and have been agreed to by the USFWS in concurrence letters and biological opinions during informal and formal ESA consultations, respectively. As a part of these avoidance and minimization measures, Detachment Fallbrook has agreed that future impacts to areas subject to such measures would be

avoided to the greatest extent practical. However, from an ecosystem management approach, these sites would not be excluded from impacts if their use would be best for the resources overall.

2.4.6 Outdoor Recreation and Public Access

In accordance with the Sikes Act, the Navy is charged to provide outdoor recreation and interpretive programs when it is compatible with the military mission, safety, and security. Other relevant laws and guidance include 10 USC 2671 (Hunting, Trapping and Fishing on Military Reservations), National Historic Preservation Act (NHPA), NAVFACINST MO-100.4 Guidance on Special Interest Areas, USDODINST 6050.2 Use of Off-Road Vehicles on DOD Land, and OPNAV M-5090.1, Chapter 12, and NAVFAC P-73 Volume II Navy Real Estate Operations and Natural Resource Management Procedural Manual.

Detachment Fallbrook's mission as an ordnance handling and storage facility precludes recreational use of its lands by Detachment personnel with the exception of recreation within cantonment areas. A Walking, Jogging, and Bicycling Policy (NAVWPNSTASB DETFBINST 6100.1 CH-1, dated 5 February 2015) outlines the specific guidelines for these activities on Detachment Fallbrook to include a map of authorized routes that are restricted to administrative roads and trails outside of ESQD arcs.

Security and safety regulations prohibit access to the Detachment by the general public with the exception of certain sponsored events (e.g., National Public Lands Day) in which visitors are escorted by authorized personnel (Photo 15). Only authorized personnel are permitted within magazine areas (ESQD arcs) for official duties, which does not include recreation. Additionally, hunting with firearms is not permitted because of its incompatibility with weapons storage/handling, and safety regulations prohibit jogging, bicycling, or other recreation within ESQD arcs. As such, outdoor recreation opportunities are limited to on-site employees who are able to take advantage the scenic, diverse landscape and abundance of wildlife on the Detachment. Many employees take advantage of trails within the administrative areas to jog and walk as well as have opportunities to view wildlife, often throughout the course of their day. Additional recreational opportunities within the administrative area include a facility with a softball field and tennis court as well as an outdoor picnic area and a barbecue site.

Photo 15. Building bird and bat houses on National Public Lands Day, 2010. (Photo by G. Smith)

See Chapters 4 and 5 for how Detachment Fallbrook provides education and outreach that does not require ESQD access (Section 4.2.8) and non-recreational public access for the sustainable multipurpose use of Detachment Fallbrook lands (e.g., via the agricultural outlease and sponsored research) (Sections 4.4, 4.13, 5.9).

2.4.7 Real Estate Agreements

The real estate agreements pertaining to land use at Detachment Fallbrook are listed in Table 2-3. Additional information about real estate agreements, including a map and further described in Appendix D. The largest of Detachment Fallbrook's real estate agreements is the lease of a

majority of the acreage for livestock grazing, which serves to manage fuel loads to control wildfire (see Map 2-3 for pasture locations, Photo 16).

Table 2-3. Real estate and other agreements regarding land use of Detachment Fallbrook.

Lease Number, Memorandum of Understanding, License, or Permit	Date	Size or Use
Easement (N6247482RP00P73)	in perpetuity	Fallbrook Sanitation District (13.672 acres), 30-ft wide strip over sewer line paralleling Ammunition Road
Easement (NOY(R)-46450)	in perpetuity	SDG&E (3.42 acres) 25-ft wide for 69 Kv powerline southeast corner of property
Easement (NOY(R)-46966)	in perpetuity (terminated)	SDG&E (no acres given) 12-ft strip eastern perimeter. Superseded by NF(R)-23664
Easement (NOY(R)-56146)	12/31/2009 (terminated)	Pacific Telephone and Telegraph (0.39 acres). 10-ft wide strip in northeast corner for telephone line has since been removed; believed to have been destroyed in the 2002 Gavilan Fire and not re-established.
Easement (NF(R)-23664)	exp. 3/20/2025	SDG&E (3.71 acres) 12-ft wide strip for 12 Kv power line parallel to Perimeter Road, eastern border.
Easement (N6247481RP00P03)	exp. 10/5/2030	Fallbrook Manor Apartments 0.03 acres drainage structure, 24 in corrugated steel pipe
Easement (N6871192RP02P98)	exp. 9/16/2042	Fallbrook Public Utilities District (0.91 acres), 30-ft strip for 18-in reclaimed water pipeline
Agricultural Outlease (N6247315RP00030)	exp. 10/31/2019 with 6 additional 1-year option years	Mendenhall Cattle Company, LLC (approximately 7,326 acres)
Quit claim (85-200775)	7 May 1985 (expired)	Atchison, Topeka, and Santa Fe Railway Company
Transfer and Acceptance of Military Real Property (NAVFAC P-78)	30 Nov. 1973 (date of transfer)	0.913 acres of land were reassigned and transferred from the CO, NAVWPNSTA Seal Beach to Commanding General, MCB Camp Pendleton, California
Fee Simple Disposal of property to County of San Diego	15 Apr. 1963 (date disposed)	294.37 acres for the purpose of the Air Park

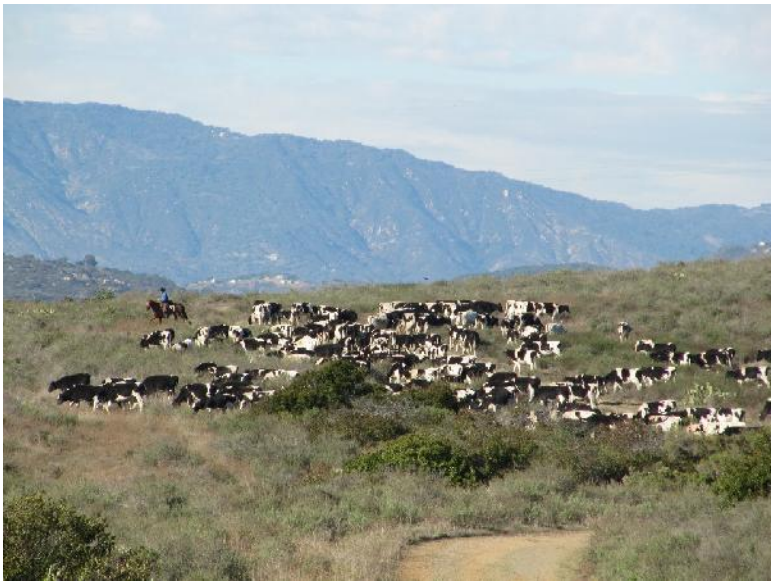


Photo 16. Over 80% of Detachment Fallbrook is leased for livestock grazing in support of fire management. (Photo by C.M. Wolf)

2.5 REGIONAL LAND USE SETTING

Regional land use provides a framework for understanding the circumstances under which the installation currently operates as well as an understanding of its conservation role, as a result of development trends, regional socio-economics, and regional conservation efforts. Land uses and regional growth have influenced not only the physical appearance of Detachment Fallbrook but also its current setting. Military installations in southern California, are among some of the last remaining places for the region's federally listed and sensitive species. Detachment Fallbrook has managed to maintain more than 80% of its land as natural area, and, along with MCB Camp Pendleton and the Cleveland National Forest, comprises the largest remaining contiguous wildland space within Southern California.

Northeast of Detachment Fallbrook is an unincorporated area of San Diego County that includes the communities of De Luz and Fallbrook. Topography and zoning limit the density of development in the vicinity of the Detachment but does not limit large tracts of real estate from being developed as a single project, as long as the overall average meets the zoning requirements.

CHAPTER 3
NATURAL RESOURCES

Detachment Fallbrook resides within the California Floristic Province, which is a Mediterranean-type ecosystem known for high biodiversity and endemism (species unique to a geographic region) and is recognized as a biodiversity hotspot of global significance (Cowling et al. 1996). The California Floristic Province is also highly threatened by human activities (Underwood et al. 2009).

The low-intensity land use requirement of the military mission has kept over 90% of Detachment Fallbrook lands as undeveloped and largely natural open space that supports a range of plant communities and provides habitat for many sensitive species, including federally listed threatened and endangered species. Vegetation communities on the Detachment represent some of southern California's most sensitive due to regional losses from urbanization, agriculture, and grazing, including native grasslands, coastal sage scrub, riparian woodlands, willow riparian, and wetlands. Also represented are more common communities such as chaparral.

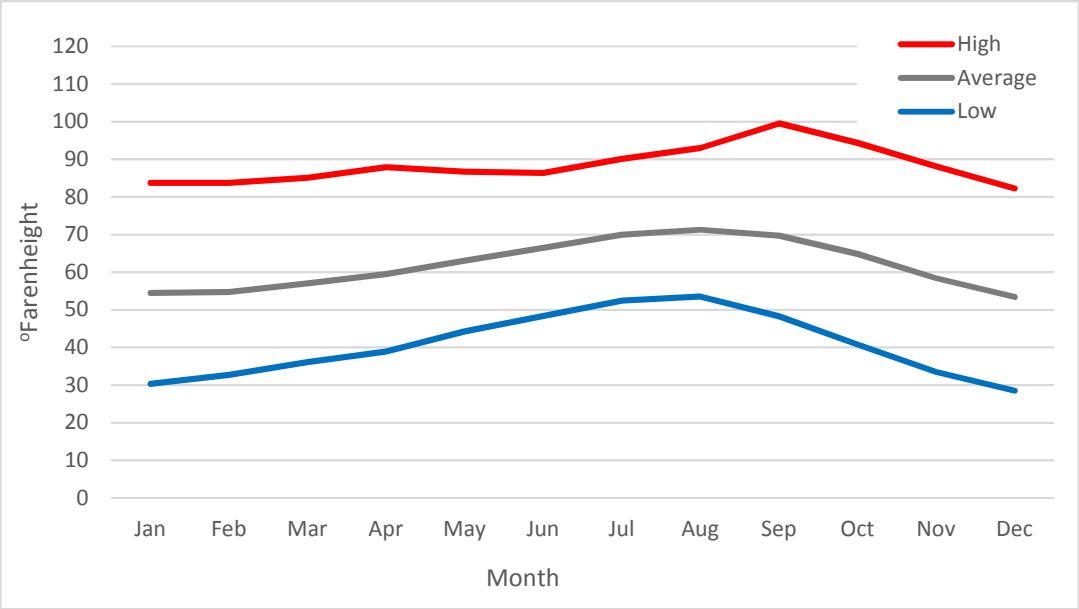
Chapter 3 describes the physical and biological setting at Detachment Fallbrook upon which natural resources management (Chapter 4) is based. For a full list of natural resources surveys and studies, see Appendix H. For additional setting context, brief descriptions of the management of environmental programs that are not within the purview of natural resources management, such as air quality or stormwater, are also included in this chapter.

3.1 CLIMATE AND WEATHER

Coastal southern California is characterized by a semi-arid Mediterranean climate. The presence of a cold offshore current and semi-permanent high pressure ridge over the Pacific Ocean creates a climate similar to that found in regions of Europe, South Africa, and Australia, with mild wet winters, cool summers, infrequent summer rainfall, moderate daytime onshore breezes, and frequent early morning clouds that disperse to hazy afternoon sunshine. An important aspect of the coastal southern California climate is low stratus clouds: including both low clouds and fog in areas close to the coast (LaDochy & Witiw 2012), which includes Detachment Fallbrook. Precipitation is highly seasonal, with around 90% of annual precipitation within the period of record occurring in the months of November through April, when the oceanic high pressure center is at its weakest and farthest point south, and as the fringes of mid-latitude storms occasionally move through the area. The fall and winter are punctuated by warm, dry Santa Ana winds.

3.1.1 Temperature

The annual average temperature in the vicinity of Detachment Fallbrook is 62°Farenheit (F) (Weather Underground 2016). Average monthly maximum temperatures range from 82°F in December to 100°F in September, while average minimum temperatures range from 29°F in December to 54°F in August (Weather Underground 2016). Winters are moderate with nighttime temperatures only rarely dipping below freezing. Days between 11 December and 14 February are considered potential freeze dates. Figure 3-1 shows the mean minimum and maximum monthly temperatures over the course of a year within the Fallbrook region.

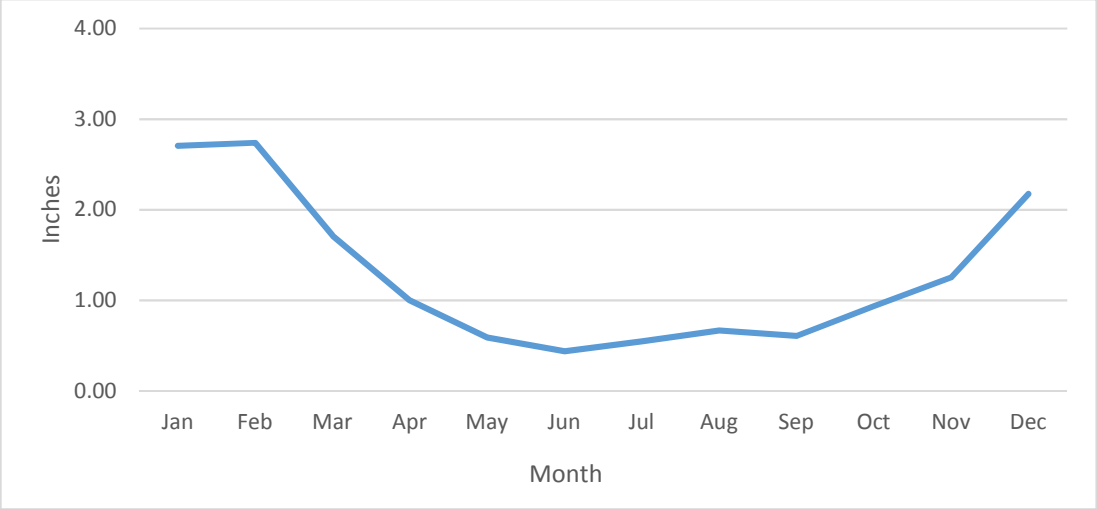


Source: Weather Underground (http://www.wunderground.com/history/airport)

Figure 3-1. Average Monthly Temperatures, January 1986 through December 2015, MCAS Camp Pendleton Air Station

3.1.2 Precipitation

Annual precipitation in a "rainfall year" (July through June) range from lows just over 2 inches to highs over 30 inches, with an average of 15 inches (Weather Underground 2016). Figure 3-2 shows the average precipitation per month from 1986-2015. January and February are usually the wettest months with an average of just under three inches of precipitation, while June and July are usually the driest months with less than 0.5 inches of precipitation (Figure 3-2). One weather pattern that can affect the amount of annual precipitation in the region is El Niño. These conditions occur periodically, about every seven to ten years, and have the potential to bring wetter and sometimes drier conditions than usual winters in southern California.

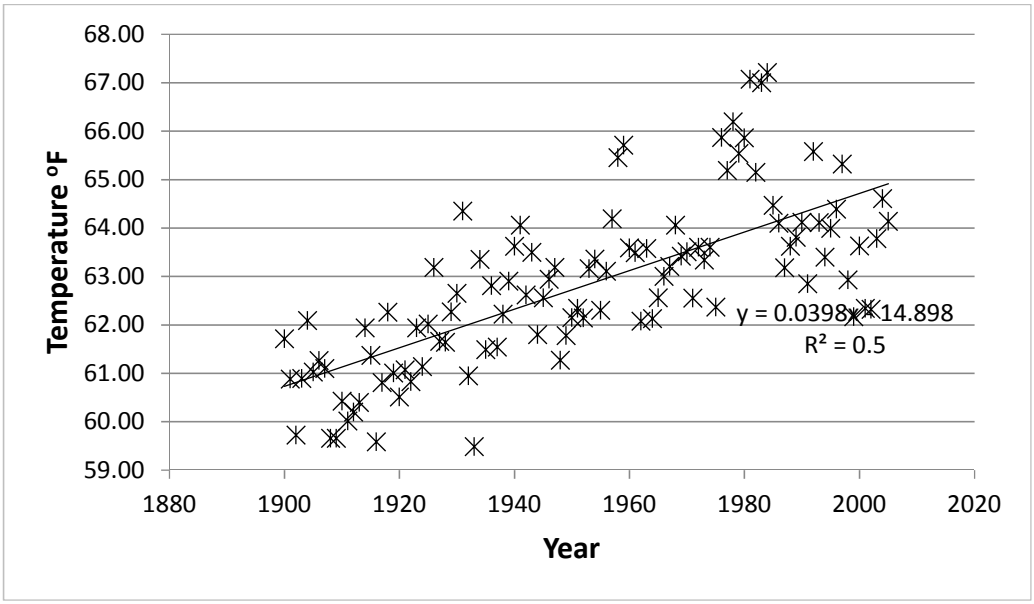


Source: Weather Underground (http://www.wunderground.com/history/airport)

Figure 3-2. Average Monthly Rainfall, Inches, January 1986 through December 2015, MCAS Camp Pendleton Air Station

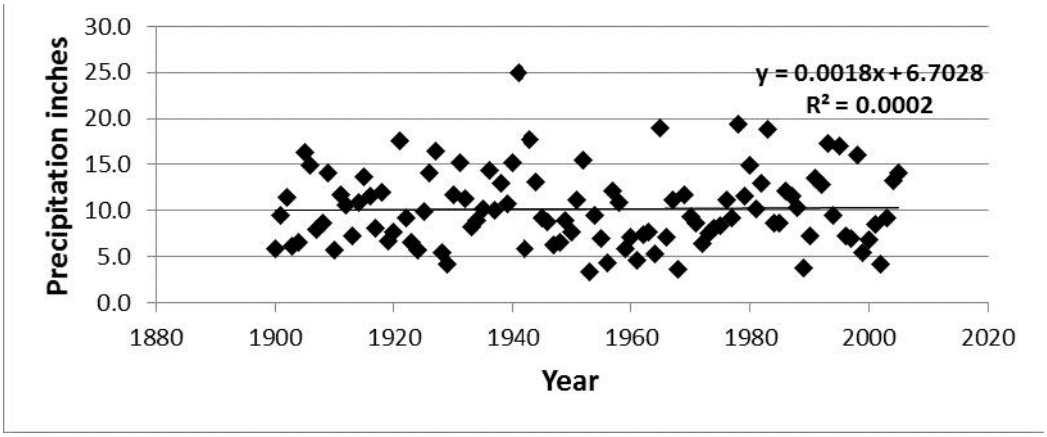
3.1.3 Climate Change Predictions

There is overwhelming agreement in the scientific community that anthropogenic warming started in the 20th century and that future average near-surface temperatures will be higher and global climatic variability will increase (Stocker et al. 2013). With respect to precipitation, however, moisture within the western United States during the 20th century has been more variable with increases and decreases. Within California, the climate has become hotter and wetter over the last century (Smith et al. 2004). Locally, data from Lindberg Field in San Diego show an increase in average annual temperature (Figure 3-3), but no change in average annual precipitation since 1900 (Figure 3-4). Future projections for southern California show continued average temperature increases though precipitation projections are less certain (Cayan et al. 2008). An important, but poorly modeled aspect of climate change is that extreme events are projected to increase, although this is not evaluated in Figures 3-3 and 3-4.



Source: Western Regional Climate Center 2009a

Figure 3-3 Average Annual Temperature, Lindberg Field, San Diego California



Source: Western Regional Climate Center 2009b

Figure 3-4 Annual Precipitation, Lindberg Field, San Diego California

Cayan et al. (2008) modeled four future climate scenarios, using two emission scenarios and two different global climate models (GCM). The two GCMs were shown to realistically simulate California's climate but with differing sensitivity to greenhouse gas; the results represent a range of possible future climates. The lower of the two emission scenarios appears unrealistic at this date as actual emissions have increased much faster than even the highest emissions scenarios developed for the Intergovernmental Panel on Climate Change (IPCC) in the late 1990s (Raupach et al. 2007). For the medium-high emissions scenario over southern California region, both GCMs project an increase in average temperatures, but differ on the extent of increase, whereas precipitation projections for the region diverge with one projecting an increase and the other a decrease. Specifically, the National Center for Atmospheric Research (NCAR) and the Department of Energy's (DOE) Parallel Climate Model (PCM) projects a slightly wetter and hotter climate (2.5ºC increase in temperature and 8% increase in precipitation by 2100) while the National Oceanic and Atmospheric Administration (NOAA) Geophysical Fluid Dynamics Laboratory (GFDL) CM2.1 model predicts a much hotter and drier climate (4.4ºC increase in temperature and 26% decrease in precipitation by 2100).

Photo 17. Marine layer typical of coastal southern California. (Photo by MC1 Eli J. Medellin)

An important aspect of the coastal southern California climate is low stratus clouds, commonly referred to as the marine layer (Photo 17). Low stratus clouds, including both low clouds and fog, are characteristic of coastal southern California and are important drivers of species dynamics and ecosystem function in areas close to the coast. Many species are restricted to the fog belt where low coastal cloud cover has been documented to reduce drought stress on plants through shading and fog drip (Fischer et al. 2009). Despite the importance of low coastal cloud cover, the phenomenon is poorly addressed in climate change models (Qu et al. 2014) and there is uncertainty around the future of low clouds and fog. There is evidence that coastal fog has been decreasing in southern California possibly due to urbanization (Williams, unpublished) and possibly due to climate change (LaDochy & Witiw 2012; Johnstone et al. 2010). Alternatively, some projections of future warming in California indicate a possibility that the interior will experience greater warming than the coast (Cayan et al. 2008), suggesting that the fate of coastal fog is uncertain (Lebassi-Habtezion et al. 2011). Finally, estimates of the strength of low-level temperature inversions from climate change models show increasing trends in all seasons through the end of the century (Iacobellis et al. 2010), leading some to conclude that the marine layer is likely to persist and may even increase.

Extreme weather events such as drought, heavy rainfall, and severe winds, defined in the context of the historic range of variation as occurring less than 5% of the time, are projected to increase in frequency with climate change (IPCC 2007), although the seasonal timing of precipitation is not projected to change substantially (Garfin et al. 2013). These extreme weather events are important drivers of species (e.g., die-offs of vulnerable life stages [Lawson 2015]) and ecosystem processes (e.g., catastrophic fire [Littell et al. 2009] and landslides [Dennis et al. 2013]). While these events are projected to increase, they are difficult to assess and are poorly predicted by global climate models (IPCC 2007, Field et al. 1999). That being said, globally, winter low temperatures, summer high temperatures, and heat waves have all increased. Overall, in North America heavy precipitation events have increased (Stocker et al. 2013), however, precipitation remains difficult to

quantify. Santa Ana winds are expected to decrease in frequency but increase in intensity (Gershunov et al. 2013).

Regional predictions for the southwestern United States often do not split out the narrow coastal zone in which Detachment Fallbrook lies (Garfin et al. 2013). This means that generalized projections such as increases in storm frequency and intensity for the southwest as a whole (Gershunov et al. 2013) may not be reflected along the southern coast of California. The storm frequency in southern California is anticipated to decrease as storm tracks shift north, although because warm air can hold more moisture, individual precipitation events may be heavier (Meehl et al. 2007). While temperatures are likely to increase along the coast, the frequency and humidity of heat waves are also likely to increase. At the same time, however, likely increases in temperature variability mean that unprecedented cold spells may occur as the climate changes (Gershunov 2012). While droughts are projected to become more severe in the region (Cayan et al. 2010), the projections are for large spatial areas and are not broken out for areas near the coast.

3.2 TOPOGRAPHY AND SEISMICITY

Lying in the intermontane area between the Santa Margarita and San Onofre mountain ranges, Detachment Fallbrook's topography consists mostly of moderate south and west facing slopes, and rough broken ridges. The terrain varies from gently rolling hills in the south to steeply rising hills in the north (Map 3-1). There are large areas of nearly level topography. The Santa Margarita River, which forms the northern boundary of the property, has created a steep-sided canyon over time with north-facing slopes on Detachment Fallbrook's side and drainages that lead down to the riverbed and its alluvial terrace. Elevations range from 160 feet (ft) above mean sea level (AMSL) at the western base boundary on the Santa Margarita River to 890 ft AMSL in the northeastern portion.

The property lies approximately ten miles west of the Elsinore fault, one of the largest faults in southern California, but also one of the quietest (Southern California Earthquake Data Center Webpage, www.data.scec.org). It is rated as capable of producing earthquakes of magnitude 6.5–7.5. The Newport-Inglewood- Rose Canyon fault runs off-shore past the Fallbrook area and is rated as capable of producing an earthquake of 6.0–7.2.

3.3 GEOLOGY AND SOILS

3.3.1 Geology

Detachment Fallbrook lies within the western extent of the Peninsular Ranges batholith of southern California. Six geologic formations at Detachment Fallbrook, are recorded below (descriptions adapted from Ganus [1973]).

- Monzogranite (Granodiorite, Kgd) of Cretaceous age, consisting of mostly hornblende-biotite granodiorite described as coarse to medium grained. Several varieties of granodiorite have been noted in the region but in general the granodiorite is massive, medium grained, equigranular, and light gray. Jointing (fracturing) commonly occurs in three directions at roughly right angles resulting in a blocky appearance of the outcrops. Joints are prominent and systematic but more widely spaced than in the other rock types in the area. Outcrop boulders may be as large as 10 to 20 feet or more in length. Weathering is less severe in the than in other crystalline rocks in the area due to the lower percentage of plagioclase feldspar in the granodiorite.
- Tonalite (Kgt) of Cretaceous age, consisting of mostly hornblende-biotite tonalite described as coarse grained and light gray. Tonalites typically occur as medium-grained, light gray

rocks with clean-cut textures of white feldspars, quartz, hornblende, and biotite. Outcrops occur as weathered boulders averaging several feet in diameter. Jointing is described as regular and widely spaced. Weathering is described as moderate to deep, resulting in friable sandlike soil and scattered boulders. The plagioclase feldspars in the tonalite alter more easily than the other minerals and outcrops of this rock typically are easily fractured and may be friable. Intergranular openings resulting from weathering are the main source of porosity in this rock.

- Diorite/Gabbro (Kgb) of Cretaceous age, consisting of mostly biotite-hornblende-hypersthene gabbro described as coarse grained, dark gray, and massive. Unweathered gabbro is dark gray to black, fine to medium grained and equigranular (note that gabbro may be coarser near Fallbrook than in western San Diego County in general based on Tan's [2000] description). Outcrops tend to show prominent joints that break the outcrops into rectangles varying from a foot to several feet on a side. Weathering produces red, clay-rich soil, and most of the gabbro in the area weathers deeply.
- Volcanic (Metamorphic, KjM) rocks that are coeval with or predate the intrusive plutonic rocks include metavolcanic and metasedimentary rocks (undivided) of Cretaceous- and Jurassic-age described as low-grade greenschist facies metamorphic rocks. The physical characteristics of the metamorphic rocks are variable but many are schistose or slatey and have closely spaced joints. Metamorphic rocks generally weather deeply (quartzite is an exception to this rule) and tend to form lowland valleys where they occur.

Sedimentary rocks mapped at a regional geologic scale at the Detachment are identified along the Santa Margarita River and include:

- Older alluvium floodplain deposits (Qoa) of Pleistocene age is described as mostly moderately well-consolidated, poorly sorted, permeable floodplain deposits and consisting of sand, silt, and clay.
- Active alluvium floodplain deposits (Qa) of Late Holocene age is described as sand and gravel deposits, unconsolidated to locally poorly consolidated, in active alluvial floodplains.

3.3.2 Soil Types

Thirty-four soil types of ten different major series are present on Detachment Fallbrook (Map 3-2). According to the county soil survey (USDA 1973), these soils are either alluvial, derived from granitic rock (Visalia, Tujunga, Ramona, Placentia, and Greenfield series), weathered in place from decomposed granodiorite (Fallbrook, Vista, Cieneba, and Bonsall series), or are clays derived from acid igneous rock (Bonsanko series). One area containing clay soil is also shown on the map, but other areas containing unmapped clay inclusions are known. The upland, mostly sandy loams are soft and easily erodible, and the quartz sand grains are abrasive. When these soils occur on steep slopes they tend to be shallower and more vulnerable to erosion than the deeper sediments of the swales and valleys. However, when the gentler slopes are cultivated, they are susceptible to gully erosion.

Appendix I contains a table of soil types and brief descriptions of their erodibility. Expanded, more detailed descriptions of these soils can be found in the U.S. Department of Agriculture (USDA), San Diego County Soil Survey listed in the references section of this report (USDA 1973). The level of soil resolution for Soil Survey maps is appropriate for general planning purposes only. For activities where soil properties are important, such as construction projects, testing should be done to confirm the nature of the soil on site.

3.3.3 Soil Erosion

Soil erosion is caused by the action of water and wind wearing away and removing soil from the land's surface and transporting it to another location. Erosion is one of the primary causes of land degradation and can cause water pollution from excess sediments and air pollution from airborne particulates. The loss and destabilization of soil can have devastating and long-term effects on production capacity, wetland values, ecological processes, and sensitive species. Rates of soil erosion depend on numerous factors including vegetation cover, climate (e.g., wind velocity or rainfall amount, timing, intensity, frequency), soil characteristics (e.g., silty soils are more prone to erosion), topography and slope (e.g., length, steepness, surface roughness), and land use.

Photo 18. Streambank erosion, Fallbrook Creek, 2014. (Photo by C.M. Wolf)

As with many watersheds in the arid west, the Detachment reflects a legacy of elevated rates of erosion, most notably evidenced by sediment accumulations, rill (small stream) erosion, numerous gullies, and channelized streams (Photo 18). A stationwide erosion inventory was conducted in 1990 that included comparison of historic aerial photos and evaluation of average annual soil loss over time (Kellogg & Kellogg 1990). Most of the gullies present today appear to have been instigated while lands were dry-farmed for grain (Kellogg & Kellogg 1990). Historic dryland farming was an intensive land use which likely changed the natural potential of soils to support indigenous vegetation communities and biodiversity by affecting soil structure and managing for what was essentially a monoculture of grain. Kellogg & Kellogg (1990) presented evidence that many of the historic gullies have since largely stabilized and current erosion rates are probably lower now than historically due to less intensive land use.

Two fundamentally different types of gullies occur on Detachment Fallbrook, using the delineation described by Harvey et al. (1985, as cited in Kellogg & Kellogg 1990). "Discontinuous" erosion is caused by concentrated flows that are essentially independent of the natural drainage system (and can remain so if cover and other conditions contain the sediment). This type of erosion can be seen associated with magazines, firebreaks, and roads. The second type of erosion forms "continuous" gullies that are expansions of the natural drainage system. Examples of continuous erosion can be seen in the southeast portion of the installation, where the gullies' relationship to stream systems are clearly evident on aerial photos.

Almost all of the continuous-type gullies in the southeast pasture existed before establishment of the installation in 1941, and were probably caused by cultivation. Cultivation of dry-farmed wheat is evident in these areas on the 1928 and 1938 aerial photos (Photo 3, 4, and 19), and probably existed at least as far back as the 1890s when the railroad was established and used for shipping grain out of the region.

The sandy loam soils derived from decomposed granite that prevail on the Detachment generally lack cohesion because of their high sand and low clay content. This, combined with the abrasive nature of the quartz sand particles, allows them to gully readily when plant cover is disturbed. Most of the continuous gully types that occur in the southeast of the installation are the highly-developed forms of these soils. Although they may not be mapped as such because of the limited accuracy (80– 85%) of the USDA soil survey, these more developed soils tend to occur in the gentle swales upslope from the stream channels, where current gullies are found. Water penetrates these soils quickly when ground cover is disturbed, or runs across the surface if there is compaction, but does not go beyond the subsoil. It collects in the small, swale depressions where the gullies are initiated.

Although erosion rates have abated in recent decades, soil erosion is an ongoing process that is still elevated in areas and under certain conditions (e.g., after wildland fires or major storm events). The 1990 soil erosion study produced a map of 176 erosion sites based on aerial photos and field visits, along with an indexed set of photographs. Only about 10% (n=18) of the sites were considered to be predominately active at that time (Table 7 in Kellogg & Kellogg 1990).

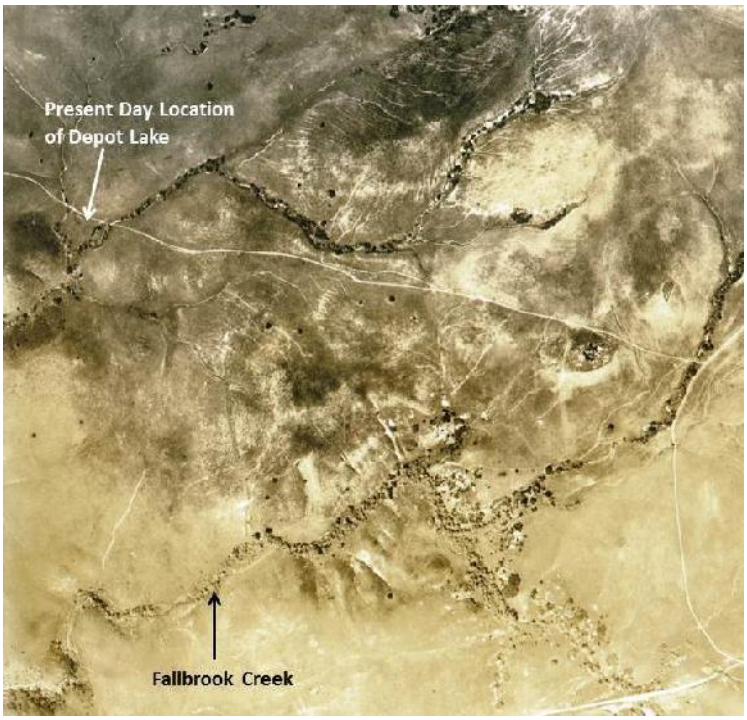


Photo 19. Narrow riparian habitat and erosion gullies visible on 1928 aerial photo.

In 2012, an erosion inventory followed-up on the 1990 sites (7 of the sites could not be located or accessed), with an addition of 90 sites, for a total of 259 sites evaluated (AMEC 2013). The majority of the sites were considered low or moderate erosion severity (n=69) or recommended for removal from the inventory altogether (n=121). The remaining 43 and 26 sites were ranked as high or extreme, respectively. The extreme sites were mainly those that posed a threat to infrastructure, with some posing a threat to water quality. One site that was ranked extreme for water quality issues was the Fallbrook Creek road crossing at the culvert just south of Building 315. This site later received extensive repairs in 2014 (ACCI 2015).

3.4 HYDROLOGY

3.4.1 Watershed and Surface Waters

Detachment Fallbrook overlies portions of two coastal watersheds (Map 3-3). The northern, central, and southwestern part of Detachment Fallbrook, drained by the Santa Margarita River and Fallbrook Creek, is part of the Santa Margarita River Watershed. The southeastern part of Detachment Fallbrook, drained by Pilgrim Creek, is part of the San Luis Rey River Watershed. The topographic divide between these two watersheds is shown on Map 3-3.

Short, steep drainages on the northern and western portions of the property run directly into the Santa Margarita River, while the central area of the property first drains into Fallbrook Creek before reaching the Santa Margarita. The southeastern portion drains into Pilgrim Creek, which then flows through MCB Camp Pendleton and the city of Oceanside before joining the San Luis Rey River.

Fallbrook Creek, a tributary to the Santa Margarita River, would naturally be an intermittent or ephemeral stream, but runoff from off-Detachment agricultural and urban irrigation has changed it to a perennial stream (USDON 1987; Jenks 1993). Fallbrook Creek continues onto MCB Camp Pendleton, emptying into Lake O'Neill. A maximum of 1,200 acre-ft is stored annually in Lake O'Neill for water supply and recreational purposes.

Surface water on Detachment Fallbrook is stored in small water impoundments, mostly on tributaries to the Santa Margarita River, Fallbrook Creek, and Pilgrim Creek (Map 3-3). Historically, most of these ponds were created for farming and ranching on the original Santa Margarita Rancho. The ponds are now managed primarily for livestock watering, with fish and wildlife enhancement and fire protection as added beneficial uses. Of the numerous stock ponds on the Detachment, most are fairly shallow, having silted in over the years, and are ephemeral. Only the three larger impoundments, identified as Depot Lake, Lower Lake, and the unnamed pond behind Building 380, typically hold water year-round except in low rainfall years (Map 3-3).

3.4.1.1 SANTA MARGARITA RIVER WATERSHED

The Santa Margarita River is one of the largest rivers draining the southern California coastal plain. This watershed covers approximately 744 square miles in San Diego and Riverside counties, with approximately 7,000 acres of Detachment Fallbrook within this watershed (MWDSC 2007). The river is formed by the joining of two large creeks: Temecula Creek, which drains the Palomar Mountains to the west, and Murrieta Creek, which drains the Santa Ana Mountains to the north. The portion of this watershed that includes Detachment Fallbrook overlies bedrock with surface drainage that drains into the Lower Santa Margarita River Basin, which is a groundwater basin, as defined by the California Department of Water Resources (CDWR; CDWR 2003).

The significance of this river in Southern California was described in the Watershed Urban Runoff Management Plan for the Santa Margarita Watershed (Anchor Environmental et al. 2005) as:

> *"Numerous studies document the Santa Margarita River as the largest, finest example of a riparian system and estuary in southern California… The Santa Margarita River and its estuary have largely escaped the typical development and channelization of its lower 27 miles and as such, it supports the largest populations of seven federally- or state-listed endangered species. The relatively intact functioning physical features of the river's floodplain and estuary make this diversity of habitats and abundance of wildlife possible... [Despite its comparatively good condition,] historically, agriculture, more recently residential, commercial, and industrial development have impacted the [Santa Margarita River Watershed]." (p. 9)*

As noted by State Engineer William H. Hall in 1888, the Santa Margarita River has been well known for its dynamic flows (Hall 1888):

> *"...this river is no exception to the rule of light summer flow and winter torrents which is applicable to all Southern California streams. In July or August, one unfamiliar with these water-courses could not suspect it of the extreme violence displayed in such winters as 1884–85, when it destroyed the California Southern Railroad for nearly twenty miles. Several thousand cubic ft per second (possibly 5,000) must have been the volume of its flow at that time, sustained for several weeks. The ordinary winter flow, however, does not exceed 600–800 cubic feet per second (cfs), and that immediately following protracted storms, only. In summer, it is never dry in the long canyon, and maintains a discharge of 2–4 cfs throughout the driest month." (p. 46)*

In 2001, a levee was completed downstream from Detachment Fallbrook on the Santa Margarita River to protect Marine Corps Air Station (MCAS) Camp Pendleton facilities from the type of flooding that occurred in 1884–1885, and again in 1993 when the airfield was threatened.

The Santa Margarita River Watershed Management Plan (Anchor Environmental et al. 2005) was prepared for the entire watershed area. This planning effort took both a short-term and long-term watershed protection approach, assuming significant population increases in the Temecula Valley region of Riverside County of 2.1 million by 2030. Increasing urbanization and increase of

impervious surfaces in this area are likely to disturb or disrupt biological connectivity and will have a significant impact on the hydrology of the area. The potential environmental consequences of poorly planned and managed growth include fragmented landscapes, loss of critical habitat, increased fire risk, degraded water quality, and significant downstream flooding. Approximately 50 federal and state resource agencies plus private and non-governmental interest groups participated in the planning process.

The Plan's goals included improved interagency coordination, reducing dependence on imported water without damaging local water resources, and managing stream corridors for multiple use. The Plan mentioned Fallbrook Creek's status on the Monitoring List for iron, manganese, and phosphorus, and its need for protection from upper watershed land uses that could affect water quality. Among many recommendations was the creation of a watershed management council to pursue inter-jurisdictional water quality monitoring. It also recommended that a model be developed to enable science-based development of total maximum daily loads (TMDL) in the watershed. TMDL is a regulatory term from the Clean Water Act (CWA) that is a calculation of the maximum amount of a pollutant a body of water can receive while still meeting water quality standards. In response, a collaboration of stakeholder agencies (called the Santa Margarita River Executive Management Team) is working on this using the Watershed Analysis Risk Management Framework Model. Another recommendation was to conduct sampling to validate the CWA 303(d) listing for eutrophication of the Santa Margarita estuary.

3.4.1.2 SAN LUIS REY WATERSHED

The San Luis Rey River Watershed covers approximately 558 square miles, with approximately 1,900 acres of Deatchemnt Fallbrook within this watershed. It includes the Mission, Bonsall, Moosa Canyon, Pala, Pauma, and Warner groundwater basins (MWDSC 2007). The southeastern part of Detachment Fallbrook overlies bedrock portions of the watershed with surface drainage into the Mission groundwater basin by way of Pilgrim Creek. Summer flow in Pilgrim Creek, as in Fallbrook Creek, is augmented by runoff of imported domestic and agricultural water from neighboring upstream property, including that of a commercial nursery. The San Luis Rey Watershed Council, consisting of a partnership of various interested parties (e.g., local landowners, agricultural growers, Native American bands), is active in developing and implementing a comprehensive resource management plan for the San Luis Rey River and its tributaries (MWDSC 2007).

The San Luis Rey stream system has a major dam at Lake Henshaw and several other smaller impoundments along its reaches. Henshaw Dam was built in 1922 and controls over one-third of the watershed. The western portion of the stream system, in Oceanside, is channelized and has a levee in place to keep flood waters from flowing out into the surrounding densely populated areas. The natural processes in these areas are severely impaired. About 86% of the San Luis Rey River miles are free flowing, but only two percent of river miles are protected. It harbors 44 special-status species. The Oceanside General Plan Land Use Element (City of Oceanside 2002) designates the majority of the San Luis Rey River floodway as General Open Space or Agricultural. The lower part of the river is within a designated Resource Conservation Area overlay in the San Diego County General Plan (County of San Diego 2011).

Development of a general resource plan for the San Luis Rey River began in 1997. The stakeholder-based San Luis Rey Watershed Council was funded by the EPA and the Coastal Conservancy, and managed by Mission and Upper San Luis Rey Resource Conservation Districts. A status report for the watershed was to be developed in cooperation with Natural Resources Conservation Service (NRCS) Watershed Planning Division. Management guidelines, rather than a comprehensive management plan, were determined to be more appropriate given a substantial deficiency of available research and data to support planning direction for the watershed. Thus, the

project was completed in October 2000 when the Council published the San Luis Rey River Watershed Guidelines (SLRWC 2000).

The Regional Water Quality Control Board (RWQCB) lists the San Luis Rey River mouth as a CWA 303(d) list impaired water body for bacteria. The bacteria identified as problems are part of intestinal flora of warm-blooded animals, and exceed limits for beneficial uses at the City of Oceanside San Luis Rey River mouth. Also listed as impaired for total dissolved solids and chloride is the Lower San Luis Rey River. Excessive total dissolved solids are believed to be from groundwater seeps and springs, and runoff from irrigation using groundwater (PBS&J 2003).

3.4.2 Runoff and Streamflow

Runoff and streamflow are directly affected by precipitation and land use (e.g., water diversion, development of impervious surfaces, groundwater extractions, irrigation, etc.). Stormwater runoff associated with Detachment Fallbrook industrial facilities is permitted via an industrial stormwater permit and managed via development and implementation of a Stormwater Pollution Prevention Plan that is reviewed and updated annually. Construction projects with more than 1-acre of ground disturbance are required to develop and implement a construction stormwater pollution prevention plan.

Streamflow is measured by the U.S. Geological Survey (USGS) at several gaging stations located near Detachment Fallbrook (Map 3-3 and Table 3-1). The data show the naturally wide variation in streamflow typical of southern California streams.

Table 3-1. Annual mean streamflow measurements (ft^3/sec) for gage stations near Detachment Fallbrook (Data Source: U.S. Geological Survey web site, accessed [18 August 2015]).

Annual Mean Streamflow (ft3/sec) at Gage Stations					
	Northeast of Detachment Fallbrook		West/South of Detachment Fallbrook		
Year	Sandia Creek	Santa Margarita River North	Santa Margarita River South	Fallbrook Creek	O' Neill Lake Outlet
1990	2.65	5.99	4.61	--	--
1991	9.15	50.4	50.4	--	--
1992	6.60	28.2	46.1	--	--
1993	36.8	219.6	337.0	--	--
1994	3.77	16.5	26.2	1.13	--
1995	21.1	78.6	183.6	4.60	--
1996	2.89	10.8	15.4	0.967	--
1997	6.34	16.6	36.5	1.81	--
1998	17.8	88.8	152.2	4.77	--
1999	2.62	8.38	--	0.649	0.368
2000	3.90	10.3	--	0.559	0.004
2001	5.93	15.1	--	0.866	0.458
2002	2.75	5.23	6.19	0.175	0.762
2003	10.4	38.3	53.4	1.34	
2004	5.15	11.3	17.6	0.391	0.950

Annual Mean Streamflow (ft3/sec) at Gage Stations					
	Northeast of Detachment Fallbrook		West/South of Detachment Fallbrook		
Year	Sandia Creek	Santa Margarita River North	Santa Margarita River South	Fallbrook Creek	O' Neill Lake Outlet
2005	29.9	137.3	250.7	5.42	5.84
2006	6.10	19.6	25.9	0.600	2.94
2007	3.99	7.93	5.46	0.291	0.715
2008	9.28	35.7	42.7	0.994	2.39
2009	4.66	25.5	27.7	0.579	1.18
2010	8.05	40.6	75.0	0.878	2.10
2011	15.8	89.7	135.3	2.08	1.52
2012	3.00	11.2	11.3	0.470	1.36
2013	1.98	7.15	3.13	0.219	1.58
2014	2.48	13.8	8.79	0.155	1.11

3.4.3 Floodplains

Since the Santa Margarita River channel on Detachment Fallbrook is located within a remote, steep canyon, the floodplain is narrow and the opportunity for flood damage on Detachment Fallbrook is limited to about 695 acres of a largely undeveloped portion of the installation (USDON 1989). A flood event in 1977–78 damaged a well adjacent to the Santa Margarita River and also inflicted substantial damage to roads, culverts, the rail line, and bridges causing many areas of Detachment Fallbrook to be inaccessible by vehicle during the flood. Estimated value of the damage in 1978 was $1.5 million dollars (USDON 1989). Other than the perimeter fence and roadway, which is not subject to high traffic levels, no significant infrastructure remains within the Santa Margarita River floodplain today.

Most of the Santa Margarita River's increased flooding potential has come from off-Detachment sources, a result of upland urbanization (Anchor Environmental et al. 2005). However, when wildfire consumes vegetation that secures and protects the soil surface erosion by wind and water is a typical consequence. Loss of soil will impair site productivity (ability of the soil to support plants) both in the short and long terms. Sedimentation compounds the loss of productivity by affecting water quality, suffocating living organisms in the downslope drainage, and affecting the hydrologic balance such that downstream floods come more frequently and peak at higher levels.

Within the interior of the installation, the primary flood concerns are associated with Fallbrook Creek and major access routes, most notably Ammunition Road. During the same 1977-78 period, Fallbrook Creek experienced major storm damage (USDON 1989). A large storm event in 1993 did not cause extensive damage along the Creek, but a portion of Ammunition Road was closed due to undermining of a culvert crossing near Building 315. Traffic, which was lower than today's levels, was routed through the administrative area. Given the infrequency of such road closures historically, Ammunition Road does not appear to have much flood potential within the current variance of storm events. However, the road does have a series of culvert systems, which, if they become compromised, could damage the roadway infrastructure preventing it from handling traffic for a short period.

Fallbrook Creek is deeply incised along most of its length on the Detachment and shows very little floodplain development overall, a condition primarily resulting from increased peak storm

discharges due to urbanization outside of the Detachment boundary and past intensive land use for agriculture on the Detachment. A few constructed impoundments along the creek act as grade controls and sediment catchments with most other reaches being downcut and without floodplain development. The impoundments, including the pond behind Building 380, Lower Lake, and a largely silted-in reservoir downstream of Ammunition Road, help attenuate storm pulses. Future land management may include dredging of these reservoirs to maintain their storage capacity and utility as flood control and water storage structures.

As Detachment Fallbrook moves away from past agricultural practices such as dryland farming and implements a sustainable grazing program, some natural recovery of hydrologic function is expected to occur along Fallbrook Creek including some broadening of the floodplain. The oak and riparian woodlands along the Creek will provide woody debris additions that are a common prescription for stream restoration. Chapter 4 includes long-term restoration projects that would seek to alter the stream channel in specific reaches and actively construct a floodplain. Such projects could target specific reaches to provide better flood protection of nearby infrastructure and road crossings.

3.4.4 Water Rights and Plans for Future Water Developments

Based on the 1961 U.S. District Court decision (as part of the "Fallbrook Case"), the Santa Margarita River drainage's surface water rights are considered by the Court to be riparian rights for stockwater improvements. A riparian water right is the right to use the natural flow of water on riparian land, and in this case the reason for the usage was stockwater improvements. However, two points need to be considered: (1) the quantity of water for stockwater that is considered "reasonable" (under the "reasonable use doctrine") has not been decided by the court and (2) no prescriptive right can be acquired, so there is no obligation of upstream users to provide water for a prescribed amount to this downstream use.

The State of California can issue a certificate of validity of a stockpond right for stockponds with a capacity of not more than 10 acre-ft that were constructed prior to 1969 (SWRCB 2003). All of the ponds on Detachment Fallbrook were built before 1969 and their storage capacities vary greatly, swelling in peak rain years and yet reducing capacity over time as they acquire sediment from the inflows. The priority of right will be the date the claim is filed, not the date the ponds were built. The State Water Resources Control Board (SWRCB) (which administers new water right approvals) declared in Orders 89-25 and 91-07 that the Santa Margarita River system is "fully appropriated." This declaration means that no additional applications to appropriate surface water will be accepted by its Division of Water Rights for this watershed, "including all tributaries where hydraulic continuity exists" (Jenks 1995). This action would appear to preclude the possibility of obtaining an appropriative water right for construction of new stock ponds or for historic stock ponds that have a capacity greater than 10 acre-ft.

Groundwater rights are affected by the federal court case. The court retained jurisdiction over groundwater if it is determined that the underground or sub-surface waters "add to, contribute to, or support the Santa Margarita River stream system" (Jenks 1995). The affected well sites pump from aquifers of younger alluvium, located along streams, and older alluvium, underneath younger alluvium but not limited to areas adjacent to stream channels. Excluded from court oversight are well sites pumping from waters found in the basement complex and/or residuum deposits.

The Detachment funded a Cattle Water Well Feasibility and Conceptual Design Study (AMEC 2011, 2012) that evaluated possible locations to drill groundwater wells to supply cattle troughs in undeveloped areas of the base. The report evaluates seven areas for drilling, six of which were identified as reasonable locations for hydrogeologic water extraction. In 2013, the Public Works Officer for NAVWPNSTA Seal Beach sent a letter to the Assistant Chief of Staff Facilities on MCB Camp Pendleton to formalize an agreement that water extracted from the Santa Margarita

River watershed on Detachment Fallbrook for the purpose of supplying cattle troughs could be metered and biannually reported to MCB Camp Pendleton's Office of Water Resources (OWR). OWR would consolidate and include Detachment Fallbrook's water use into their required annual report to the SMR Watershed Watermaster. Detachment Fallbrook is also considering increasing water availability to cattle by extending potable water lines to supply troughs.

Detachment Fallbrook is part of the DOD or Naval Enclave, which consists of Detachment Fallbrook, MCB Camp Pendleton, MCAS Camp Pendleton, and Naval Hospital Camp Pendleton. MCB Camp Pendleton has appropriative or "use or lose" water rights on the Santa Margarita River that have not been fully developed for over 40 years. One of the goals of the Santa Margarita River Conjunctive Use Project (SMR CUP) is to develop MCB Camp Pendleton's water rights and resolve water rights disputes with Fallbrook Public Utilities District (FPUD).

A court case regarding these riparian water rights on the Santa Margarita River that pre-dates the existence of the military base was recently won by the Naval Enclave (i.e., Detachment Fallbrook and MCB Camp Pendleton, through representation by the Department of Justice). The result is that water districts in the upper Santa Margarita watershed are required to discharge more water into the river. Certain year-round flow requirements to the Santa Margarita River were approved by the Federal District Court. The approved flows are variable based on climatic conditions in the watershed to somewhat match the natural variability of the river's natural flow conditions. The 25-page Cooperative Water Resource Management Agreement was signed on 26 March 2002. Discharges from that agreement began in December 2002, and those flows are monitored by the MCB Camp Pendleton and the Rancho California Water District.

The SMR CUP between MCB Camp Pendleton and FPUD, which is currently under consultation, would help secure MCB Camp Pendleton's compliance with CWA requirements for wastewater processing, long-term and appropriated water rights for MCB Camp Pendleton, and groundwater recharge for long-term water supply. It will also address ongoing concerns regarding future water use between the U.S. Marine Corps and FPUD. The advantages of developing a viable conjunctive use project for FPUD include reduced dependency on imported water supplies, development of a local water supply, and reduced costs. MCB Camp Pendleton would benefit from establishing a connection to imported water supplies and upgrades to the existing groundwater diversion and recovery facilities, and providing increased water supplies to accommodate future growth. Both FPUD and MCB Camp Pendleton would benefit from improved basin water quality and settlement of an ongoing legal dispute (United States v. Fallbrook). Developing a conjunctive use project between FPUD and MCB Camp Pendleton would create an opportunity to satisfy not only future water demands and economic concerns associated with the purchase of imported water, but also the ecological demands of sensitive habitat which depend on both the surface and groundwater within the Santa Margarita River basin.

3.4.5 Water Quality, Supply, and Use

3.4.5.1 POTABLE WATER

Potable water is delivered to Detachment Fallbrook through FPUD waterlines but is purchased directly by the Navy from the San Diego County Water Authority (SDCWA), then dispersed to facilities through nearly 20 miles of Navy-owned water lines. Water to Detachment Fallbrook is delivered through the FPUD distribution system directly from the imported water facilities of the Authority and the Metropolitan Water District of Southern California (MWDSC). MWDSC delivers water to the Authority and its member agencies through five pipelines consisting of treated and untreated potable water. Delivered water is stored on Detachment Fallbrook property in two tanks of one million and 100,000 gallon capacities (USDON 1989).

Much of Detachment Fallbrook's nearly 20 miles of water distribution infrastructure is from the 1940s, with older water lines consisting of 85% asbestos cement (non-friable) and 15% cast iron (USDON 1989, and current GIS). In 1995, a pressure reducing valve was installed by the Facilities Department at the FPUD's 6" water service main. Other sections and valves have been replaced, but often on an emergency basis when blowouts occur. In 2011, following a period of an elevated number of breakages, approximately 1.1 miles of pipeline, or an estimated 5.6% of the water infrastructure, were replaced with PVC lines. Old lines were abandoned in place.

Emergency water supply cutoff risks were recently ameliorated when the San Diego County Water Authority completed its emergency water storage project (http://sdcwa.org/emergency-storage-project). This project's goal was to ensure an uninterrupted water supply during a prolonged interruption of its imported water supply, such as after an earthquake, with water flowing through a second aqueduct into the Olivenhain Reservoir. The project's additional capacity is projected to meet the County's emergency needs through at least 2030.

The periodic drought conditions in the region can constrain water use at the Detachment for non-essential projects, such as landscaping. The landscape may have to withstand little or no water for long periods of time. Along with water conservation efforts, water reclamation is an important alternative to supplement limited water supply in the San Diego region.

3.4.5.2 TERTIARY TREATED WATER

A reclaimed (tertiary treated) water line runs through Detachment Fallbrook, from Fallbrook Public Utilities District to the Oceanside outfall (Map 2-3). No water from this tertiary treated pipeline water is used on the Detachment. Reclaimed systems have special design considerations including cross connection protection, signage, and other means of preventing direct human consumption of reclaimed water and a separate on-site distribution system. The reclaimed water distribution piping is specially marked and colored (e.g., purple pipe) to alert people to the presence of reclaimed water and prevent connections to potable water systems.

3.4.5.3 SURFACE WATERS

In addition to the natural creeks, streams, and ephemeral ponds, Detachment Fallbrook has numerous artificially created impoundments and stock ponds, many of which were created in the early 1900s to provide water for livestock. Most of these impoundments and ponds still provide water for livestock today, but they have not been maintained (dredged) for several decades and have becomes shallower from silt buildup (see Section 3.7.4 for additional discussion of ponds and other open water habitats).

Surface water quality at Detachment Fallbrook has been tested periodically for various projects over the years. Beginning in 2013, Detachment Fallbrook supported a monitoring project to record data in accordance with the Surface Water Ambient Monitoring Program bioassement protocol (SWAMP 2007) at two locations in the SMR and three locations in Fallbrook Creek (Amec Foster Wheeler 2016).

Water quality falls under the jurisdiction of the San Diego RWQCB and management prescriptions are described in the San Diego Basin Plan (RWQCB, San Diego Region 1994 and amendments through 2011). The Basin Plan is implemented by watershed, and Detachment Fallbrook is part of both the Santa Margarita River and San Luis Rey River watersheds. The designated beneficial uses of watershed subareas, and their associated water quality standards, are provided in the Basin Plan.

The Santa Margarita River is listed as an impaired water body (RWQCB 1994 and amendments through 2011). The river and the Santa Margarita Lagoon exceed state standards for acceptable levels of organic nutrients. The lagoon is impaired due to eutrophic conditions, which means it is rich in nutrients and supports a dense plant population that kills animal life during plant

decomposition by depriving the animals of oxygen. The Lower Santa Margarita River is impaired due to Enterococcus, fecal coliform, phosphorus, and total nitrogen levels. The Upper Santa Margarita River is impaired due to increased levels of phosphorus and toxicity. The CWA requires that the states establish priority rankings for waters on the list and develop TMDLs for each water body that specifies the maximum amount of a pollutant that a water body can receive and still meet water quality standards. These TMDLs are still in preparation (RWQCB 1994 and amendments through 2011).

Probable sources of pollution in the watershed include agricultural operations, septic systems, livestock, domestic animals, use of recycled water, and wastewater treatment facilities. Increases in organic nutrients will initially enhance growth of primary producers leading to an alteration in species composition. It can eventually lead to oxygen depletion and a buildup of toxins (e.g., sulfides) that can kill many aquatic species. Data from surface water quality monitoring stations on the Santa Margarita River indicate that many measures exceed or appear likely to exceed recommended concentrations in the river: total dissolved solids, dissolved oxygen, nutrients, and minerals (boron, manganese and iron) (RWQCB 1994 and amendments through 2011).

Another water quality problem is high levels of sediment. Until the flood of 1993, studies had predicted that the Santa Margarita River would be a low sediment producer due to its lower average annual rainfall and higher percolation rates compared to other large rivers in the region (Brownlie & Taylor 1981). In January 1993, intensive rainfall in the headwaters, combined with over 5,000 acres upstream of bare ground from unfinished and unprotected construction sites, helped yield a river of “liquid sandpaper” which scoured channels and left four- to eight-ft deposits of sand and gravel in the MCB Camp Pendleton floodplain and estuary downstream of Detachment Fallbrook (RWQCB 1994 and amendments through 2011).

On Detachment Fallbrook, erosion surveys determined that sediment is primarily produced by firebreaks, roads, and gullies (Kellogg & Kellogg 1990, AMEC 2013). Fallbrook Creek's water quality is affected by activities upstream, including urban and agricultural runoff, before it reaches the property.

3.4.5.4 GROUNDWATER

As previously stated, the Santa Margarita River Watershed covers approximately 744 square miles in San Diego and Riverside counties (MWDSC 2007). This watershed includes groundwater basins in the upper portion of the watershed (Temecula and Murrieta creeks) and lower portions of the watershed (Santa Margarita River) as well groundwater within the residuum and fractured bedrock. The portion of this watershed that includes Detachment Fallbrook overlies bedrock portions of the watershed with surface drainage that drains into the Lower Santa Margarita River Basin, which is a groundwater basin, as defined by CDWR (2003). The Santa Margarita River Watershed and Lower Santa Margarita River Basin are adjudicated (MWDSC 2007). A watermaster and steering committee were appointed by the Court in 1989 to administer and enforce the provisions of the modified final judgment and decree entered into on April 6, 1966, by the U.S. District Court in the case United States vs. Fallbrook Utility District, et al. (MWDSC 2007).

As previously stated, the San Luis Rey River Watershed covers approximately 558 square miles and includes the Mission, Bonsall, Moosa Canyon, Pala, Pauma, and Warner groundwater basins (MWDSC 2007). CDWR (2003) combines the smaller basins into one basin named the San Luis Rey Valley groundwater basin. The southeastern part of Detachment Fallbrook overlies bedrock portions of the watershed with surface drainage into the Mission groundwater basin by way of Pilgrim Creek. The San Luis Rey Watershed Council, consisting of a partnership of various interested parties (e.g., local landowners, agricultural growers, Native American bands), is active in developing and implementing a comprehensive resource management plan for the San Luis Rey River and its tributaries (MWDSC 2007).

Groundwater occurrence within the bedrock in the general San Diego County region has been described by Ellis and Lee (1919); Ganus (1973); and Merriam (1951). W.J. Ganus (1973) described the occurrence of groundwater in bedrock and residuum in general terms, noting that recharge to the bedrock occurs through fractures at or near the surface and that fracture intensity in crystalline rocks has generally been found to decrease with depth. The following descriptions of the potential water resources from the different types of bedrock at Detachment Fallbrook are summarized from generalized descriptions of rock types in western San Diego County by Merriam (1951).

- Monzogranite (Granodiorite): Weathering results in a tightly cemented grus within the joints, which may result in a decrease in the water-bearing properties of this rock. Well construction in the granodiorite is complicated by the presence of unweathered masses of granodiorite or of aplite dikes. In general, granodiorite is considered the poorest of the crystalline bedrock water sources and it rarely produces more than a few gpm to wells.
- Tonalite: Tonalite bedrock is generally considered a moderately good source of groundwater as it is easily drilled and has sufficient porosity. Bouldery areas and areas with quartz stringers and aplite or pegmatite dikes are less desirable because of the difficulty in drilling in these areas. It is noted that tonalite is the rock formation that most consistently provides useful wells; wells drilled in the gabbro may yield more water than wells constructed in the tonalite but the likelihood of having an unsuccessful well is greater in the gabbro.
- Diorite/Gabbro: These rocks are generally considered a favorable formation for water wells because its weathered zones are easy to drill through and its jointed character results in relatively high bulk permeability.
- Volcanic (Metamorphic) rocks: These rocks are variable but many are schistose or slatey and have closely spaced joints that add to the permeability and storage capacity of the rock. Meta-andesite tuff, slates, and phyllites are the most favorable types of metamorphic rocks for aquifers and are easily drilled but are erratic in terms of yielding water.

3.5 AIR QUALITY

Air quality for the United States is regulated under the Clean Air Act (CAA) including the latest amendments made in 1990. To comply with the CAA, the Environmental Protection Agency (EPA) has set National Ambient Air Quality Standards (NAAQS) per 40 CFR Part 50, for pollutants considered harmful to public health and the environment.

The NAAQS establishes pollution concentration limits for six criteria pollutants: carbon monoxide, lead, nitrogen dioxide, ozone, sulfur dioxide, and particulate matter (PM) regulated as PM_{10} (10 microns or smaller) and $PM_{2.5}$ (2.5 microns or smaller) for ambient air on a regional scale. The NAAQS have been separated into two classifications: primary standards and secondary standards. Primary standards provide public health protection, including protecting the health of "sensitive" populations such as asthmatics, children, and the elderly. Secondary standards provide public welfare protection, including the protection against decreased visibility and damages to animals, crops, vegetation, and buildings. For a list of primary and secondary standards, see http://www.epa.gov/ttn/naaqs/criteria.html. Based on air quality data, the EPA designates areas in the country as unclassifiable, attainment, nonattainment, or maintenance with respect to the NAAQS for each criteria pollutant. The State of California has established more stringent air quality standards, the California Ambient Air Quality Standards (CAAQS). The CAAQS must be met and monitored by regional air districts.

The San Diego Air Pollution Control District (SDAPCD) is designated as a Primary Quality Assurance Organization in the State of California and is the air pollution control agency for all of

San Diego County, which includes Detachment Fallbrook. When an area that is found to have air pollution to exceed the NAAQS or CAAQS, within the last three years, it is classified as either a federal or state nonattainment area for the criteria pollutant.

According to the San Diego Air Pollution Control District Attainment Status Fact Sheet (2010) the San Diego Air Basin is currently a federal non-attainment area for the 8-hour ozone standard. The San Diego Air Basin has Federal designation of unclassifiable for PM10 and in attainment for the NAAQS for all other criteria pollutants.

The San Diego Air Basin is a non-attainment area for the state 1-hour ozone, 8-hour ozone, PM10, and PM2.5. The San Diego Air Basin has state designation of unclassified for hydrogen sulfide and visibility and is in attainment for the remaining CAAQS for all other criteria pollutants. See http://www.sdapcd.org/info/facts/attain.pdf.

The status of air quality provides an ecological context for natural resources management, but few natural resources management activities are expected to contribute to the overall air pollution in the SDAPCD. The main exception to this would be prescribed burning. Although prescribed burning can reduce wildland fire risk, the resulting smoke emissions are sources of respirable particulate matter (PM) less than or equal to a nominal 10 micrometers (PM_{10}). The EPA requires smoke management planning to control this pollution source. The SDAPCD has implemented a smoke management program to minimize smoke impacts from a projected increase in prescribed burning by land managers in San Diego County. The potential for prescribed fires to impact smoke sensitive areas requires the SDAPCD to be closely involved with each prescribed burn project. All prescribed burn projects must be registered with the SDAPCD. Burn project registration is accomplished by submittal of a Smoke Management Plan and observation of the special requirements described in this section. Prescribed burns greater than 10 acres have additional requirements and any prescribed burn greater than 250 acres require consultation and approval from the California Air Resources Board.

Air Compliance at Detachment Fallbrook is managed by the Naval Weapons Station Seal Beach Environmental Programs and Services Office by a designated Air Compliance Manager. Management of the Air Compliance program is per the Department of the Navy Environmental Readiness Program Manual (OPNAV M-5090.1) which states that Navy commands and installations must comply with applicable CAA requirements and related regulations.

3.6 WILDLAND FIRE

Mediterranean type ecosystems such as comprise Detachment Fallbrook are among the most fire prone ecosystems in the world. Winter rains coincide with temperatures that allow significant vegetative growth and the summer drought dries the vegetation enough to promote extensive wildfire (Keeley et al. 2012). Fire has been an important evolutionary force and a primary driver of ecological processes in Mediterranean type ecosystems. Many plant species have adaptations to fire that allow them to persist even in relatively high fire frequency environments (Bond & Keeley 2005, Bellingham & Sparrow 2000). In addition, there is evidence of long Native American use of fire as a management tool (Keeley 2002).

Management for natural resources and fire protection objectives necessitates understanding drivers of fire hazards and the ecological effects of fire and fire management (e.g., prescribed burning or suppression). Within southern California, wildfire management is complicated by (1) high human population densities that both promote fire through increased ignitions and require protection from fire (Pausas & Keeley 2009) and (2) rich biodiversity with numerous narrow range endemics (Cowling et al. 1996) often with legal protections (Schwartz et al. 2002).

The fire season in coastal southern California typically occurs in the summer and fall beginning several months after the last rains when plant growth has stopped and live fuel moisture has dropped (Dennison & Moritz 2009, Minnich 2006, Sugihara et al. 2006), although large fires can occur year round depending on rainfall patterns, humidity, and winds (Keeley & Fotheringham 2003). Extreme Santa Ana winds are an important factor in fire spread and are often the driving force behind very large fires in southern California (Moritz et al. 2010). While severe fire weather can influence fire size, accurate advance predictions of high fire years have proven elusive (Keeley 2004). This may be due, in part, to the challenge of assessing dead fuel load.

The proportion of dead fuel within stands is an important driver of fire hazard (Baeza et al. 2011). In the past, dead fuel has been considered primarily a function of stand age (Conard & Regelbrugge 1993), but recent evidence suggests that quantities of dead fuel within a stand are more variable and short term response to drought can have an important effect on fire hazard, independent of stand age (Keeley & Fotheringham 2003). Advances in remote sensing technology may make it feasible to more readily assess dead fuel loads which may in turn allow for better predictions of annual fire risk prior to the onset of the fire season (Keeley et al. 2012).

The ecological role of fire, and factors that influence risks of fire, has important policy implications. In the past, it was thought that more frequent fire was needed to reduce fire severity and would meet both fire protection and natural resources management objectives (Federal Fire Policy 2001). The existence of fire adaptations and the long-term use of fire as a management tool were used to support this supposition. Moreover, there is evidence that 20th century fire suppression in at least some systems in western North America has led to fuel build-up and a change from a fire regime of frequent, low intensity fires to less frequent, high intensity fires (Allen et al. 2002, *but see* Odion et al. 2014). With the Mediterranean type ecosystem shrublands of the region, differences in fire patterns were used as evidence that fire exclusion resulted in an unnatural buildup of fuels in southern California that resulted in larger, less frequent fires than in northern Baja California (Minnich 1983). More recent work has shown, however, that fire suppression did not result in fire exclusion or reduce annual area burned (Keeley et al. 1999).

The shrublands that occur in Mediterranean type ecosystems are crown fire systems, meaning that the entire fuel load is consumed in a fire (Keeley et al. 2012). This is primarily a result of the fuel structure with shrubs producing and retaining dense woody vegetation from the ground to the top of the canopy. In these systems, long fire-free intervals only result in a moderate increased risk of wildfire (Moritz et al. 2004). The implications of this are that repeated burning does not reduce the risk of high intensity crown fires in Mediterranean type ecosystem shrublands. Frequent burning not only does not reduce the occurrence shrubland crown fires (Moritz 1997), but it can harm species in these ecosystems (Zedler 1995).

Climate change is likely to force changes in fire regimes in the coming decades (Piñol et al. 1998, Pausas 2004, Westerling & Bryant 2008). While weather is a significant determinant of fire regimes, it is not necessarily clear how fire regimes will change with changing climate. Pausas (2004) and Piñol et al. (1998) have documented increased fire frequency with increasing temperatures and decreasing summer rainfall (while average annual precipitation stayed the same). Westerling and Bryant (2008), on the other hand, concluded that where fire regimes are dependent on the rate of accumulation of biomass, fires can occur more frequently with greater rainfall. Recent modeling work by Batllori et al. (2013) supports both of these findings. They conclude, based on modeling efforts, that fire activity is likely to increase in some areas and decrease in others within Mediterranean type ecosystems over the next century; a hotter and drier climate is predicted to result in lower biomass and less fire activity, whereas a hotter and wetter climate could lead to more biomass and greater fire activity.

3.6.1 History of Detachment Fallbrook Fires

Documented fire occurrences on Detachment Fallbrook date back as far as 1919, although few data are available before military ownership (Table 3-2). Neighboring MCB Camp Pendleton has had an average of 300 fires per year since 1968, representing a very high ignition rate. This creates a high potential of wildfire traveling onto Detachment Fallbrook. Since the early 1940s, when both installations were established, about 30% of the wildland fires on Detachment Fallbrook that had documented origins, and were not controlled burns, originated from MCB Camp Pendleton. While a seemingly low percentage of ignitions, these incidents tend to comprise the larger fires on Detachment Fallbrook. Other ignition sources include illegal campfires by trespassers, sparks from equipment, trains and automobiles, cigarettes, control burns, and misuse of matches (USDON 2003a).

Map 3-4 and Table 3-2 summarize the fire frequency and historical fire patterns. The table also provides ignition sources and acreage burned. Some limitations of the records include data gaps in certain years and potentially inaccurate fire perimeter mapping due to reliance on a firefighter's memory after the incident. While mapping limitations are recognized, an independent study of vegetation age structure at MCB Camp Pendleton confirmed much of the mapped history on that installation based on the same records. As part of MCB Camp Pendleton's LTETMP, stem cross-sections from shrubs adjacent to permanent monitoring plots were aged as an estimate of years-since-last-fire. These were compared to the MCB Camp Pendleton's fire history records and a high degree of similarity was found. Field results which deviated from the maps were often from locations in draws or pockets which may have been inadvertently mapped as "burned" when polygons were drawn around the fire perimeter (SDSU 1996).

Table 3-2. Documented fire history for Detachment Fallbrook, 1919–Present.[a]

Year	Total Acreage(s) [b]	Minimum # ignitions: Reported Cause(s) [c]
1919	**697 (658)**	1: unknown
1950	**852 (805)**	1: escape from MCB Camp Pendleton
1951	**235** (40; 25; **219**)	2: camper in river bottom, unknown
1952	**9** (**9**)	1: car wreck
1953	**122** (5; **99**)	1: escape from MCB Camp Pendleton
1955	No GIS (4; 3; 5)	3: sparks from incinerator, sparks from road grader, sparks from street sweeper
1956	**158** (3; 40; 6; 50; **154**)	4: sparks from welder, escape from MCB Camp Pendleton, 14 Area Dump escape from MCB Camp Pendleton, escape from Camp Pendleton
1957	**16** (3; 2; 3; **13**)	3: cigarette, sparks from incinerator, cigarette
1958	**101** (40; 20; **100**)	2: sparks from road grader, escape from Camp Pendleton
1959	**19** (4; 2; 18; **18**)	2: AT&SF train crew, down power line
1960	**16** (1; 10; **15**)	2: unknown, escape from Camp Pendleton
1962	**63** (6; 5; 1; **62**)	3: escape from MCB Camp Pendleton, escape from MCB Camp Pendleton, escape from MCB Camp Pendleton
1964	**235** (90; **235**)	1: escape from MCB Camp Pendleton
1965	10, 14 (10; **14**)	2: unknown, unknown
1968	**2098** (40; 3000; 1000; 10; **2082**)	4: sparks from road grader, escape from Camp Pendleton, escape from MCB Camp Pendleton, spotting flares
1969	**226** (5; **226**)	2: illegal campers, escape from MCB Camp Pendleton

Year	Total Acreage(s) [b]	Minimum # ignitions: Reported Cause(s) [c]
1970	**21** (1; **21**)	2: sparks from train wheels, sparks from generator exhaust
1972	**17** (5; **17**)	1: unknown
1974	196 & 146, overlapping (2; 25; 50; 2; 40; **202**)	4: cigarettes, sparks from bulldozer, escape from MCB Camp Pendleton, bulldozer pulling chain.
1975	**141** (5; 1; **141**)	3: children playing with matches, illegal campers, cigarette, ammo firing
1976	**19** (2; 1; **18**)	2: sparks from welder, car fire started grass fire
1978	**891** & **17**, overlapping (4; 148; 10; 50; **891**; **17**)	8: unknown, control burn (5 locations), sparks from mower, sparks from mower, sparks from mower.
1979	**153** (775; 50; 2; **153**)	4: control burn, rekindle from control burn, ammo firing (flares), sparks from generator
1983	**383** (900; **376**)	1: sparks from control burn
1987	No GIS (90; 45)	2: control burn, control burn
1988	**459** (200; **456**)	2: control burn, control burn
1990	**2032** (**1219**)	1: escape from Camp Pendleton
1993	**24** (**24**)	1: unknown
1998	**469** (150)	1: “DeLuz Fire” escape from MCB Camp Pendleton
2002	**2002** (1970)	1: “Gavilan Fire”, started on private land within community of Fallbrook
2004	**100 (96)**	1: “India Fire”, burned across from MCB Camp Pendleton
2005	**25** (10)	1: sparks from a mower
2006	**104**	1: sparks from firebreak disking
2013	**558** (**1; 557**)	2: small unnamed fire started by children in DeLuz housing on Camp Pendleton (~ 1 ac); “DeLuz Fire”, apparent arson that started near Naval Hospital on MCB Camp Pendleton
2014	**5081**	2: small unnamed fire (~0.1 ac) started on private land within community of Fallbrook; “Tomahawk Fire”, presumed branch hit powerline on Detachment Fallbrook during Santa Ana winds.
2015	**< 0.1**	1: cigarette by Building 3 on Detachment Fallbrook.

[a] Historical data in this table are not considered especially accurate but are included for general descriptive value. Caution is advised for any efforts to interpret historical fire trends. Data since the mid-1990s are considered more accurate.

[b] Total fire acreage, as available in Detachment Fallbrook’s GIS, is provided per year in which one or more wildland fires occurred.

Bolded acreages were mapped in GIS; unbolded acreages were not mapped and it is possible they may overlap with other fire acreages that year.

() = Values in parentheses reflect the acreages per fire event according to MCB Camp Pendleton Fire Department records and previous GIS records, which may or may not match current Detachment Fallbrook GIS data. (MCB Camp Pendleton data are often initial perimeter mapping results.)

[c] Number and cause of ignitions can be difficult to ascertain with historical data. A minimum number of ignitions was deduced based on combined information from Detachment Fallbrook and MCB Camp Pendleton records. Causes of ignition sources are added where possible. The ignition source may not have originated on the Detachment; the description of reported causes indicates, when known, whether the ignition originated off site.

Since 2002, three wildland fire events (Gavilan, DeLuz, and Tomahawk) cumulatively burned an estimated 6,932 acres or about 78% of the installation, when removing areas of overlap are factored out. On 10-12 February 2002, the Gavilan Fire was ignited off-base within the community of Fallbrook. Fanned by strong Santa Ana winds (peak gusts of 25 miles per hour [mph]), with temperatures up 104° F and relative humidity as low as 2%, the fire burned onto Detachment Fallbrook and MCB Camp Pendleton, covering a total of 5,121 acres, of which 1,993 acres burned on Detachment Fallbrook (23% of the installation). This fire burned across most of the major vegetation types found on Detachment Fallbrook, including grasslands (308 acres), coastal sage (1,016 acres), chaparral (238 acres), oak woodland (153 acres), and riparian (177 acres). Approximately 41% of the vegetation burned had no previous recorded fire history, while another 42% had not burned in at least 30 years.

Just over ten years later, approximately 5,153 acres, or 58%, of the installation burned in FY14 between the 2013 DeLuz and 2014 Tomahawk Fires, removing overlap. On 5 October 2013, the DeLuz fire burned approximately 560 acres in the northwestern corner of the Detachment. Although in an area subject to a relatively higher fire frequency owing to Camp Pendleton ignition sources, the 2013 DeLuz fire appeared to be caused by arson and was not due to mission related activities. Less than eight months later, and following record drought conditions, the Tomahawk Fire ignited.

On 14-16 May 2014, the Tomahawk Fire burned approximately 4,632 acres on Detachment Fallbrook, with an additional 134 acres on MCB Camp Pendleton (Photo 20). The cause of the Tomahawk Fire is attributed to high winds (up to 60 mph) blowing tree branches into power lines near the old housing area on the installation (northeastern perimeter). The fire spread quickly with the combination of the winds, low fuel moisture levels following months of drought, and extremely low relative humidity (around 2%). With shifting wind directions, the fire was contained almost exclusively on the installation, although there was some damage to properties within the community of Fallbrook. There were numerous fires in San Diego County during the Tomahawk Fire, spreading thin firefighting resources. The Tomahawk Fire was administratively combined with the “Basilone Complex” fires that included two other large fires, Las Pulgas and San Mateo, occurring within the same time period on MCB Camp Pendleton.

Photo 20. Tomahawk Fire, May 2014. (Photo by Cpl. Orrin G. Farmer)

The Tomahawk Fire was not only devastating in terms of the infrastructure destroyed (powerlines, communication lines, fences), but also in the amount of natural resources consumed. A Burned Area Emergency Response (BAER) assessment provided an initial evaluation of the effects of the Basilone complex fires on natural resource with recommended remedial actions (USFS 2014). (Note: the acreages presented in the BAER report were based on preliminary GIS and are not considered definitive; however, the general assessment of effects remains valid.) Based on the vegetation burn severity data (GIS: "Cumulative Fires 2014 and Flora 2010 Veg"), the fire burned through every habitat type found on Detachment Fallbrook including grasslands (791 acres), coastal sage scrub (3,376 acres), chaparral (2 acres), oak woodland (102 acres), and riparian (256 acres). Approximately 45% of the vegetation burned had no previous recorded fire history, while another 35% had not burned in at least 30 years.

3.6.2 Fire Severity

The ecological effects of fire depend, in part, on fire severity, which, in turn, is influenced by vegetation type, topography, weather, and other factors. The terminology of fire severity (ecosystem impacts) and fire intensity (energy output) are problematic and often not precisely used (Keeley 2009). While they both are measurable, the characteristic that land managers are most interested in is ecosystem effects. However, ecosystem effects are not directly related to severity and intensity across habitat types, although they are related within habitat types. Grass- and forb-dominated vegetation types will generally have the lowest fire intensities, while open shrublands typically have intermediate values, and dense closed canopy coastal sage scrub and chaparral that burn in stand-replacing fires typically have the highest intensity fires (Photo 21). Since the late 1990s, fire severity burn patterns of wildland fires over five acres on MCB Camp Pendleton and, starting with the Gavilan fire in 2002, on Detachment Fallbrook have been mapped based on residual biomass and other evidence left behind after fires.

Fire severities are recorded on a scale of 1 (most severe) to 5 (least severe) using a modified version of a burn severity coding system developed by the National Park Service (1992) (Table 3-3). Ratings are assigned based on an overall visual estimation of the extent of removal of litter, herb, shrub, and tree layers.

Photo 21. Severely burned (top; May 2014) and recovering (bottom; May 2016) habitat on Fallbrook Creek. (Photos by C.M. Wolf)

Table 3-3. Fire intensity classes and definitions, adapted from National Park Service (1992).

Fire Severity	Class	Effects on Litter/Duff	Effects on Herbs/Grasses	Effects on Shrubs Effects on Trees
1 Completely Burned	Burned to ash	Burned to ash	Burned to ash, few resprouts	Burned to ash or killed by fire
2 Heavily Burned	Burned to ash	Burned to ash	Burned to ash, some resprouts	Killed by fire or severely stressed
3 Moderately Burned	Burned to ash	Burned to ash	Burned to singed, some resprouts	Crown damage only to smaller trees
4 Lightly Burned	Blackened, but not evenly converted to ash	Burned to ash, some resprouting	Singed/stressed, may resprout/ recover	No effect on mature trees, may kill seedlings/saplings
5 Scorched	Blackened	Singed/stressed, may resprout/recover	Not affected, slight stress	No effect on trees
6 Unburned	Unburned inclusions within a fire should be marked as 6			

3.6.3 Ecological Effects of Fire

Fire has been an important evolutionary force and a primary driver of ecosystem processes in Mediterranean type ecosystems. Many plant species have adaptations to fire, some requiring fire for reproduction (e.g., seed germination is stimulated by fire) and others with strong resprouting abilities that allow them to persist even in relatively high fire frequency environments (Bond & Keeley 2005, Bellingham & Sparrow 2000).

When considering the ecological effects of fire it is important to remember that, although fire is an important driver of ecosystem and species population dynamics, the ecological communities at Detachment Fallbrook are comprised of species assemblages with different population responses to fire (Lawson 2011a). Some species are more vulnerable to the effects of fire, requiring longer recovery times and recolonization from neighboring refugia (Photo 22). Because plants depend on endogenous recovery (recovery from onsite propagules that are fire adapted or were protected from fire, e.g., by soil), the impact of fire size and the presence of patchiness on the landscape after fire may be more important as refugia for animals, which are more likely than plants to have to recolonize sites after burns. Even for species that require fire, not just any fire regime is beneficial (Keeley 2009). In southern California shrublands, historic fire return intervals range from about 30 to more than 100 years (Keeley 1992). While plant species can theoretically be at risk from fire intervals that are too infrequent and exceed species tolerances, the greatest risk appears to stem from fires that are too frequent (Bond & Keeley 2005, Syphard et al. 2009, Zedler et al. 1983).

Photo 22. Post-fire population recovery can require several years for species such as the San Diego cactus wren that nest almost exclusively relatively slow growing prickly pear and colla cacti. (Photo by C.M. Wolf)

Mediterranean type ecosystem shrublands that burn too frequently are subject to vegetation type conversion (Keeley & Brennan 2012, Zedler et al. 1983). Most concern is generated over changes from shrubland to grassland when invasive grasses replace shrub cover (Keeley et al. 2012). This type conversion has not been a particular problem for

Detachment Fallbrook where coastal sage scrub has been increasing. However a more subtle form of type conversion can occur when resprouting shrubs that are more able to persist under short fire intervals replace obligate or facultative seeding shrubs (Lucas et al. 2013; Syphard et al. 2006). When frequent fire depletes the seedbank of obligate seeding species, resprouting species can increase. Unfortunately this could have adverse effects on the California gnatcatcher when the resprouter laurel sumac increases at the expense of drought deciduous shrubs favored by the gnatcatcher. Because long lived woody species can hold space effectively for many years in the absence of fire, this kind of type conversion may persist much longer than type conversion to grassland. Recent work has shown that extreme drought has similar effects on the balance between resprouting and obligate seeding shrubs due to the shallower rooting depth of the seeders compared to the resprouters (Dario 2014), raising the specter that climate change could reinforce these undesirable vegetation shifts.

For species that need fire at some point to drive reproduction, plant and seed longevity mean that many can persist with fire free intervals exceeding 100 years. Indeed, for a number of plant species, fire intervals may be much longer depending on seed longevity (Lawson et al. 2010). Robust populations of obligate seeding shrubs (species whose seed require fire to germinate) have materialized post-fire where there was no evidence of them in the pre-fire vegetation (Tyler & D'Antonio 1995) or where pre-fire densities were diminished after very long fire free intervals (Keeley et al. 2005). These seedlings evidently were generated from a live seedbank that persisted long after the adult plants that produced them had died. Short fire intervals, on the other hand, can result in local extirpations of shrub species (Zedler et al. 1983) and, in fact, were used as a range management tool in the past to type convert shrublands to grasslands (Hedrick 1951; Burcham 1955).

The disruption of landscape level processes through habitat loss and fragmentation further complicates the contemporary ecological role of fire and fire management. Many species (e.g., many animals, plants that are not specifically fire adapted) likely persisted in the fire-prone landscapes of southern California through survival in unburned refugia and subsequent recolonization of burned habitat (Wirtz et al. 1988). However, such species may not be able to maintain sufficient metapopulation sizes and distributions in a fragmented landscape because of disrupted dispersal (Lawson 2011a). Since 1953, in western San Diego County, the amount of the landscape in natural habitats south of MCB Camp Pendleton and Detachment Fallbrook has declined by almost 50% and the number of remnant natural habitat patches has increased by a factor of 38 with the average patch size declining two orders of magnitude from approximately 1900 ha to 30 ha (Lawson 2011b). This has affected both source recolonization dynamics of native species (Lawson 2011a) and fire regimes themselves (Syphard et al. 2009). What this means is that vague objectives of ensuring that fire plays its "natural role" in ecosystems is not sufficient when those ecosystems are so disrupted and neither fire processes nor population demographics can function "naturally".

Thus, fire management needs to be driven by specific objectives. This is exemplified by two species of management concern at Detachment Fallbrook, the California gnatcatcher and the Stephens' kangaroo rat. The California gnatcatcher requires woody vegetation; areas denuded by fire do not support gnatcatchers (Beyers & Wirtz 1997). As burned coastal sage scrub regrows, it can take an estimated four to seven years to become suitable nesting habitat for gnatcatchers (CalPIF 2004, Cario & Zedler 1995, Wirtz et al. 1997, see also discussion below). On the other hand, the Stephens' kangaroo rat requires low cover grasslands/forblands and can use post-fire early seral stage coastal sage scrub not suitable for California gnatcatchers (Spencer 2002). An appropriate fire strategy for natural resources management will have less to do with fire playing its "natural role" in the ecosystem than meeting specific objectives for target species which could vary depending on regional population dynamics and the degree to which Detachment Fallbrook's population contributes to the overall status of a species.

Coastal sage shrub structure and cover may be more important to the coastal California gnatcatcher than how old the habitat is, though vegetation structure and age are obviously related (Beyers & Wirtz 1997). Vegetation within gnatcatcher territories is often typified by shrubs that are approximately one meter in height (Atwood 1990, Bontrager 1991, Rubinoff 2001). California sagebrush commonly reaches this height after about four to five years of growth (Beyers & Wirtz 1997). With respect to percent shrub cover, gnatcatchers generally prefer relatively open sage scrub (Bontrager 1991, Grishaver et al. 1998, Beyers & Wirtz 1997), however, actual shrub cover ranges among studies. Within gnatcatcher breeding territories, for example, Bontrager (1991) estimated average total shrub canopy cover ranged from 62-66% shrub cover, Beyers and Wirtz (1997) estimated > 50%, whereas others have found territories in even less shrub cover (Atwood 1993).

Data from Detachment Fallbrook show 28% and 13% of gnatcatchers observations in 2000 and 2009, respectively, within habitat that had not burned for 6-15 years (Table 3-4). The remaining gnatcatcher observations were within older habitat that had not burned for over 15 years (Table 3-4). What is not clear is the percent shrub cover within age class stands. Factors such as the intensity of the fire, available seed bank, grazing levels, and other disturbances are expected to influence how quickly vegetation returns after a fire and the percent coverage achieved. This variability was described by TDI (2002), which assessed coastal sage scrub cover in locations on MCB Camp Pendleton believed to be of similar age based on fire history. Recovery after five years was consistently greater than 40% total shrub cover; however, some sites exceeded 60% cover in two to three years, while others remained at 50% cover after 20 years (TDI 2002).

Table 3-4. Locations of California gnatcatcher pairs, as observed in 2000 and 2009 on Detachment Fallbrook, in relation to habitat age as based on historical fire records.

No. years since last fire	2000 No. of Pair Locations (% of Total, n=55)	2009 No. of Pair Locations (% of Total, n=120)
3-5 years	0 (0%)	0 (0%)
6-10 years	8 (15%)	12 (10%)
11-15 years	7 (13%)	4 (3%)
16-20 years	2 (4%)	5 (4%)
21-25 years	3 (5%)	16 (13%)
26-35 years	5 (9%)	22 (18%)
>35 years	29 (53%)	61 (51%)
2000 locations from Pass 3 in Varanus (2002) 2009 locations from Cumulative Assessment in GANDA & Cadre (2010)		

Riparian habitats are not typically as fire prone as upland habitats because the roots of many woody species in these habitats stay in contact with ground water maintaining relatively high live fuel moisture levels during the fire season (Dwire & Kauffman 2003). While riparian habitats can be more resistant to burning because of this, they are by no means fire proof and burn in sometimes large, intense fires. Although *Salix* spp are generally strong resprouters and regrow rapidly after fire, mortality does occur and is higher on drier sites (O'Leary & Bredemeyer 2012).

Wildland fire and invasive species interact in multiple ways (Klinger et al. 2006). Invasives, particularly annual grasses in the Western U.S., have been documented to alter fire regimes by creating a continuous fuel bed that allows fires to move more readily across the landscape resulting in increasing frequency (D'Antonio & Vitousek 1992, Zeder et al. 1983, Keeley & Brennan 2012). Moreover, disturbance caused by fire can open up habitat and allow the colonization or population

expansion of invasive species. Because of the susceptibility of disturbed areas to invasives, one management technique often implemented after fire is weed control in burned areas. In addition to the effects of invasives on fire regimes and the ability of fire to promote invasive spread by opening habitat, fire can adversely affect invasive species. Prescribed fire, for example, has been used as a technique to control invasive species (DiTomaso et al. 2006). Due to the ammunition storage mission and logistical challenges associated with prescription burns, it is unlikely that prescribed fire will be used in this way at Detachment Fallbrook.

3.7 VEGETATION COMMUNITIES AND HABITATS

Vegetation in a given area provides an indication of the potential floral and faunal communities present, and is influenced by a range of past and present environmental factors such as soil, hydrology, topography, elevation, climate, land use, and site history (e.g., fire, agriculture). Vegetation communities are often used to delineate ecosystems (e.g., California Mesic Chaparral ecological system) or as a proxy for describing habitat types (e.g., Coastal Sage Scrub habitat). An ecosystem, however, can have much broader applications and can vary in size from an entire forest to a single puddle. An ecosystem is defined by the nutrient cycling and energy flow between the living organisms within a community in conjunction with nonliving components of the environment (e.g., soil, water). Likewise, habitats go beyond the vegetative aspect of the environment and are defined by the requirements of a particular organism, which may include only a small component of a single vegetation community or encompass multiple vegetation communities.

While the terms ecosystem, vegetation community, and habitat may be conceptually fairly simple to define, many systems are naturally dynamic and classifications and mapping approaches can be highly variable. Classification and mapping depends upon numerous considerations, including the scale and intended purpose of the product. Without clear classification and mapping goals, objectives, and standards, vegetation and habitat mapping products may not be repeatable, provide value for trend detection, or be comparable to regional maps.

At Detachment Fallbrook, vegetation and habitat mapping projects historically have been informative models with respect to depictions of general community types and useful for many mission support objectives. However, vegetation classification and mapping was not standardized and it was difficult to have confidence in the comparison of products through time (e.g., it was often unclear how much of the variance could be attributed to actual floristic changes in the field versus differences in classification/mapping methodologies). This is not a unique challenge to Detachment Fallbrook.

Since the mid-1990s there has been a movement to develop federal standards to establish a consistent approach for vegetation classification and mapping throughout the country. The first National Vegetation Classification (NVC) Standard was adopted by the Federal Geographic Data Committee in 1997, with a second edition adopted in 2008 (FGDC 2008). The National Vegetation Classification standard is a *process* standard. The standard itself does not contain a formal set of Classification units, but rather outlines the process by which such units are to be described, peer reviewed, and maintained through various data-management and web tools. This means that the classification is *dynamic*, subject to change as vegetation scientists revise or newly describe vegetation types in the United States. A formal set of classification units with ecological context and geographic ranges is provided in the U.S. National Vegetation Classification (USNVC), the most current version of which was launched in 2016 (www.usnvc.org).

With the widely diverse floristic communities in California, the USNVC has limited utility for localized mapping within the State. For this reason, CDFW developed and maintains updates to the Vegetation Classification and Mapping Program (VegCAMP), which is the State expression of the

NVC system. CDFW, in collaboration with the California Native Plant Society (CNPS), also publishes print editions and maintains an online version of A Manual for California Vegetation (MCV). A subset of MCV alliances and associations been further defined for western San Diego County (Sproul et al. 2011), with a supplement completed a few years later (Dunn & Kentner 2015).

The MCV classification is hierarchical and includes categories that are defined by the plant species composition (e.g., the grouping level is an "association", with an "alliance" being the next level up). The underlying principles of the classification are unlikely to change. However, as more vegetation data are collected throughout the state, refinecriments to classification should be expected. With the recent regional efforts (Sproul et al. 2011, Dunn & Kentner 2015), the classifications for the western San Diego region are becoming more mature and changes are anticipated to be few and fewer over time.

Prior to the FY14 fire, Detachment Fallbrook awarded a contract to develop a classification key and vegetation mapping protocol that follows VegCAMP and MCV (USDON, in prep). That effort also produced a revised vegetation map for the installation, but it is still in draft and the results have not been incorporated in this INRMP update (AECOM, in prep).

The vegetation communities and cover types presented in Table 3-5 correspond to Map 3-5, which was based predominantly on mapping that was done in 2007 and 2008 (TDI 2011a, 2013a). Due to the emphasis on habitat mapping for certain animal species, some vegetation communities, such as shrublands and riparian corridors, were historically mapped with greater resolution than other communities. To help illustrate potential California gnatcatcher habitat, for example, Map 3-6 presents coastal sage scrub subtypes.

The vegetation mapping in 2007/08 endeavored to implement the VegCAMP/CMV system of classification and mapping. However, there are many aspects of the final 2007/08 map product that are not consistent with VegCAMP/MCV and will not be comparable to subsequent mapping products. This inconsistency with MCV was due at least in part to the fact that VegCAMP had not been widely applied in southwestern California and many alliances and associations had yet to be defined for our area. Nonetheless, the 2007/08 vegetation map remains a useful model of the vegetation communities on the installation for the majority of management needs and mission support requirements.

It is important to point out that the 2007/08 vegetation mapping presented in this INRMP does not reflect the effects of the FY14 fires. To facilitate interpretation of the contemporary vegetation communities present, the extent of the DeLuz and Tomahawk Fires is overlain on the 2007/08 vegetation in Map 3-5. The affected acreages are also tallied in Table 3-5. The vegetation communities within the burned areas are in varying states of recovery and are composed of shrub seedlings, shrub resprouts, and characteristic post-fire herbaceous species. The vegetation is considered early seral stage habitat with an anticipated return to similar pre-fire structure and composition in time, as virtually none of the stands had burned in the three to five years prior to the FY14 fires (Keeley 2005).

To provide a simplified context for a discussion of habitat values and resource management, Table 3-5 and the following subsections categorize vegetation communities into more traditional types (e.g., "coastal sage scrub" is used in lieu of listing 7 alliances, "chaparral" is use in lieu of 2 NatureServe ecosystems). These simplified, more traditional vegetation categories generally correspond to the wildlife habitat types as classified using the California Wildlife Habitat Relationships (CWHR) system (Mayer & Laudenslayer 1988, and subsequent versions). Also, vegetation communities are described in the subsections below, in part, using Holland (1986), which is considered somewhat outdated for vegetation type classifications, but remains a useful

reference for describing floristic and ecological aspects of the communities for potential habitat value.

For the annual INRMP metrics, the Navy adopted the use of the terrestrial "Ecological Systems" classifications in NatureServe for assessing the effectiveness of management and the integrity of ecosystems on Navy lands. NatureServe (www.natureserve.org) is a nonprofit organization that maintains the NVC for the U.S. Although the NatureServe ecosystems do not entirely align with the California expression of NVC, an estimated 9 NatureServe ecosystems are present on Detachment Fallbrook (Table 3-6). To facilitate connection of NatureServe ecosystems to natural resources management, Table 3-6 provides a crosswalk to the more traditional community types.

The type of vegetation present provides only one indication of the potential habitat value present. Habitat value or quality depends on many factors beyond vegetation type. For example, native species diversity, a combination of richness (number of species) and relative abundance, in a community is often considered a positive indicator of habitat quality. In theory, the presence of certain sensitive species can further provide an indicator of habitat quality. The size of habitat patches and their arrangement on the landscape can also have a significant influence on their ability to support certain species. Patch size has been shown to be the single most important predictor of native plant species richness (Alberts et al. 1993). Researchers have found a negative correlation between a number of species and the proximity of urban edges or level of fragmentation of a habitat (Alberts et al. 1993, Andren et al. 1985, Andren & Angelstam 1988, Santos & Telleria 1992). For individual species, habitat quality is often referred to in terms of suitability. Determining habitat suitability for a given species can sometimes be difficult to discern. Often the best indicator of habitat suitability is occupancy by the species.

Table 3-5. Vegetation communities and land cover acreage estimates on Naval Weapons Station Seal Beach Detachment Fallbrook, as estimated in 2000, 2007/08, and after the FY14 DeLuz and Tomahawk Fires.

Vegetation Community [a]/ Cover Type	Characteristic Species/ Description	2000 [b]		2007/08 [b]		Post-FY14 Fires [c]	
		Acres	% of Land	Acres	% of Land	Burned Acres	Unburned Acres
Coastal Sage Scrub [b]	California sagebrush, white sage, black sage, California buckwheat, laurel sumac, coyote brush, monkeyflower, goldenbush, deerweed	4,734	53.3%	5,401	60.8%	3,774	1,627
Chaparral	Chamise, ceanothus, scrub oak (acreage includes coastal sage scrub/chaparral mix)	272	3.0%	312	3.5%	59	253
Riparian Communities	Willows, mule fat, sycamore, cottonwood	536	6.2%	424	4.8%	304	120
Oak Woodland	Coast live oak, Engelmann oak	243	2.7%	331	43.7%	117	214
Open Water, Other Wetlands	Lakes, ponds, streams, vernal pools, and associated herbaceous plants (e.g., rushes, sedges)	17 [d]	0.3%	19	0.2%	6	13
Grassland	Exotic annual (~ 96%) and native perennial grasslands	2,279	25.7%	1,812	20.4%	791	1021
Eucalyptus		23	0.3%	26	0.3%	9	17
Disturbed	Fuelbreaks, mowed areas, dirt roads	111	1.3%	147	1.75	3	144
Developed	Buildings, paved roads, parking lots	680	7.7%	403	4.5%	90	313
Total		8,894[d]		8,875[d]		5,153	3,722

[a] Vegetation community and land cover types are grouped into simplified categories that generally correspond to California Wildlife Habitat Relationships (CWHR) system (Mayer & Laudenslayer 1988). Categories loosely correspond to the Manual of California Vegetation (Sawyer & Keeler-Wolf 1995) classifications and the ecological system classifications as found in NatureServe (see Table 3-6).

[b] Vegetation mapping was predominantly based on TDI (2002) for 2000, and TDI (2011a, 2013a) for 2007/08. These two vegetation and mapping efforts were not strictly comparable and differences between years should be interpreted with caution. The two mapping efforts are presented here for general management and discussion value.

[c] Acreage estimates following the FY14 (October 2013 DeLuz and May 2014 Tomahawk) Fires are based on the 2007/08 vegetation layer with an overlay of the vegetation burn severity layer.

[d] The acreage of the installation is 8,852 acres. Differences in total acreages between mapping efforts are due to variances in older perimeter boundary GIS layers.

Table 3-6. Crosswalk between traditional vegetation community types and NatureServe ecosystem classifications at Detachment Fallbrook.

Traditional Community Type	NatureServe Ecosystems
Coastal Sage Scrub	SOUTHERN CALIFORNIA COASTAL SCRUB (CES206.933)
Chaparral	SOUTHERN CALIFORNIA DRY-MESIC CHAPARRAL (CES206.930)
	CALIFORNIA MESIC CHAPARRAL (CES206.926)
Riparian Communities	NORTH AMERICANWARM DESERT RIPARIANWOODLAND AND SHRUBLAND (CES302.753)
Oak Woodland	MEDITERRANEAN CALIFORNIA FOOTHILL AND LOWER MONTANE RIPARIANWOODLAND AND SHRUBLAND (CES206.944)
	SOUTHERN CALIFORNIA OAKWOODLAND AND SAVANNA (CES206.938)
Open Water, Other Wetlands	NORTH AMERICAN ARIDWEST EMERGENT MARSH (CES300.729)
	SOUTH COASTAL CALIFORNIA VERNAL POOL (CES206.950)
Grassland	CALIFORNIA CENTRAL VALLEY AND SOUTHERN COASTAL GRASSLAND (CES206.942)

3.7.1 Coastal Sage Scrub

Photo 23. Coastal sage scrub. (Photo by K. Fischer)

The coastal sage scrub (CSS) on the Detachment is sometimes still referred to as "Diegan coastal sage scrub," which follows the Holland (1986) classification (Photo 23). CSS is a shrub community occurring in xeric environments, usually on well drained soils, on south and west facing slopes; it predominates where the sun has the greatest desiccating effect. At higher elevations, CSS intergrades with chaparral, but it tends to occupy drier and hotter sites (more arid) than chaparral. It also contrasts with chaparral by its drought-coping strategy of shedding foliage, while chaparral plants tend to tolerate water loss by adaptations such as thick, waxy leaves that resist desiccation.

Plants associated with coastal scrub are typified by low to moderate-size (rarely reaching more than two meters in height), mesophytic leaves, flexible branches, and semi-woody stems growing from woody bases. The mature phase is typified by greater than 50% cover of some mixture of California sagebrush (*Artemisia californica*), California buckwheat (*Eriogonum fasciculatum*), laurel sumac (*Malosma laurina*), white sage (*Salvia apiana*), black sage (*Salvia mellifera*), prickly pear cactus (*Opuntia* sp.), and cholla (*Cylindropuntia prolifera)*. Sub-dominants can include lemonadeberry (*Rhus integrifolia*) and native grasses such as needlegrass (*Stipa* spp.). (Note: the dominant grassland *Stipa* species, *S. pulchra* and *S. cernua*, were recently reclassified from the genus *Nassella*.)

Coastal sage scrub is the single most prevalent vegetation community at Detachment Fallbrook (Table 3-5) and is associated with one of the installation's federally listed threatened species, the coastal California gnatcatcher (*Polioptila californica californica*). CSS occurs on slopes throughout

the Detachment, with the exception of some north-facing slopes at the northern boundary and above the Santa Margarita River.

As elsewhere where CSS occurs, the coastal sage on Detachment Fallbrook is a mosaic of patches where different shrub species dominate and shrub density can vary greatly. In 2000, the CSS map was delineated into CSS Types in an effort to better reflect habitat suitability for the coastal California gnatcatcher (TDI 2002). Five distinct CSS Types, based upon the dominant species present, were identified ranging from most suitable for the gnatcatcher (Type I) to least suitable (Type V):

I Sagebrush (*Artemisia*) dominated;

II Mixed Sagebrush (*Artemisia*)/ Buckwheat (*Eriogonum*) dominated;

III White sage (*Salvia apiana*) dominated;

IV Laurel sumac (*Malosma laurina*) dominated; and

V Recovering (recently burned).

Although the vegetation classification and mapping standards have changed since TDI (2002), the CSS Types still provide a useful generalization for CSS habitat suitability for the California gnatcatcher.

Two major drivers for this vegetation type are fire and exotic plant invasion. Coastal sage scrub is adapted to a specific fire regime with characteristic frequency, extent, and intensity. Many of the component species of CSS have characteristics that predispose them to periodic fire, such as volatile oils in plant parts or adaptations to cope with fire like fire-cued seed germination or resprouting after fire. Though fire is a natural process in southern California, overly frequent burning of coastal sage scrub can deplete the seed bank and convert the habitat to grassland. Long periods without fire appear to carry less ecological risk as compared to short fire intervals (see discussion in Section 3.6). However, long fire intervals may favor the expansion, or recolonization, of coastal sage scrub species into grasslands which may or may not be desirable from a management perspective in certain areas (e.g., where Stephens' kangaroo rats reside). As with most native vegetation communities, the effect of exotic or invasive plants tend to be more problematic in disturbed areas, including along edges of fragmented stands and urban edges (e.g., road sides).

In addition to the coastal California gnatcatcher, coastal sage scrub supports several sensitive plant and wildlife species. A few sensitive plant species associated with coastal sage scrub have been detected at Detachment Fallbrook, including but not limited to: Lewis' evening primrose (*Camissoniopsis lewisii*; NOREAS 2016), a CRPR List 3 species; Palmer's grapplinghook (*Harpagonella palmeri*; NOREAS 2016), a CRPR List 4.2 species; and small-flowered microseris (*Microseris douglasii* ssp. *platycarpha*; TDI 2007), a CRPR List 4.2 species. Coastal sage scrub provides habitat for many of the sensitive wildlife species found on Detachment Fallbrook, including several California species of special concern including San Diego cactus wren (*Campylorhynchus brunneicapillus sandiegensis*), red diamond rattlesnake (*Crotalus ruber*), San Diego horned lizard (*Phrynosoma blainvillii*), and orange-throated whiptail (*Aspidoscelis hyperythra*).

Although much of the coastal sage scrub in San Diego County has been lost to urban development, this has been the most abundant vegetation community on the Detachment and, prior to the FY14 wildland fires, had exhibited evidence of expansion over the years. Following the FY14 fires, a considerable amount (roughly 70%) of coastal sage was burned and is currently in a state of

recovery, representing a temporal loss of habitat for wildlife species associated with older seral stages of this community (e.g., coastal California gnatcatcher, San Diego cactus wren).

3.7.2 Chaparral

The chaparral present on Detachment Fallbrook includes chamise chaparral, southern mixed chaparral, and coastal sage/chaparral scrub, based on the Holland (1986) nomenclature. Chaparral is one of the most fire-susceptible vegetation types in the world due to its shrub density and structure, summer dryness, and volatile waxes and oils (Barbour & Major 1977). Chaparral is generally believed to be adapted to fire return intervals ranging between about 30 and 150 years (Stephenson & Calcarone 1999, Zedler 1995), with average natural return intervals of 50 to 70 years (Minnich 1983, Davis & Michaelsen 1995, Conard & Weise 1998, Mensing et al. 1999). These fire-free intervals are longer than previously thought. Root crown sprouting shrubs such as chamise (*Adenostoma fasciculatum*) recover quickly from fire and obligate seeding shrubs such as ceanothus (*Ceanothus* spp.) recover as well (Lawson 2011a). A pulse of herbaceous species recruiting from seed and underground storage structures also occurs in the first few years after fire eventually declining in density and cover as the pre-fire closed-canopy condition is recreated.

Because chaparral and many of its component species are widely distributed in California, there is no direct threat to it as a vegetation type. Large-scale changes in climate or pollution may affect the distribution of chaparral species but research on the effects of potential changes is not well developed.

The chaparral stands on Detachment Fallbrook exist in remote areas, are small in size, and are not known to support any sensitive plant species or unique habitat or soil associations. Sensitive wildlife species found in chaparral that are known to occur on the Detachment include the California species of special concern orange-throated whiptail, the San Diego horned lizard, and the red diamond rattlesnake.

3.7.3 Riparian Woodland and Scrub

Photo 24. Santa Margarita River riparian vegetation, June 2008. (Photo by C.M. Wolf)

Riparian woodland and scrub vegetation grows along rivers, streams, and other drainage courses, particularly where water flows or lies near the soil surface (Photo 24). Riparian plant associations on the Detachment include southern coast live oak riparian forest, southern arroyo willow riparian forest, southern riparian forest, sycamore alluvial woodland, mule fat scrub, and southern willow scrub. These habitat types are present in the Santa Margarita River and its associated network of ephemeral streams and the network of drainages across interior of the Detachment that also contribute to the San Luis Rey watershed. While these riparian communities have overlap in the plant species found within them, they are differentiated by the proportion of the different species, vertical structure, and volume of the vegetation.

Despite the relatively small area covered by the riparian communities, a greater diversity of wildlife depends on these plant communities than on other habitat types (e.g., Montgomery 1996). Riparian areas provide habitat and forage for migratory and resident birds, cover for large and small mammal species, and riverine habitat for water dependent herpetofauna. These communities also provide natural wildlife corridors for movement of species between habitat types. In addition, riparian systems provide ecosystem services in that the plants filter sediment and contaminants for water quality protection and the water provides groundwater recharge.

Sensitive species found in riparian areas on Detachment Fallbrook include the federally endangered least Bell's vireo (*Vireo belli pusillus*), southwestern willow flycatcher (*Empidonax traillii extimus*) and arroyo toad (*Anaxyrus californicus*) (the latter two species being almost exclusively associated with the Santa Margarita River). In addition to numerous migratory birds, several California species of special concern are also found in riparian habitat on Detachment Fallbrook, including western spadefoot (*Spea hammondii*), western pond turtle (*Actinemys [=Emys, Clemmys] marmorata*), yellow warbler (*Setophaga petechia*), and yellow-breasted chat (*Icteria virens*).

3.7.3.1 RIPARIAN SCRUB

On Detachment Fallbrook, two types of riparian scrubs are found: mule fat scrub and southern willow scrub. Scrub communities are typically found in areas within riparian systems that have frequent flooding. The vegetation is typically thick, but can be patchy, and it is found along stream edges. Willows (*Salix* sp.) and mule fat (*Baccharis salicifolia*) dominate the habitat. When the vegetation is thick, there is very little understory (Holland 1986).

Mule fat scrub, as the name implies, is dominated by mule fat and is usually found in intermittent stream channels with fairly coarse substrate and moderate depth to the water table and requires frequent flooding (Holland 1986). If frequent flooding does not occur, mule fat scrub commonly succeeds to cottonwood or sycamore dominated riparian forests or woodlands (Holland 1986).

Southern willow scrub is found on loose, sandy, or fine gravelly alluvium deposited near stream channels (Holland 1986). This habitat was once extensive along the major rivers of coastal southern California, but has been greatly reduced by urbanization, flood control, and streambed improvements (Holland 1986). Southern willow scrub is described as a dense, winter-deciduous community dominated by several willow species (*Salix* sp.), with sub-dominants such as mule fat that is often too dense to support a well-developed herbaceous understory (Holland 1986). Fremont cottonwoods (*Populus fremontii* ssp. *fremontii*) and western sycamores (*Platanus racemosa*) are scattered in this habitat.

3.7.3.2 RIPARIAN FORESTS

Three types of riparian forests are found on Detachment Fallbrook: southern arroyo willow riparian forest, southern coast live oak riparian forest, and southern riparian forest. Riparian forests are dense evergreen woody communities typically found in the bottomlands and outer floodplains of medium to larger streams (Holland 1986). Like southern willow scrub riparian forests are dense broadleaf winter-deciduous communities that support multiple canopy layers. Mature trees such as Fremont cottonwoods, western sycamores, and oaks (*Quercus* sp.) forming the upper canopy and willows, other shrubby species, and vines form the lower canopy layers (Holland 1986).

Southern arroyo willow riparian forest is dominated by willows with smaller willows and oaks in the understory (Holland 1986). Southern coast live oak riparian forest is found on fine-grained rich alluvium and is dominated by coast live oak (*Quercus agrifolia*) (Holland 1986), with associated species of willow. Southern riparian forest typically consists of a tall deciduous riparian trees with more of a mix of dominant species.

3.7.3.3 ALLUVIAL WOODLAND

Sycamore alluvial woodland is the one type of alluvial woodland is found on Detachment Fallbrook. Alluvial woodlands are open, winter-deciduous broadleafed riparian communities that have a well-spaced upper canopy of mature trees, a widely spaced middle canopy, and an understory of grasses (Holland 1986).

Sycamore alluvial woodland is dominated by well-spaced western sycamores (Holland 1986). Blue elderberry (*Sambucus nigra ssp. caerulea*) is widely spaced in the subcanopy and the understory is non-native grasses or mule fat (Holland 1986). It is typically found in the braided, depositional channels of intermittent streams, usually with cobbly or bouldery substrate (Holland 1986). High stream flow can damage or uproot woody species.

3.7.3.4 TRENDS IN RIPARIAN HABITAT QUALITY

Historical photos show that the riparian areas were significantly impacted from past land use, especially dryland farming. Aerial photos from 1928 show that almost no riparian vegetation existed within the current boundaries of Detachment Fallbrook (Photo 19; Kellogg & Kellogg 1990). More contemporary land management has resulted in improvements of the riparian corridors in recent decades. However, the legacy of impacts is still visible today, such as the greatly incised stream channels that are incapable of supporting wide riparian corridors (Photos 18 and 19). Additional influences that have impacted riparian habitat, and have the potential to continue to impact riparian habitat if not well managed, are cattle grazing, exotic species, and fire.

Livestock grazing, if left unmanaged, can result in reduced understory biomass, reduced recruitment of overstory plant species, and altered bank topography and hydrologic cycles (Kauffman & Krueger 1984). It was noted in 1988 that cattle had "removed or substantially degraded shrubby vegetation at all but a few sites on Fallbrook Creek" (Kus 1988). Seasonal grazing was instituted between 1986 and 2005 specifically to improve riparian vegetation, and riparian fencing was constructed in 1995 to improve least Bell's vireo habitat (USDON 2003b, USDON 2016). In addition, the perimeter fencing, which is inset substantially from installation's northern boundary due to the steep terrain, prohibits cattle access to the Santa Margarita River. Within the interior of the installation, the fenced enclosures protect an estimated 35% of additional riparian habitat, including limited access to Depot Lake (see Map 2-3).

A study in the fall of 2002 (USDON 2003b) concluded that grazing impacts in the riparian vegetation appeared limited, except in a few noted places. However, subsequent observations bring this conclusion into question. There was no grazing on the installation between 2005 and 2010, and the riparian understory grew much denser during this period. Because there were also several above average rainfall years during this time, the increase in understory density is unlikely due entirely to the absence of cattle. However, after grazing resumed in the spring of 2010, there was gradual loss of understory structure. As the reduced understory also corresponded with lower rainfall levels, it is difficult to differentiate grazing and precipitation effects without an experimental framework (ICF 2016). Nonetheless, site specific observations of cattle impacts (e.g., gradual loss of habitat around nests being monitored within one season) and comparisons with cattle-excluded areas, suggest loss of riparian understory is at least partially, if not largely, attributable to cattle influences (ICF 2016). Balancing trade-offs between benefits to upland habitats and impacts to riparian habitats remains a conservation focus of the grazing program on Detachment Fallbrook.

Exotic species invasions can change the vegetation structure and composition of riparian communities. These changes in the structure, species composition, and function of the community may cause wildlife to decline both in abundance and diversity. Giant reed (*Arundo donax*), tamarisk (*Tamarix* sp.), pepper trees (*Schinus* spp.), and castor bean (*Ricinus communis*) exemplify problem exotic species in riparian systems on Detachment Fallbrook. The installation's weed control program targets these species for control. While populations of most of these species do not

typically change rapidly, castor bean has increased in density and extent following the Tomahawk Fire. Since treatment programs were initiated, the occurrence of tamarisk and pepper trees has been greatly reduced.

Fire is another major factor influencing riparian vegetation. The role of fire in California riparian woodlands is poorly understood. While the community itself is resistant to ignition, once a fire starts it can become intense and difficult to suppress. Post-fire survival is often high for the trees in these woodlands, and they may recover very slowly (O'Leary & Bredemeyer 2012). Riparian system dynamics are historically driven by flood disturbance which comes with high water availability that fosters recovery. A concern with fire driven disturbance is that if it comes during drought, sufficient moisture to support characteristic post flood succession will not be available. However, after the intense Gavilan Fire in 2002, which burned much of the Santa Margarita riparian woodlands, the riparian vegetation has recovered.

After the FY14 fires, many of the riparian areas on Detachment Fallbrook were heavily burned. The western portion of the Santa Margarita River was burned during the De Luz Fire (33 acres) and many of the drainages in the interior of the Detachment were burned during the Tomahawk Fire (256 acres). The fire killed all the aboveground biomass but vegetation woody plants were sprouting from root crowns within a few months. The riparian areas have high potential for recovery from the fire; however, based on water availability some drainages will likely recover more rapidly than others. Fallbrook Creek is fed from water from the town of Fallbrook. This creek has high potential for recovery. Drainages that feed into Depot Lake are not replenished with water from Fallbrook and these will stay dryer longer. Thus recovery is expected to be slower.

3.7.4 Open Water and Freshwater Marsh

Open water and wetlands provide many vital ecological functions and support a high diversity of resident and migratory wildlife species. For regulatory purposes under the Clean Water Act, the term wetlands means "those areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas" (40 CFR 230.3(t)). Wetlands regulated under the Clean Water Act are commonly referred to as jurisdictional wetlands and must meet specific criteria for vegetation, soils, and hydrology (USACOE 2008).

Wetlands provide high levels of ecosystem services and are among the most impacted habitats in the world. Some important functions include water quality enhancement, flood control, nutrient cycling, sediment capture, nutrient and sediment filtering, groundwater recharge, and corridors for wildlife. In addition, freshwater marshes are essential to migrating birds and other wildlife. As the focal point of the fluvial system, high quality wetland and water habitat will support wildlife numbers and diversity across a landscape far beyond its borders.

Many of the riparian areas associated with the river, streams, tributaries, and ponds on the Detachment are also jurisdictional wetlands (Map 3-7). Wetlands can be intermittent or ephemeral and are occasionally isolated from, or not directly connected to, a stream or tributary (e.g., vernal pools). Several small ponds are scattered throughout Detachment Fallbrook with two largest being Depot and Lower Lakes (Photos 25 and 26). The ponds in general have gradually reduced in size or no longer hold standing water because of sedimentation or breaching of dams. Some have been colonized by willows along their margins.

The majority of the ponds at Detachment Fallbrook are of manmade origins, impoundments built in the early 1900s as part of the original Santa Margarita Rancho for livestock grazing. Although none of the old concrete water troughs from that era are operational, some have dates carved in them from the 1936-39 period. While many of the old stock ponds still serve as water sources for the

grazing program, no new stock ponds have been built since the 1970s. Historically, pumped well water supplemented some of the cattle water sources. Currently, three water troughs connected to the potable water distribution lines supplement water sources in Pastures 2 and 3, see USDON (2016).

Sensitive species associated with the larger ponds habitats at Detachment Fallbrook include Clark's marsh wren (*Cistothorus palustris clarkae*) and western pond turtles. Clark's marsh wren are known to occur at Depot and Lower Lakes, and western pond turtles are known to occur in Depot Lake and Lower Lake and along Fallbrook Creek.

3.7.4.1 DEPOT LAKE

The largest water impoundment, Depot Lake, was created at some point between 1944 and 1946, most likely as a cattle watering source, and today covers two to 12 acres, depending on the water level (Photo 25). During extended drought periods, Depot Lake has gone completely dry. Depot Lake was heavily utilized as a stock-pond for cattle grazing until approximately 1994, when cattle use was restricted to one month per year (USDON 2016). The lake also served as a recreational site for boating, fishing, and occasional camp grounds for Boy Scouts until those activities were halted in 2004. Depot Lake has historically served and currently still serves as a wildlife pond and wildland fire-fighting water source in which water is pulled from the lake by helicopters either via bucket or hose apparatus. The area around Depot Lake has burned twice since 2000, in the 2002 Gavilan and 2014 Tomahawk wildfires, and possibly during earlier wildfires. During peak rain years, various types of debris have washed into Depot Lake, including a large dumpster that was likely deposited during high flows in 2004-2005.

During the Navy's Installation Restoration/Munitions Response Program (IRP/MRP) Preliminary Assessment (PA; Malcolm Pirnie 2006), the lake was identified as a potential site for munitions dumping and is now included in the IRP/MRP as UXO Site 6. Although the site is considered relatively low risk for potential unexploded ordnance, the lake remains off limits for recreational use and allows only limited access for authorized use. In 2010, the lake was authorized by the AMHAZ board for limited use by the cattle grazing program, under certain conditions to include high water levels.

Photo 25. Depot Lake in 2008 (below) and following drought and fire in May 2014 (above). (Photos by C.M. Wolf)

Photo 26. Lower Lake in 2011 (top), after the Tomahawk Fire in 2014 (middle), and recovering in 2016 (bottom). (Photos by C.M. Wolf)

3.7.4.2 LOWER LAKE

Created around the mid-1950s, Lower Lake is very similar to Depot Lake in that it is also man-made, has been used as a cattle and wildlife water source since its inception, and has historically served as a recreational site for boating, fishing, and occasional camp grounds for Boy Scouts (Photo 26). Likewise, Lower Lake has historically and currently serves as a wildland fire-fighting source in which water is pulled from the lake by helicopters either via bucket or hose apparatus.

The lake water depth fluctuates with the season with severe lows documented in the late summer and fall. During extended drought periods, Lower Lake has gone completely dry. The average high water mark occurs at approximately three acres. Lower Lake is fed by tributaries that originate in the unincorporated village of Fallbrook. The village of Fallbrook is a known pollution source that has contributed metal debris into the riparian system including shopping carts, mattress springs, metal canisters, and pipes. Prior to the 2014 Tomahawk fire, Lower Lake was not documented to have burned since a fire in 1969. Due to its inclusion in the IRP/MRP, Lower Lake was fenced off in 2009 and use by cattle is restricted to certain conditions, including only during high water levels. Lower Lake is also included in the Navy's IRP/MRP as UXO Site 7.

3.7.4.3 VERNAL POOLS

Vernal pools are unique wetlands found in only a few regions of the world. They are found in generally flat areas over some form of impermeable soil or rock layer that severely restricts drainage. They collect rain water in winter and spring, and gradually dry out through early summer. Various plants, amphibians, and crustaceans have become specifically adapted to these ephemeral wetlands, and depend on them for survival. In San Diego County, 95–97% of the vernal pools that historically occurred have been lost due to development (Bauder & McMillan 1998). Vernal pools were formerly regulated by the U.S. Army Corps of Engineers (USACOE) under Section 404 of the CWA, but following a recent court case "Solid Waste Agency of Northern Cook County (SWANCC) v. USACOE" (No. 99-1178 [January 9, 2001]), vernal pools require evaluation to determine if they are connected to other Waters of the U.S. Vernal pools may also be protected under the Endangered Species Act (ESA) if they contain federally listed species. It is unlikely that any Detachment Fallbrook pools are afforded protection by the USACOE, based on the soils in the area.

Detachment Fallbrook soils generally are not conducive to vernal pool establishment because most do not contain subsurface hardpans. Historically, one set of two small vernal pools has long been identified and is fenced to exclude cattle. In work conducted during the winter-spring of 2002-2003 and 2004-2005 to determine the presence or absence of the federally listed species associated with vernal pools, a total of 35 pools or ephemeral basins were identified (Cobb 2009, Map 3-7). Due to the above-average rainfall years, many of the adjacent basins merged into approximately 15 larger pools during the survey. Most of the basins/pools were artificially created from tire ruts, heavy equipment use, or road construction, and are generally highly disturbed with low biodiversity. The origin of the pools is fairly evident from past and current aerial photographs and in-field observations of land use (e.g., dip between magazine and road contouring, dozed stockpond for cattle). The old borrow pit area northeast of Depot Lake is an example of a formerly heavily disturbed area that now ponds water during spring and mimics a vernal pool.

Vernal pools can support several sensitive vernal pool plants, federally listed fairy shrimp, including the endangered San Diego fairy shrimp (*Branchinecta sandiegoensis*) and Riverside fairy shrimp (*Streptocephalus woottoni*). One sensitive plant that is associated with vernal pools has been detected at Detachment Fallbrook: vernal barley (*Hordeum intercedens*), a California Rare Plant Rank (CRPR) List 3.2 species (TDI 2007). No federally listed fairy shrimp have been found on Detachment Fallbrook; only the common Lindahl's fairy shrimp (*Brachinecta lindahli*) was found during the fairy shrimp survey by Cobb (2009). A protocol survey for listed fairy shrimp consisted of two wet seasons at the time the Detachment's surveys were conducted (Cobb 2009).

(The current USFWS protocol for fairy shrimp surveys requires a wet and dry season sampling.) The surveys conducted at the Detachment established the absence of federally listed brachiopods from the pools surveyed (Cobb 2009); however, these results are usually pertinent to project disturbance types of survey efforts are considered valid for approximately five years. The only sensitive vertebrate species that may be dependent upon vernal pools to complete their life cycle is western spadefoot. This species is known to occur in ponded water on Detachment Fallbrook.

3.7.4.4 WATERS OF THE U.S. AND JURISDICTIONAL WETLANDS

Under Section 404 of the CWA, the USACOE regulates the discharge of dredged or fill material into waters of the United States, including wetlands (33 CFR 320.3(f)). At 33 CFR 328.3, waters of the U.S. are defined as:

(1) All waters which are currently used, or were used in the past, or may be susceptible to use in interstate or foreign commerce…;

(2) All interstate waters including interstate wetlands;

(3) All other waters such as intrastate lakes, rivers, streams (including intermittent streams)… the use, degradation or destruction of which could affect interstate or foreign commerce…;

(4) All impoundments of waters otherwise defined as waters of the United States under the definition; and

(5) Tributaries of waters defined in paragraphs (a) (1)–(4) of this section.

(6) The territorial seas;

(7) Wetlands adjacent to waters (other than waters that are themselves wetlands) identified in paragraphs (a)(1) through (6) of this section.

The limits of USACOE jurisdiction in non-tidal waters of the U.S. extend laterally to the ordinary high water mark (OHWM) or beyond the OHWM to the limit of any adjacent wetlands, if present (33 CFR 328.4). The OHWM is defined as "that line on the shore established by the fluctuations of water and indicated by physical characteristics such as a clear natural line impressed on the bank, shelving, changes in the character of soil, destruction of terrestrial vegetation, the presence of litter and debris, or other appropriate means that consider the characteristics of the surrounding area" (33 CFR 328.3). In the absence of adjacent wetlands, USACOE jurisdiction in non-tidal waters of the U.S. ends where the OHWM is no longer visible, typically outside of the active channel.

Wetlands are a sub-set of waters of the U.S. and are considered a special aquatic site, as defined at 40 CFR 230.41. Wetlands are delineated using a three parameter approach as described in the 2008 Arid West Supplement to the 1987 Corps of Engineers Wetland Delineation Manual (USACOE 2008). The three parameters that define a wetland under the 2008 Arid West Supplement consist of:

(1) A predominance of hydric vegetation: there must be a prevalence of vegetation adapted to saturated soils

(2) Hydric soils: there must be an soil that is saturated, flooded or ponded during the growing season long enough to create anaerobic soil conditions

(3) Hydrology: there must be evidence of permanent or periodic inundation to shallow levels under normal circumstances.

Due to variations in regional environmental conditions, the USACOE has created the Regional Supplements to the Corps of Engineers Wetland Delineation Manual (USACOE 2008). The criteria

and guidelines in the Arid West Region (Version 2.0) are used to conduct all wetland jurisdictional delineations within this region.

Recent case law, such as Riverside Bayview Homes, SWANCC and Rapanos/Carabell, have added nuances to assessing USACOE jurisdiction, particularly where wetlands, depressional, and/or ephemeral resources are concerned. The USACOE has recently published the "Clean Water Act Rule: Definition of Waters of the United States" in the Federal Register. The new definition of waters of the U.S. provides guidance on these issues and will go into effect on August 28, 2015.

A stationwide wetland delineation focused on determining jurisdiction of water of the U.S. was conducted in 1996 and is now out of date with respect to current regulatory determinations; however, many of the areas that were delineated as jurisdictional wetlands are still likely jurisdictional (see TDS 1996). In general, the Santa Margarita River and its tributaries, including Fallbrook Creek, and the headwaters of Pilgrim Creek, and their associated wetlands are considered jurisdictional or potentially jurisdictional (Map 3-7).

3.7.5 Oak Woodland

Oak woodland communities generally occur on north facing slopes and in shaded ravines where there is ample moisture. At Detachment Fallbrook, oak woodlands are especially common in drainages and on slopes in the Santa Margarita River watershed (Photo 27). The dominant tree in oak woodlands is coast live oak, but Engelmann oak (*Q. engelmannii*), which is a CRPR list 4.2 species, is also found on the Detachment. Other component species include toyon (*Heteromeles arbutifolia*), laurel sumac, blue elderberry, poison oak (*Toxicodendron diversilobum*), and grasses in the understory.

Photo 27. Oak Woodland with adjacent southern willow scrub. (Photo by B.E. Kus)

Oak woodlands are a unique resource that provide habitat for a suite a wildlife species. Statewide, over 330 species of birds, mammals, and reptiles utilize oak woodlands (Ohmann & Mayer 1987). Wildlife species that use this habitat include California species of special concern such as the western spadefoot, orange-throated whiptail, and yellow warbler. Oaks may be the single most important tree for wildlife food and cover statewide. Engelmann oak can be a part of these woodlands but less abundant than coast live oak. While Engelmann oak is the rarer of the two species, competitive interactions between them could be drastically altered over the range of the species by a relatively new invasive species, the goldspotted oak borer (GSOB, *Agrilus coxalis*). Because the GSOB kills adult coast live oak but not Engelmann oak, it is conceivable that Engelmann oak could increase in density in mixed stands as canopy gaps open.

Because oak species are long lived, demographic patterns of reproduction, recruitment, and death can play out over periods longer than typical management horizons – well beyond an individual manager's career. Concern has long been expressed that recruitment rates in California's oak woodlands are low (Muick & Bartolome 1987, Grunzweig et al. 2008) and that existing recruitment may be insufficient to maintain stand structure and density. However, this assertion is typically inferred from short-term studies and stand structure snap shots. Long-term studies at MCB Camp Pendleton have shown that, in contrast to fears over insufficient recruitment to maintain stand density and extent for many California oaks, a pulse of recruitment has moved

through the woodlands on MCB Camp Pendleton over the past 24 years – resulting in an increase in the number of larger individuals (those with a maximum stem diameter at the base of between 3.2 and 51.2 centimeters [cm]) (Lawson 2015). The largest oaks (up to 135 cm) on MCB Camp Pendleton appear to be holding steady with a balance between mortality and recruitment, and with the largest individuals increasing in size. During the same time period, the number of the smallest individuals (those with a maximum stem diameter less than 0.3 cm at the base) fluctuated widely, apparently driven by rainfall. Oak reproduction is episodic and patchy and these large fluctuations, which occur both spatially and temporally, are likely to be the basis of the concerns over low recruitment rates (Lawson 2015).

The oak woodlands on neighboring MCB Camp Pendleton occur in two elevational bands – from approximately 125 to 225 m and from approximately 650 to 800 m (Lawson 1993). The woodlands at Detachment Fallbrook would correspond to the low elevation woodlands. Although oaks are generally well adapted to wildland fire (e.g., Holmes et al. 2008), there is some evidence that low elevation woodlands may not recover as well from severe fire as high elevation woodlands (Lawson 2015). Of particular concern is that recruitment of large sapling and small adult (up to 25.6 cm stem diameter) size classes may not be sufficient at low elevations to compensate for mortality associated with the most severe fires (Lawson 2015).

Oak recruitment is also potentially threatened by invasive plants and cattle grazing. In the early 2000s, there was a concerted effort to remove a population of exotic Peruvian pepper trees (USDON 2005b) that had invaded the oak woodlands, especially along a tributary to Fallbrook Creek (RECON 1996). Today, pepper trees are much less common and are kept in check as part of the general invasive species removal program.

Oak woodlands are subject to recruitment impacts from grazing, but this has not been documented as a significant problem at Detachment Fallbrook. Surveys of oaks within grazed pastures have found abundant oak seedlings and saplings that varied in size, indicating recruitment over time (Lawson 2016; TDI 2007). Studies in the literature, on the other hand, have shown that cattle can significantly reduce the recruitment of young seedlings in a population (Lathrop & Osborne 1990, Lopez-Sanchez et al. 2014). This could suggest that cattle grazing on Detachment Fallbrook may have a similar negative impact on the recruitment of young oaks despite the fact that recruitment has been evident. However, as oaks are such long-lived species, relatively low recruitment rates are sufficient to maintain stand structure and density over time. In other words, if more than one recruit per mature tree reaches maturity in the estimated 200-300 year life span of an oak, the population would increase. Recruitment is also affected by other acorn and sapling browsers, or by high-intensity fires.

3.7.6 Grassland

As is typical of grasslands throughout California, the majority of the grasslands at Detachment Fallbrook are composed of non-native annuals such as several species of brome (*Bromus* spp.), wild oats (*Avena* spp.), and rattail fescue (*Festuca myuros*), and annual and perennial forbs (Photo 28). Detachment Fallbrook grasslands typically have relatively low biomass as a result of grazing. Likely influenced by grazing, but especially in drier years (see below for the influence of weather), the forb filaree (*Erodium* sp.) is particularly common. Native perennial grasses (e.g., *Stipa* spp.) are generally much less prevalent, but they do exist at varying densities on the installation and are not well captured in existing vegetation maps (the apparent underrepresentation of native grasses in vegetation maps was noted during LTETM sampling in 1995, SDSU 1996).

Photo 28. Annual exotic dominated grasslands, May 2008. (Photo by C.M. Wolf)

Variation, both spatial and temporal, within grasslands (production, species composition, etc.) is influenced by a several environmental factors, including: differences in precipitation, temperature, soil characteristics, and residual dry matter (RDM) (e.g., Bentley & Talbot 1951, Pitt & Heady 1978). In general, certain patterns of temperature and precipitation (typically colder, wetter) can cause a "grass year," or a prevalence of annual grasses, whereas other patterns (hotter, drier) can favor a prevalence of forbs, such as *Erodium* spp., and even perennial grasses (e.g., Pitt & Heady 1978, Dudney et al. 2014). Grassland community composition is also influenced by lagged effects of past weather (e.g., the influence of prior year seedbank, mulch) (Dudney et al. 2014).

There are basic differences in attributes between the native bunchgrasses and non-native annuals. The perennials green up first and stay green later than the annual grasses, and thus provide a longer gazing season. Perennial grasses are deep-rooted compared to annuals, and may provide superior erosion control; however, the faster growing annuals produce biomass that protects the soil surface more quickly. The lack of carryover of annual grass seed from year to year creates a situation where the annual mulch levels left behind each season can control next year's grassland composition. The abundant mulch produced by non-native grasses excludes light to the soil surface and also cools the soil surface (Evans & Young 1972) so that the cooler-season non-natives get a head start on germination, which is essential to their competitive advantage (Young et al. 1970). High-density grasses such as rattail fescue and soft brome (*Bromus hordeaceus* ssp. *mollis*) tend to out-compete purple needlegrass (*Stipa pulchra*) more than other *Stipa* sp. (Bartolome & Gemmill 1981). Native perennial grasses compete well against non-native annuals in years of poor seed production or after a fire (Bartolome 1979, Young et al. 1981).

Heady (1956, in Barbour & Major 1977) argued that fire has only a temporary effect on species composition within grasslands, and original species composition is quickly restored. Needlegrass stands have been shown to benefit from fire due to removal of thatch that obstructs light from the grass bunches, increased tillering and increased seed weight (Menke 1992). On MCB Camp Pendleton, Kellogg and Kellogg (1990) have shown that perennial grasses dominate in all areas that have had even a single historical fire and that show no evidence of past cultivation. Assuming an influence from past cultivation, however, Detachment Fallbrook's grasslands may not exhibit the same post-fire response. Based on 1938 aerial photos and other records, areas on Detachment

Fallbrook currently dominated by annual grasslands were dry-farmed for grain in the late 1800s continuing to the late 1930s (Photos 3 and 4).

A disturbance such as grazing can have both positive and negative effects on conservation of different native plant guilds, and even different species within a guild (Hayes & Holl 2003). Hayes and Holl (2003) conducted a study where they used paired grazed and ungrazed plots, native annual forb species richness and cover were higher in grazed sites as mulch and litter layers were opened up, but exotic annual grasses and forbs were also higher in grazed sites. Native grass cover and species richness did not differ between grazed and ungrazed sites, but cover and richness of native perennial forbs was higher in ungrazed sites. Livestock grazing can be an important strategy for maintaining and increasing native annual forbs, but it also can have negative effects on native perennial forbs. Grazing regimen, especially seasonal timing, can also have a significant influence on vegetation. For example, cattle grazing in winter and spring can benefit native bunchgrasses by controlling mulch, and helping to shift the balance towards more native species in the grassland areas (Talbot et al. 1939; Heady 1956; Menke 1989), as long as natives are already present to respond.

Although there may be ways to help favor native perennials or reduce the effects of exotic grasses, exotic annual grasses are likely to persist. Nonetheless, there are certain exotic invasive species in grasslands that the Navy has sought to control or eradicate over the years. In the mid-1990s, grasslands, as well as coastal sage scrub, on the Detachment were becoming invaded by the non-native bridal veil broom (*Genista [=Retama] monosperma*) (p. 8, RECON 1996). Aggressive weed control for this exotic shrub has since significantly reduced its occurrence, although it is still a problematic invasive species and continues to be treated annually. Following the discovery of a patch of barbed goatgrass (*Aegilops triuncialis*) during a rare plant survey (TDI 2007), an extensive eradication program was implemented for this annual exotic grass that exhibits seed dormancy (Lawson et al. 2012, and annual weed reports). Should no new barbed goatgrass plants be discovered during annual vigilance surveys, this noxious weed is expected to be eradicated from the installation by approximately 2018. (See Section 3.8.3 and 4.15 for exotic plant control.)

Open-structured grasslands can be habitat for the federally endangered Stephens' kangaroo rat (*Dipodomys stephensi*). However, other native grassland species, including the grasshopper sparrow (*Ammodramus savannarum*), require much denser cover of grasses and forbs than Stephens' kangaroo rat. Other sensitive species documented on Detachment Fallbrook that use grasslands for foraging and potentially nesting are white-tailed kite (*Elanus leucurus),* a California fully protected species, and northern harrier (*Circus cyaneus*), loggerhead shrike (*Lanius ludovicianus*) and burrowing owl (*Athene cunicularia*), all California species of special concern. Annual grassland is also an important habitat for bats, rodents, and consequently rodent predators.

3.7.7 Eucalyptus

Eucalyptus (*Eucalyptus* sp.) trees, which are native to Australia, were often planted by early settlers for windbreaks or hardwood production. On the Detachment, Eucalyptus had been planted around the (former) living quarters, administrative complex, and Facilities Department complex. A large grove of Eucalyptus was planted southeast of the former housing area. And a small grove, which was presumably planted, occurs on top of IRP Site 27, the location of an old landfill. Eucalyptus trees appear to be establishing in in some riparian drainages.

Trees in the Eucalyptus genus, of which there are many species, grow quickly and prohibit understory growth through allelopathic chemicals in the leaf litter. Native to Australia, the genus is adapted to an environment of frequent fires and recovers quickly from disturbance (McArthur 1962). Eucalyptus, once established, will exclude most other plant species and tends to be a relatively "sterile" environment where even common rodents are scarce (McArthur 1962; Smith 1976).

Some migratory birds use eucalyptus trees as a nectar source, perhaps to their detriment (Williams 2002). In its native environment, Australian leaf gleaners have long bills that are well adapted to the sticky gum produced by the tree's flowers. However, the North American leaf gleaners such as kinglets, vireos, and warblers do not possess bills that are sufficiently long enough to manage the gum. Consequently, it clogs their faces, bills, and nares, eventually suffocating them or causing them to starve. In addition, eucalyptus may be creating sink populations for some species that breed in them. The Point Reyes Bird Observatory found that 50 percent of Anna's hummingbird (*Calypte anna*) nests in eucalyptus are shaken out by the wind, compared to 10% in native vegetation. Overall, species diversity may drop by at least 70% within eucalyptus forests (Williams 2002).

The eucalyptus forest near the former Housing Area contains about 7,000 trees consisting of eight species of eucalyptus (Map 3-5). The trees were planted by the Navy back in the early 1980s as a silvaculture project, which never came to fruition. A drip system had been installed; however, it was disconnected in 1998. The grove is eventually slated for removal. The Fire Department considers eucalyptus trees a fire hazard because they "candle" in a fire, meaning they burn easily with high intensities.

Following the Tomahawk Fire, several thousand trees, most of which were Eucalyptus and less than ten inches in diameter, were removed from around power lines as a preventative measure to reduce future fire risks. During this period, a large stand of Eucalyptus trees south of the Administrative Area was removed both by the Navy and, on the other side of the fence, by the Fallbrook Public Utilities District. A single large Eucalyptus tree that has the base of its trunk on the FPUD side of the fence was not felled because it has an active red-tailed hawk nest.

No sensitive plant species are found in eucalyptus forests but sensitive wildlife use these forests. Eucalyptus trees are used by raptors for roosting, nesting, and perching. Long-eared owls (*Asio otus*), a California species of special concern, have been observed there (R. Knight, pers. comm). Red-shouldered hawks (*Buteo lineatus*) and red-tailed hawks (*Buteo jamaicensis*) perch in the tree tops and search for prey in the surrounding shrublands and grasslands. Pellets from barn owls (*Tyto alba*) and great horned owls (*Bubo virginianus*) can be found below roosting locations.

3.7.8 Disturbed Areas

Disturbed communities comprise small grassy or ruderal habitat or landscaped areas between buildings in the developed enclaves, along roads, within firebreaks, or other areas with less than 10% vegetation cover. Some sensitive species that may be occasionally found in disturbed areas are the western spadefoot, orange-throated whiptail, red diamond rattlesnake, loggerhead shrike, and yellow warbler, although this is not the preferred habitat for any of these California species of special concern. Stephens' kangaroo rats are known to occur in disturbed areas.

3.8 PLANT SPECIES

3.8.1 Plant Diversity

At last count, approximately 600 plant species have been documented on Detachment Fallbrook (Table 3-7, Appendix J). The majority of plant species are classified as native; however, approximately 30% are non-native (Table 3-7; see Appendix J for California Invasive Plant Council rankings). Appendix J identifies which species have voucher specimens on file and which species are on the Detachment Fallbrook Watch List because more information (e.g., confirmation of presence) is needed.

Plant nomenclature generally follows the second edition of The Jepson Manual (Baldwin et al. 2012), often referred to as "Jepson 2". For some species, the Jepson Online Interchange for California Floristics (http://ucjeps.berkeley.edu/interchange.html) or the "Checklist to the Vascular Plants of San Diego County" (Rebman & Simpson 2014) was used to capture more currently accepted scientific names. Appendix J provides synonyms for nomenclature that has changed or may be in the process of changing.

Table 3-7. Summary of plant species documented on Detachment Fallbrook.

Category [a]	Number of Plant Species	Percent of Total
Federally Listed Threatened or Endangered	0	0%
Federally Listed Candidate	0	0%
State Listed Threatened or Endangered	0	0%
State Listed Rare	1	0.2%
California Rare Plant Rank (CRPR) [b]	11	2%
Native Species	414	69%
Non-native Species [c]	183	31%
Total Number of Species [a, c]	597	

[a] Note: there is overlap between categories.

[b] California Native Plant Society rare plant rank (www.rareplants.cnps.org); see Table 3-8 for list of species.

[c] Does not include two extirpated species (artichoke thistle and pampas grass).

3.8.2 Rare and Sensitive Plants

Special status and rare plant species documented on Detachment Fallbrook are listed in Table 3-8 and Appendix J. To date, there have been no observations of federally- or state-listed threatened or endangered plants.

In general, there has been a relative deficiency of rare plant occurrences on Detachment Fallbrook than expected by surveyors (e.g., TDI 2007). TDI (2007) surmised that this may be due, in part, to the different soil types on the installation (e.g., more loamy versus clayey) and the historic dryland farming. The most common rare plant on Detachment Fallbrook is the Engelmann oak (*Quercus engelmannii*, Photo 29), which has a CRPR rank of 4.2 and predominantly occurs along a few drainages in the northeastern corner of the installation with a few smaller stands or scattered individuals along the northern perimeter (TDI 2007, 2013b).

Table 3-8. Special status plant species documented on Detachment Fallbrook

Scientific Name	Common Name	Listing Status*
Bahiopsis laciniata	San Diego County viguiera	CRPR 4.2
Deinandra paniculata	San Diego tarplant	CRPR 4.2
Microseris douglasii ssp. platycarpha	Small-flowered microseris	CRPR 4.2
Pseudognaphalium leucocephalum	White rabbit-tobacco	CRPR 2B.2
Harpagonella palmeri	Palmer's grappling hook	CRPR 4.2
Quercus engelmannii	Engelmann oak	CRPR 4.2
Juglans californica	Southern California black walnut	CRPR 4.2
Sidalcea hickmanii ssp. parishii	Parish's checkerbloom	SR, CRPR 1B.2
Camissoniopsis lewisii	Lewis' evening primrose	CRPR 3
Polygala cornuta var. *fishiae*	Fish's milkwort	CRPR 4.3
Hordeum intercedens	Vernal barley	CRPR 3.2

*** SR = State Rare**

California Rare Plant Rank (CRPR):
1A. Presumed extinct in California
1B. Rare or Endangered in California and elsewhere
2. Rare or Endangered in California, more common elsewhere
3. Plants for which we need more information - Review list
4. Plants of limited distribution - Watch list

CRPR Threat Ranks
.1 - Seriously endangered in California
.2 – Fairly endangered in California
.3 – Not very endangered in California

Photo 29. Engelmann oak. (Photo by TDI 2013b)

An older plant list for the Detachment had identified Payson's jewel flower (*Caulanthus simulans*), a CNPS List 4.2 species, as having been documented by Dudek and Associates (1995) from a single population along the west side of River Road about 0.5 miles north of the southern end. Voucher specimens had even been included in the installation's herbarium from this same survey. However, upon closer examination of the original documentation by Dudek and Associates (1995), it appears that the plant identification at the time was changed from *C. simulans* to the congeneric *C. heterophyllus* var. *pseudosimulans*, which was later considered by CNPS but rejected for a rare plant ranking. In the 2005-2006 rare plant survey, only *C. heterophyllus* var. *heterophyllus* were documented in the same River Road location (TDI 2007), so it is even possible the *C. heterophyllus* var. *pseudosimulans* in 1996 may have been *C. heterophyllus* var. *heterophyllus.* Regardless, neither is listed as a rare plant in California. Payson's jewelflower (*C. simulans*) has been removed from the inventory of plants on the Detachment (Appendix J).

Two other rare plants, Coulter's saltbush (*Atriplex coulteri*) and Nevin's gilia (*Gilia nevinii*), which are CNPS List 1B and 4.3 species, respectively, also appeared on some historical plant lists for Detachment Fallbrook. However, there is no documentation of these species ever having been actually observed on the installation (no surveys and no herbarium specimens). Moreover, neither species is recorded in the California Natural Diversity Data Base (CNDDB) for quads that include

the installation. As the origin of these species on the historical plant list is unknown and cannot be verified, they has been removed from the list of species identified on the installation, however, they have been added to the watch list (Appendix J).

All rare plant survey efforts on the Detachment have been initiated with a list of special-status focal species with the potential to occur in the area. Although any rare plant observed during a survey effort is to be documented, the preliminary list of special-status focal species helps ensure that certain species are not overlooked and that the timing of surveys provides for an optimal detection opportunity. Starting with the 2015 rare plant survey (NOREAS 2016), additional documentation (e.g., photo, global positioning system [GPS] point, voucher specimen) is required for observations of any watch list species, regardless of whether it is a rare plant, and for any species that is new to the installation's inventory (Appendix J).

Stationwide rare plant surveys do not provide the same survey coverage as project level (site specific) surveys. In recent years, rare plant surveys have focused on subareas of the installation to improve survey coverage while remaining cost-effective; however, this means that only portions of the installation are covered in a given survey year. Rare plant surveys in 2005-2006 (TDI 2007), 2010-2011 (TDI 2013b), and 2015 (NOREAS 2016), for example, each covered 4,000, 2,000, and 4,000 acres, respectively. Since 2010, GPS track log data have provided additional documentation of survey coverage by recording individual surveyor routes. Occasionally, project level surveys further augment the installation's inventory of rare plant survey coverage, e.g. *Brodiaea filifolia* survey for the SMR CUP pipeline (HDR 2015).

3.8.3 Invasive Plants

Invasive plant species are considered the second greatest threat to the world's biological diversity after direct habitat loss and fragmentation (Cal-IPC 2015). An invasive plant is one that dominates an area, outcompeting native plants and impairing the structure and function of the ecosystem. Invasive species are defined in EO 13112 as "an alien species whose introduction does or is likely to cause economic or environmental harm or harm to human health." Alien species, commonly referred to as exotic or non-native species, are typically defined as not native to a specific region or ecosystem. Other terms used to describe invasive plants of management concern include weeds, pest plants, and noxious plants. In California, exotic species are those introduced after European contact and as a direct or indirect result of human activity (Cal-IPC 2015).

Exotic plants are not always invasive; however, it is not always possible to determine how invasive a plant may become when first introduced to a region. Exotic plants often have a lag phase where populations do not grow and spread rapidly before they become invasive (Crooks 2005, Simberloff 2009, Sakai et al. 2001). A lag phase can be defined as the period between the time a plant establishes in natural habitats and before it begins to spread rapidly and become invasive. Lags can be phenomena related to the mechanics of exponential growth, to evolutionary changes a species undergoes in the new habitat that make it invasive, or to changes in the environment that ultimately make it more competitive (e.g., climate change). Two things happen as a result of lags: (1) the risk of an exotic plant can be underestimated and (2) there can be time to eradicate a species before it becomes widely naturalized. To take full advantage of the lag period a precautionary approach whereby all new or localized exotics are considered potentially invasive and controlled as funding permits.

Invasive weeds can pose a serious long-term threat to many habitats found on Detachment Fallbrook. They can potentially change ecological processes such as soil chemistry, hydrology, and fire regimes. Introduced weeds can affect soil nitrogen cycling, out-compete natives for water or physically alter hydrological flow patterns, and predispose an area to higher wildfire risk by providing fuel where there otherwise might not be enough to carry a fire. By outcompeting native

species, invasive plants can greatly reduce, fragment, or otherwise degrade wildlife habitat. Sensitive and declining wildlife and plants are particularly at risk from invasive plants.

Understanding the extent and potential risk of invasive plants at Detachment Fallbrook helps provide a context for management (Chapter 4). Weed risk assessments of varying levels of sophistication have been evaluated and it turns out that a documented history of a species invasiveness in similar climatic conditions is a successful predictor of invasiveness obviating the need for more intensive analytical approaches (Hulme 2012). Appendix J identifies plant species documented on the installation that are not native to the region and provides severity ratings for those species that have been evaluated by the California Invasive Plant Council (Cal-IPC). Although nearly 30% of the plant species on the installation are non-native (Table 3-7), the threats they pose to conservation targets vary greatly. Cal-IPC ratings are one means of determining the threats posed by an exotic plant. Factors considered in the Cal-IPC ranking of a species include potential severity of its ecological impact, its ability to invade natural vegetation communities, and current extent of its invasion. Cal-IPC does not consider feasibility of control in its ratings. One challenge with prioritizing invasive species is the uncertainty of effects of different environmental conditions, including potential future climate scenarios. Weeds that occur in low numbers and seem innocuous for years may expand their range dramatically and become a difficult pest under the right environmental conditions.

Certain invasive species have become widely naturalized and control is not feasible. This is the case with most annual exotic grasses, and forbs such vetch (*Vicia* sp.), filaree (*Erodium* sp.), and mustards (*Brassica* sp. and *Hirschfeldia incana*) also fall into this category. Although filaree is exotic and widespread on the installation, it is at least considered a good food source for Stephens' kangaroo rats and cattle. Mustards had not been very prevalent on the Detachment until 2015. Following the FY14 fires and record drought, the mustard population appears to have expanded extensively.

Many of the invasive plant species targeted for control on the Detachment (e.g., giant reed [*Arundo donax*], fennel [*Foeniculum vulgare*], fountain grass [*Pennisetum setaceum*], pepper tree [*Schinus* sp.], and tamarisk [*Tamarix* sp.]) are being maintained at relatively low levels of infestation. While cattle grazing can exacerbate certain weed risks, it can also help reduce the impacts of some weedy species and is increasingly considered as a biological tool for weed management (e.g., Frost & Launchbaugh 2003, Christensen 2011, Germano et al. 2001). It is possible that fennel (*Foeniculum vulgare*) is less prevalent on the Detachment than neighboring MCB Camp Pendleton, in part, due to cattle grazing. However, a higher fire frequency also may explain much of the fennel on MCB Camp Pendleton. Although exotic annual grasses are still abundant, cattle grazing reduces their biomass to the benefit of at least some species, most notably the Stephens' kangaroo rat.

Over the years, the weed management program is responsible for the successful control or eradication of several invasive plant species. Pampas grass (*Cortaderia selloana*) and artichoke thistle (*Cynara cardunculus*) are considered to have been eradicated from the installation. Aggressive control measures in the 1990s and early 2000s greatly reduced giant reed and peppertree populations. These species occur at relatively low levels today. Castorbean (*Ricinus communis*) was also being maintained at relatively low numbers; however, this species exhibited pervasive seedling establishment after the FY14 wildland fires. Aggressive post-fire treatments and natural succession is anticipated to reduce castorbean in the next few years.

Prior to the invasion of bridal veil broom (*Genista monosperma*) on the Detachment, the species had not been documented as escaping cultivation in the region. Believed to have escaped from a nearby nursery, bridal veil broom was discovered on the installation circa 1990 in a few scattered patches (Cal-IPC 2014). By the time eradication measures were first implemented in 1996, the species had expanded to an area of approximately 2,000 acres (Cal-IPC 2014) and was described as "aggressively invading" coastal sage scrub (p. 8, RECON 1996). Today, bridal veil broom still

Photo 30. Barbed goatgrass. (Photo from SDNHM Plant Atlas)

persists throughout a large area of the installation, and is on neighboring MCB Camp Pendleton, but the population is not nearly as dense and the treated plants are much smaller in size. However, the long-term efficacy of bridal veil broom treatments was being undermined by off-site seed sources from neighboring properties in the town of Fallbrook. Through regional partnering efforts, the known locations in the vicinity of the Detachment are now under treatment (Agrichem 2015). It is possible the current distribution of bridal veil broom may make future eradication of this species difficult.

The exotic invasive barbed goatgrass (*Agilops triuncialis*, Photo 30) was discovered in a single location in the South Magazine during a rare plant survey in 2006 (TDI 2007). This noxious weed is widespread in northern California, but was not known to occur in southern California until its the discovery on the Detachment. The infestation site was estimated to cover approximately 1.6 acres when it first underwent treatment (Giessow et al. 2008). Following initial challenges with treatment efficacy, the eradication site grew to approximately 8 acres, which includes a buffer of the infestation area. However, barbed goatgrass is on target for eradication by around 2018 if not sooner (see Chapter 4). (Unfortunately, a new location was identified in southern California in 2015, at the Audubon Starr Ranch Sanctuary in Orange County; see www.Calflora.org.)

3.9 ANIMAL SPECIES

3.9.1 Animal Diversity

Of the nearly 600 animal species documented on Detachment Fallbrook, over 300 are vertebrates (Table 3-9; Appendix K). Although the invertebrates likely represent a much higher number of species, this is a poorly surveyed group; the number of documented invertebrates is expected to increase as surveys increase over time.

Table 3-9. Summary of animal species documented on Detachment Fallbrook.

Taxonomic Group	Documented Species (#)
Invertebrates [a]	281
Fish	13
Amphibian	8
Reptiles	27
Birds	205
Mammals	54

[a] Not a well surveyed group; incomplete representation of actual numbers.

Over 90% of the animal species documented on Detachment Fallbrook are native (Appendix K). Some animal species are resident year round, some are transients, and others are seasonal visitors, such as migratory birds. For its size, Detachment Fallbrook has a relatively diverse native wildlife community that is due, in part, to the protection of this federal land from development afforded by the military mission as well as to its continuity with open space on neighboring MCB Camp Pendleton, the Santa Margarita Ecological Reserve, and the Cleveland National Forest. These

adjoining properties provide landscape linkages and wildlife corridors that help buffer the resources at Detachment Fallbrook from isolation and other negative effects of regional urbanization. Many species at Detachment Fallbrook should be viewed as part of a larger population extending across MCB Camp Pendleton or throughout the Santa Margarita River corridor. Mountain lions (*Felis concolor*) and golden eagles (*Aquila chrysaetos*) are examples of wide-ranging species that use Detachment Fallbrook lands as part of much larger home ranges.

3.9.1.1 INVERTEBRATES

Invertebrates are among the most important components of a functioning ecosystem, however, they are the least studied group of animals on Detachment Fallbrook relative to their numbers. Although May (1988) estimates that invertebrates represent 97% of all animal species on earth, he points out that it is the 3% of the species with backbones (vertebrates) that receive a disproportionate amount of attention among professional taxonomists and systematists. Such taxonomic bias is not uncommon in scientific research, funding, and conservation (e.g., Czech & Krausman 2001, Clark & May 2002). Representing a vast array of species, including insects (bees, wasps, ants, beetles, butterflies, moths, etc.), crustaceans (fairy shrimp, crayfish, etc.), arachnids (spiders, scorpions), worms, snails, and the like, invertebrates are the primary prey item for many types of wildlife and are essential for the survival and reproduction of many plants (e.g., as pollinators, seed dispersers, predators on plant pests, soil aerators, and decomposers). Invertebrates are the largest, least documented, and the least understood group of animals on Detachment Fallbrook (Table 3-10).

Table 3-10. Summary of invertebrate species documented on Detachment Fallbrook.

Category [a]	Number of Invertebrate Species	Percent of Total
Federally Listed Threatened or Endangered	0	0%
Federally Listed Candidate	0	0%
Native Species	257	91%
Non-native Species	24	9%
Total Number of Invertebrate Species	281	
[a] Note: there is overlap between categories.		

For years, the understanding of invertebrate diversity on Detachment Fallbrook was limited to a few surveys that focused on certain taxonomic groups, extrapolation of general regional knowledge, and incidental and anecdotal observations. These include studies on ant and termite diversity and macro invertebrate sampling along the Santa Margarita River in the 1990s, and then fairy shrimp surveys in the 2000s. More recent studies in 2013 through 2015, are focused on providing baseline inventories of terrestrial invertebrates and aquatic macro invertebrates.

In the early 1990s, San Diego State University (SDSU) conducted a survey of ant and termite diversity on Detachment Fallbrook as part of an effort to identify San Diego horned lizard habitat (SDSU 1994). Results of the invertebrate surveys conducted in conjunction with lizard surveys revealed that the harvester (*Pheidole*, *Pogonomyrmex,* and *Messor* species) and southern fire ant (*Solenopsis xyloni*) populations (the main prey base for the San Diego horned lizard) on Detachment Fallbrook have been depleted due to the invasion of the Argentine ant (*Linepithema humile*) (K.R. Faulkner, pers. comm. and SDSU 1994 as cited in USDON 2006b). This is a trend that has been documented in the region (Suarez et al. 2000, Fischer et al. 2002).

As part of a habitat suitability study for the Southern California steelhead (*Oncorhynchus mykiss*), the U.S. Fish and Wildlife Service conducted macroinvertebrate sampling in the spring of 1997 along the Santa Margarita River, which included sampling sites just upstream and downstream of Detachment Fallbrook (USFWS 1998b). Their general findings were that the middle of the Santa Margarita River (downstream of Detachment Fallbrook) ranked relatively poorly in terms of macroinvertebrate taxonomic richness and diversity, and two sample sites just above Detachment Fallbrook showed slight improvement (USFWS 1998b). The results in the middle of the Santa Margarita River were "not unexpected [as] macroinvertebrate abundance is less in homogenous sand and silt substrates", whereas the improvement in macroinvertebrate composition upstream, "correlated strongly with the greater habitat complexity further upstream" (p. 78, USFWS 1998b).

An Anostracan (fairy shrimp) survey was conducted throughout Detachment Fallbrook during the wet seasons of 2002-2003 and 2004-2005 to investigate the potential presence of the federally endangered San Diego fairy shrimp and Riverside fairy shrimp (Cobb 2009). Although the non-listed Lindahl's fairy shrimp was confirmed in several vernal pools and ephemeral ponds on Detachment Fallbrook, no special-status fairy shrimp were identified (Cobb 2009).

In 2013, an aquatic invertebrate survey (Amec Foster Wheeler 2016) and a terrestrial invertebrate survey (Osborne Biological Consulting & Amec Foster Wheeler 2016) were initiated under the same contract. Due to drought conditions, the second year of the surveys was not conducted in 2014 as planned, but was completed in 2015 even though the drought continued.

The aquatic invertebrate survey emphasized benthic macroinvertebrates in the context of the Southern California Index of Biotic Integrity (SoCal IBI) and the California Stream Condition Index (CSCI). Results of the aquatic invertebrate survey generally rated "Poor" or "Very Poor" SoCal IBI scores, and "likely altered" and "very likely altered" on the CSCI scores, at the Detachment Fallbrook sampling sites. Although the extended drought that southern California has experienced over the past few years is expected to impact the benthic macroinvertebrates, the portions of the Santa Margarita River and Fallbrook Creek on the installation are considered waterbodies with significant upstream anthropogenic influence and the results were not atypical for ephemeral streams in the relatively urbanized landscape of coastal southern California. It does not appear that land use on the installation had a significant effect on stream conditions based on comparisons of upstream and downstream samples. Moreover, the FY14 also did not appear to have had much effect on the benthic community health (community condition scores actually increased slightly between 2013 and 2015, which could have been due to an increased nutrient load from the presence fine sediment arising from post-fire erosion). (Amec Foster Wheeler 2016)

The primary goal of the terrestrial invertebrate survey was to provide baseline survey data for invertebrate diversity at Detachment Fallbrook, with a focus on Lepidoptera (butterflies and moths), with an emphasis on the federally endangered Quino checkerspot butterfly (*Euphydryas editha quino*) and other special status Lepidopteran species. Although this extensive survey effort added nearly 200 invertebrate species to the Detachment's inventory (Appendix K), no special status Lepidoptera species were documented (Osborne Biological Consulting & Amec Foster Wheeler 2016).

A secondary goal of the terrestrial invertebrate survey was initially focused on early detection monitoring for the exotic invasive gold spotted oak borer (GSOB, *Agrilus auroguttatus*). However, with an increased awareness of expanding infestation of the invasive Kuroshio Shot Hole Borer (KSHB, *Euwallacea* sp.), and the closely related and morphologically identical Polyphagous Shot Hole Borer (PSHB, *Euwallacea* sp.), trap samples were additionally examined for those species.

All three invasive beetles have been documented in the region in recent years and are causing extensive tree mortalities. The GSOB, as its name implies, attacks only oaks and prefers those in the red oak group including the Coast Live Oak (*Quercus agrifolia*). The KSHB and PSHB,

although are genetically distinct, are morphologically and behaviorally very similar. The Shot Hole Borers have been found to attack over 200 species in the area, with over 30 species having been confirmed as reproductive hosts, including the native riparian species Coast Live Oak, California sycamore (*Platanus racemosa*), Fremont cottonwood (*Populus fremontii*), and red willow (*Salix laevigata*) and the non-native but common in Fallbrook, avocado tree. None of the three invasive beetles have been detected on Detachment Fallbrook to date (Osborne Biological Consulting & Amec Foster Wheeler 2016).

To date, no special-status invertebrates have been documented as occurring on the installation. Three special-status invertebrate species have been detected in the region of Detachment Fallbrook, the federally endangered Quino checkerspot butterfly, the San Diego fairy shrimp, and the Riverside fairy shrimp, but none have been detected on the installation. Further discussion of their potential to occur is presented in Appendix L.

3.9.1.2 FISH

Of the fish species that have been detected within the lakes, ponds, and creeks on the interior of the Detachment, one is native, the threespine stickleback (*Gasterosteus aculeatus*), and the remaining are non-native (Table 3-11 and Appendix K). The threespine stickleback was observed by Robert Knight, former Conservation Program Manager for the Detachment, and described in the 2006 INRMP (USDON 2006b). It was not identified to subspecies, and no voucher photos or other documentation are available; however, it is highly improbable that the specimen would have been the federally endangered unarmored threespine stickleback (*G. a. williamsoni*) as that subspecies is not known to occur in within this region (USFWS 2009a).

Of the four freshwater species that are native to the Santa Margarita River, only the arroyo chub (*Gila orcutti*) and Southern California steelhead are considered to occur along the Detachment Fallbrook boundary due to sightings up and down stream of the installation. The other two native freshwater species, the partially armored threespine stickleback (*Gasterosteus aculeatus microcephalus*) and the Pacific lamprey (*Entosphenus tridentatus*, formerly *Lampetra tridentate*), have been extirpated since at least the 1940s (Warburton et al. 2000, Swift & Howard 2009). Detachment Fallbrook is too far upstream on the Santa Margarita River to harbor any estuarine species.

Table 3-11. Summary of fish species documented on Detachment Fallbrook.

Category [a]	Number of Fish Species	Percent of Total
Federally Listed Threatened or Endangered	1	8%
Federally Listed Candidate	0	0%
State Listed Threatened or Endangered	0	0%
State Fully Protected Species	0	0%
State Species of Special Concern	2	15%
Native Species	3	23%
Non-native Species	10	77%
Total Number of Species	13	
[a] Note: there is overlap between categories.		

The arroyo chub is a California species of special concern that is now absent from most of its home range, a majority of which coincided with the Los Angeles metropolitan area. However, native

populations are known to occur in the Santa Margarita River including northeast and west of Detachment Fallbrook (CNDDB 2014, USFWS 1998b, Warburton et al. 2000). Given the documented sightings have occurred both upstream and downstream of Detachment Fallbrook, and provided the highly dynamic nature of the river, it is assumed that this species may occur within the stretch of the Santa Margarita River along Detachment Fallbrook at least periodically.

Southern California steelhead (steelhead), which was recently observed in the Santa Margarita River upstream of the base (USMC 2009, NMFS 2010), is expected capitalize on available migration opportunities through elevated flows during storm events (e.g., abundant rainfall). Habitat within the reach of the Santa Margarita River along Detachment Fallbrook likely serves as a migratory corridor both for adult steelhead transiting to/from the ocean to spawn in streams further upstream and rearing habitat for their offspring returning to the ocean to forage until maturity.

None of the fish species detected on the interior (non-Santa Margarita River) portion of Detachment Fallbrook have special status with the USFWS or California Department of Fish and Wildlife (CDFW). Several manmade ponds occur on the installation, some of which have contained fish. In the winter of 2001-2002, Knight and Palmer (2002) recorded a total of three species of non-native fish in Depot Lake (western mosquitofish [*Gambusia affinis*], bluegill [*Lepomis macrochirus*], and largemouth bass [*Micropterus salmoides*]) and two species in Lower Lake (bluegill and largemouth bass). A fish sampling effort nearly twenty years prior, in 1985, yielded the same species within Depot and Lower Lakes with the addition of another non-native, the pumpkinseed sunfish (*Lepomis gibbosus*) (USDON 1987), However, the dissolved oxygen levels at Depot Lake and the west Fallbrook Creek impoundments are believed to be well below the amount typically required to maintain good fish populations (USDON 1987). After Depot and Lower Lakes were classified as Munitions Restoration Project (MRP) Sites 6 and 7, respectively, in 2006, no additional fish sampling has been conducted due to access restrictions in the water due to the potential presence of unexploded munitions. The current status of the fish populations within the interior of Detachment Fallbrook is unknown; however, with recent drought years several ponds on the Station went dry or nearly so.

3.9.1.3 REPTILES AND AMPHIBIANS

Detachment Fallbrook supports a diverse herpetofaunal (reptile and amphibian) population (Table 3-12 and Appendix K). Over 30 species have been documented on Detachment Fallbrook with only two being non-native, the bullfrog (*Lithobates catesbeianus*) and red-eared slider (*Trachemys scripta elegans*). Numerous herpetofaunal species on Detachment Fallbrook are considered California species of special concern (see Section 3.9.2, Appendix K, and Appendix L for species profiles). One species, the arroyo toad, is both a California species of special concern and a federally listed endangered species that is addressed in greater detail in Section 3.10.2 and in Appendix L.

A disproportionate number of herpetofaunal surveys at Detachment Fallbrook have focused on the arroyo toad in recent decades due to its federal status and challenges with detection within upland habitat (Appendix L). However, all amphibian and reptile species that are observed during arroyo toad surveys are recorded and contribute to the installation's cumulative inventory. Two general herpetofaunal surveys, a decade apart, documented much of the species richness on Detachment Fallbrook: the 2003-2004 study by Varanus (2004a) and the 2013-14 survey by Hollingsworth and Stepek (2014). As Hollingsworth and Stepek (2015) was a more extensive study, a greater number of species were detected in 2013-2014 as compared with Varanus (2004a). However, both survey efforts reported the same two most abundant species captured: western fence lizard (*Sceloporus occidentalis*) and orange-throated whiptail.

Table 3-12. Summary of herpetofaunal (amphibians and reptiles) species documented on Detachment Fallbrook.

Category [a]	Number of Species			Percent of Total
	Amphibians	Reptiles	Total	
Federally Listed Threatened or Endangered	1	0	1	3%
Federally Listed Candidate	0	0	0	0%
State Listed Threatened or Endangered	0	0	0	0%
State Fully Protected Species	0	0	0	0%
State Species of Special Concern	2	8	10	29%
Native Species	7	26	33	94%
Non-native Species	1	1	2	6%
Total Number Species	8	27	35	
[a] Note: there is overlap between categories.				

Detachment Fallbrook is home to three species of venomous reptiles, the southwestern speckled rattlesnake (*Crotalus mitchelli pyrrhus*), the southern pacific rattlesnake (*Crotalus oreganous helleri*), and the red diamond rattlesnake (*Crotalus ruber*). The southern pacific rattlesnake is the most commonly seen species, followed by the red diamond rattlesnake and then the southwestern speckled.

3.9.1.4 BIRDS

Over 200 avian species have been documented on Detachment Fallbrook (Table 3-13 and Appendix K). The majority of avian species on the Detachment are protected under the Migratory Bird Treaty Act (MBTA) and several species are further protected by one or more federal or state laws (Table 3-13). Birds that are listed under ESA as threatened or endangered, or are candidates for listing, are discussed in detail in Section 3.10 (Federally Listed Species and Critical Habitat) and Appendix L. Avian species that are protected by the Bald and Golden Eagle Protection Act, state Endangered Species Act, and state Species of Special Concern are listed in Appendix K and profiled in Appendix L.

Five avian species detected at Detachment Fallbrook are not covered by MBTA: California quail (*Callipepla californica*), rock pigeon (*Columba livia*), Eurasian collared-dove (*Streptopelia decaocto*), European starling (*Sturnus vulgaris*), and house sparrow (*Passer domesticus*). While native to North America, the brown-headed cowbird (*Molothrus ater*) has not been considered native to California (although see Rothstein 2004, Rothstein & Peer 2005), and is a brood parasite of other native bird species. Because it has contributed to extreme declines in some native bird populations, the brown-headed cowbird has been considered a problem species and may be controlled via trapping and other methods under a special depredation permit from the U.S. Fish and Wildlife Service. As with other protected avian species, special permits are required to trap cowbirds or remove eggs and chicks from nests.

Table 3-13. Summary of avian species documented on Detachment Fallbrook.

Category [a]	Number of Bird Species	Percent of Total
Federally Listed Threatened or Endangered	4	2%
Federally Listed Candidate	0	0%
Listed under Bald and Golden Eagle Protection Act	2	<1%
Protected under Migratory Bird Treaty Act	200	98%
State Listed Threatened or Endangered	5	2%
State Fully Protected Bird Species	2	<1%
State Species of Special Concern	18	9%
Partners In Flight Priority Species	12	6%
Bird of Conservation Concern	11	5%
Native Species	200	98%
Non-native Species [b]	5	2%
Total Number of Species	205	

[a] Note: there is overlap between categories.

[b] The brown-headed cowbird is classified as a non- native species in this document; however, questions have been raised regarding its origins in California (e.g., Rothstein 2004, Rothstein & Peer 2005) . See text for further discussion.

While the majority of avian species on the Detachment are native to the region, many are seasonal residents, annually migrating to either winter or summer destinations. Migratory birds either spend the winter in the area, moving north during the spring and summer, or they arrive during the spring and summer from farther south to breed in the area. In southern California, most birds typically nest between January and August. Birds can nest in a variety of locations such as buildings, trees, shrubs, and on the ground. Some birds, such as swallows and raptors, may even use the same nesting area, occasionally even refurbishing the same nest, from one year to the next.

The avifaunal richness (number of species) on the Detachment is generally thought to be commensurate with the region based on species lists and comparative assessments from the late-1980s to mid-1990s (Kus 1988; Bloom 1996). However, species composition and diversity (richness and "evenness" or relative abundance of species) have not been well studied and findings from twenty years or more ago are out of date. For various reasons, the avifaunal community at Detachment Fallbrook, as well as at other locations throughout the region, may have changed and historical comparisons may not reflect current conditions. For example, at Detachment Fallbrook, a greater amount of riparian habitat has been excluded from cattle grazing and cowbird control efforts at neighboring MCB Camp Pendleton and in the region would be expected to have an effect on contemporary species diversity.

Nonetheless, for historical reference, in the late 1980s, Kus (1988) surveyed most of the drainages in the interior of the Detachment and compared the bird fauna with a relatively undisturbed Sweetwater River site, noting:

> *"While both Fallbrook Creek and Depot Lake appear more diverse than the Sweetwater River in terms of number of passerine bird species supported, many of the species observed at the [Detachment] are those associated with fields and grasslands, and seasonally dry*

> *oak-riparian drainages… Conversely, species typically associated with well-developed willow-riparian habitat, such as the common yellowthroat (Geothlypis trichas) and yellow-breasted chat (Icteria virens), are comparatively rare at the [Detachment], in contrast with their abundance at the Sweetwater River. The differences in species diversity among the three sites are thus largely attributable to differences in the nature of habitats adjacent to riparian areas, as well as differences in the structure and composition of riparian woodlands themselves. These differences aside, the [Detachment] sites and the Sweetwater site share 20 passerine species in common, 48 percent of all passerines observed at the [Detachment]. Only five species present at Sweetwater River did not occur at the [Detachment]." (Kus 1988, p. 13)*

During a study that spanned from 1993 to 1995, Bloom (1996) observed 16 species of raptors on Detachment Fallbrook and concluded that both the resident and migratory raptor populations appeared "normal and healthy" (p. 46) and the species composition and numbers were "typical for the region" (p. 47). Evidence of breeding on Detachment Fallbrook was found for 10 of the 16 raptor species, with most nests that were located occurring in oak woodlands or riparian habitats (Bloom 1996, p. 14). Although systematic investigations of raptor populations or productivity have not been conducted on Detachment Fallbrook since the Bloom (1996) study, periodic surveys and avian inventory lists in subsequent years appear to have yielded comparable diurnal species richness; less information is available for nocturnal raptors. In general, the relatively open habitats and large rodent populations of Detachment Fallbrook provide excellent foraging opportunities for raptors.

California Partners in Flight (CPIF) has identified of avian focal species in a series of bioregion-based Bird Conservation Plans (see http://www.prbo.org/calpif/plans.html for links to available plans). The avian focal species were selected for their dependence on the habitat types highlighted in each plan. Based on the major habitat types at Detachment Fallbrook, the following focal species from the CPIF plans have been documented on the installation (see also Appendix M):

- Coastal Sage Scrub and Chaparral (CPIF 2005): black-chinned sparrow (*Spizella atrogularis*), coastal (San Diego) cactus wren, coastal California gnatcatcher, Costa's hummingbird (*Calypte costae*), greater roadrunner (*Geococcyx californianus*), lesser nighthawk (*Chordeiles acutipennis*), white-crowned sparrow (*Zonotrichia leucophrys*), southern California rufous-crowned sparrow (*Aimophila ruficeps canescens*), Bell's sage sparrow (*Artemisiospiza belli belli*), and wrentit (*Chamaea fasciata*).
- Oak woodlands (CPIF 2002): acorn woodpecker (*Melanerpes formicivorus*), blue-gray gnatcatcher (*Polioptila caerulea*), lark sparrow (*Chondestes grammacus*), Nuttall's woodpecker (*Picoides nuttallii*), oak titmouse (*Baeolophus inornatus*), western bluebird (*Sialia mexicana*), and western scrub-jay (*Aphelocoma californica*).
- Riparian (Riparian Habitat Joint Venture (RHJV) 2004): bank swallow (*Riparia riparia*, vagrant; documented only once on the Detachment), black-headed grosbeak (*Pheucticus melanocephalus*), blue grosbeak (*Passerina caerulea*), common yellowthroat, least Bell's vireo, song sparrow (*Melospiza melodia*), Swainson's hawk (*Buteo swainsoni*), Swainson's thrush (*Catharus ustulatus*), tree swallow (*Tachycineta bicolor*), tricolored blackbird, warbling vireo (*Vireo gilvus*), willow flycatcher (*Empidonax traillii*), Wilson's warbler (*Cardellina pusilla*), yellow-breasted chat, and yellow warbler.
- Grasslands (CPIF 2000): ferruginous hawk (*Buteo regalis*), grasshopper sparrow, northern harrier, western meadowlark (*Sturnella neglecta*), and white-tailed kite.

Although many of the species listed above are relatively common on the Detachment, several have only been documented a handful of times or are vagrants (note, for example, number of times each are cited in Appendix K). The yellow-billed cuckoo (*Coccyzus americanus*) is a CPIF focal

species, as well as a federally listed species, associated with riparian habitat that has not been documented on the Detachment, but may have the potential to occur on the installation in the future.

3.9.1.5 MAMMALS

Due in part to the continuity with, and wildlife corridors provided by, the surrounding open spaces on MCB Camp Pendleton, along the Santa Margarita River (including the Santa Margarita Ecological Reserve), and the Cleveland National Forest, Detachment Fallbrook enjoys a diverse array of mammalian species including indigenous fauna such as mule deer (*Odocoileus hemionus*), coyotes (*Canis latrans*), bobcats (*Lynx rufus*), mountain lions (*Puma concolor*), American badgers (*Taxidea taxus*), and San Diego black-tailed jackrabbits (*Lepus californicus bennettii*) (Table 3-14 and Appendix K).

Table 3-14. Summary of mammalian species documented on Detachment Fallbrook.

Category [a]	Number of Mammalian Species	Percent of Total
Federally Listed Threatened or Endangered	1	2%
Federally Listed Candidate	0	0%
State Listed Threatened or Endangered	1	2%
State Fully Protected Species	0	0%
State Species of Special Concern	10	19%
Native Species	45	83%
Non-native Species [b]	9	17%
Total Number of Species	54	

[a] Note: there is overlap between categories.

[b] The American beaver is classified as a non-native in this document; however, questions have been raised regarding the origin of this species in coastal southern California. See text for further discussion.

The population status of some of the largest animals occupying Detachment Fallbrook is the least known and includes primary carnivores, such as the coyote, bobcat, and mountain lion. Most of the mountain lion signs recently noted were found along the Santa Margarita River gorge to the north, away from areas with the heaviest human activity. However, there have been sightings at Lower Lake (e.g., K. Fischer, personal observation) and radio collared mountain lion with CDFW tracking devices reveal routes that individuals have taken through the Detachment. Large home ranges for these animals would likely necessitate the use of land on Detachment Fallbrook as well as on adjacent, undeveloped areas of MCB Camp Pendleton and the Cleveland National Forest (Hunsaker & Clark 1996). Large predators can play an important role in maintaining other wildlife populations. A recent study found that in fragmented coastal sage scrub, those patches frequented by coyotes had considerably fewer nest predators (e.g., domestic cats, skunks, opossums, and raccoons) and markedly increased bird diversity (Crooks & Soulé 1999).

In 1972–1973, a general survey of rodents was conducted on Detachment Fallbrook. This survey examined the relative abundance of 14 species in eight habitats (Bleich 1973). In the 1990s, broad surveys of all taxa on Detachment Fallbrook updated the species list (Hunsaker & Clark 1996). After these surveys, the majority of the mammal survey efforts have solely focused on the federally endangered Stephens' kangaroo rat. During focused trapping for the Stephens' kangaroo rat,

incidental captures of other small mammals have included Dulzura kangaroo rats (*Dipodomys simulans*), deer mice (*Peromyscus* spp.), pocket mice (*Chaetodipus sp.*), and western harvest mice (*Reithrodontomys megalotis*), a similar diversity to those captured during the first trapping effort in 1972-1973.

Of the more than 50 species of mammals known to occur on Detachment Fallbrook, the Stephens' kangaroo rat is the only federally and State listed endangered species (Table 3-14; see also Section 3.10.7 and in Appendix K). Mammals that are also listed as California species of special concern include western red bat (*Lasiurus blossevillii*), pallid bat (*Antrozous pallidus*), pocketed free-tailed bat (*Nyctinomops femorosaccus*), western mastiff bat (*Eumops perotis*), San Diego black-tailed jackrabbit, Dulzura pocket mouse (*Chaetodipus californicus femoralis*), northwestern San Diego pocket mouse (*Chaetodipus fallax fallax*), San Diego desert woodrat (*Neotoma lepida intermedia*), and American badger. These species are discussed in detail in Appendix L.

Two additional California species of special concern mammal species were identified as occurring in the region and include the Los Angeles pocket mouse (*Perognathus longimembris brevinasus*) and the pacific pocket mouse (*Perognathus longimembris pacificus*) (CNDDB 2014). The closest sighting of the Los Angeles pocket mouse was in 1993, 9.6 miles northeast of Detachment Fallbrook (CNDDB 2014). As the species has not been documented near Detachment Fallbrook since the early 1990s nor has it been captured during trapping regimes on the installation, there is no potential for the species to occur. The pacific pocket mouse is also listed as federally endangered and are known to occur on MCB Camp Pendleton; however, this species is restricted to more coastal areas and has no potential to occur on Detachment Fallbrook (CNDDB 2014).

The origins of the American beaver has been brought into question recently (see Lanman et al. 2013). The species is typically considered not native to this region and is the subject of control measures by MCB Camp Pendleton including along the shared reach of the Santa Margarita River. With their dam building, beavers can dramatically modify the hydrology of the river and adversely affecting, among other species, the endangered arroyo toad. That said, beaver dams also create wetland habitat for many species and improve groundwater recharge. Should beavers become accepted as a native species to the area (see Lanman et al. 2013), the rationale for control measures will be revisited.

Deer are a game animal actively managed and hunted on MCB Camp Pendleton; however, hunting of game species has not been allowed on Detachment Fallbrook for security and safety reasons. Another ungulate, the American bison (*Bison bison*), was introduced to MCB Camp Pendleton in the 1970s, but none of the herd has wandered onto or become established on Detachment Fallbrook.

One group of mammals, the Chiroptera or bats, has received a lot of conservation attention in North America in recent years. This is due in part to their ecological and economic value in the face of alarming population declines following the spread of a fungal disease known to be associated with white-nose syndrome (WNS). As a group, bats comprise just about 25% of mammalian species worldwide are considered to be important components of a healthy ecosystem, providing pollination and seed dispersal for many plants in the tropics and deserts. In the U.S., bats feed almost exclusively on insects and provide insect control by eating tons of insects per night, including many agricultural pests. One bat can eat between 600-1,000 mosquitoes and other insects in just an hour.

First documented in New York in 2006, WNS quickly spread south and west, resulting in the death of millions of bats with mortality rates of 90-100% in most caves (www.whitenosesyndrome.org). Being long-lived and having only a single pup per year, bat species affected by WNS are unlikely to recover quickly if at all. It remains to be seen if WNS will spread to warmer parts of the US with severity similar to that in the northeastern U.S.

Of the twenty-two bat species known to occur in San Diego County, 15 are considered sensitive by federal or state agencies. On Detachment Fallbrook, bat surveys conducted in 1994 (Brown 1995) and 2013-2014 (Stokes 2015) confirmed a high species diversity with 11 species of bat detected, four of which are California species of special concern (western red bat, pallid bat, pocketed free-tailed bat, and western mastiff bat). These bats utilize several habitats for roosting and feeding, especially over the open water and streams and the community of Fallbrook. A few species (Yuma myotis, Mexican free-tailed bat, and big brown bat) have been documented as roosting in several buildings, mostly above-ground magazines, and have been a nuisance problem with guano and the potential for human health risks. Several bat boxes or "condos" have been installed on or near inert storage magazines over the years in an effort to provide an alternative, safe, and convenient roost for bats using the area (Chapter 4).

3.9.2 Rare and Sensitive Animals

Many sensitive wildlife species have been observed at Detachment Fallbrook (Table 3-15, Appendix K); a number of which were already introduced in the taxonomic subcategories in Section 3.9.1 (Animal Diversity) (Photo 31). For the purpose of this document, sensitive species are defined by their legal and/or regulatory status. Species listed by Federal and/or State agencies as threatened or endangered, or are candidates (or proposed) for such lists are collectively referred to as Species at Risk (SAR) in the DOD (DODINST 4715.03).

Table 3-15. Special-status animal species documented on Detachment Fallbrook

Scientific Name	Common Name	Listing Status
Fish		
Gila orcutti	Arroyo chub	CSC, MSHCP
Oncorhynchus mykiss	Southern steelhead trout	FE, CSC
Amphibians		
Anaxyrus californicus	Arroyo toad	FE, CSC, MSHCP
Spea hammondii	Western spadefoot	CSC, MSHCP
Reptiles		
Anniella pulchra	California legless lizard	CSC
Asipidoscelis hyperythra	Orange-throated whiptail	CSC, MSHCP
Phrynosoma blainvillii	Blainville's horned lizard	CSC, MSHCP
Plestiodon skiltonianus interparietalis	Coronado skink	CSC
Salvadora hexalepis virgultea	Western patch-nosed snake	CSC
Crotalus ruber	Red-diamond rattlesnake	CSC, MSHCP
Thamnophis hammondii	Two-striped garter snake	CSC, MSHCP
Actinemys marmorata	Pacific pond turtle	CSC, MSHCP
Birds		
Aythya americana	Redhead	CSC
Pelecanus erythrorhynchos	American white pelican	CSC
Ixobrychus exilis	Least bittern	CSC
Plegadis chihi	White-faced ibis	MSHCP
Elanus caerulus	White-tailed kite	CFP
Circus cyaneus	Northern harrier	CSC, MSHCP

Scientific Name	Common Name	Listing Status
Buteo swainsoni	Swainson's hawk	ST, DOD PIF
Aquila chrysaetos	Golden eagle	BGEPA, CFP, DOD PIF, MSHCP
Haliaeetus leucocephalus	Bald eagle	BGEPA, SE
Sternula antillarum	Caliifornia least tern	FE
Athene cunicularia	Burrowing owl	CSC, DOD PIF, MSHCP, BCC
Asio otus	Long-eared owl	CSC
Chaetura vauxi	Vaux's swift	CSC
Calypte costae	Costa's hummingbird	BCC
Selasphorus sasin	Allen's hummingbird	BCC
Picoides nuttallii	Nuttall's woodpecker	BCC
Falco mexicanus	Prairie falcon	DOD PIF
Contopus cooperi	Olive-sided flycatcher	CSC, DOD PIF
Empidonax traillii (extimus)	(Southwestern) Willow flycatcher	(FE), SE, MSHCP
Pyrocephalus rubinus	Vermilion flycatcher	CSC
Lanius ludovicianus	Loggerhead shrike	CSC, DOD PIF, BCC
Vireo bellii pusillus	Least Bell's vireo	FE, SE, MSHCP
Riparia riparia	Bank swallow	ST
Baeolophus inornatus	Oak titmouse	BCC
Cistothorus palustris clarkae	Clark's marsh wren	CSC
Campylorhynchus brunneicapillus sandiegonensis	Coastal (San Diego) cactus wren	CSC, DOD PIF, MSHCP, BCC
Polioptila californica californica	Coastal California gnatcatcher	FT, CSC, MSHCP
Setophagia petechia	Yellow warbler	CSC, BCC
Icteria virens	Yellow-breasted chat	CSC, MSHCP
Aimophila ruficeps canescens	Southern California rufous-crowned sparrow	MSHCP
Spizella breweri	Brewer's sparrow	DOD PIF
Spizella atrogularis	Black-chinned sparrow	DOD PIF, BCC
Amphispiza belli belli	Bell's sage sparrow	DOD PIF, MSHCP
Ammodramus savannarum	Grasshopper sparrow	CSC, MSHCP
Agelaius tricolor	Tricolored blackbird	CSC, DOD PIF, MSHCP, BCC
Xanthocephalus xanthocephalus	Yellow-headed blackbird	CSC
Carduelis lawrencei	Lawrence's goldfinch	DOD PIF, BCC
Mammals		
Lasiurus blossevillii	Western red bat	CSC
Antrozous pallidus	Pallid bat	CSC, MSHCP
Nyctinomops femorosaccus	Pocketed free-tailed bat	CSC
Eumops perotis	Western mastiff bat	CSC

Scientific Name	Common Name	Listing Status
Lepus californicus bennettii	San Diego black-tailed jackrabbit	CSC, MSHCP
Chaetodipus californicus femoralis	Dulzura pocket mouse	CSC
Chaetodipus fallax fallax	Northwestern San Diego Pocket Mouse	CSC
Dipodomys stephensi	Stephens' kangaroo rat	FE, ST
Onchomys torridus ramona	Southern grasshopper mouse	CSC
Neotoma lepida intermedia	San Diego desert woodrat	CSC
Taxidea taxus	American badger	CSC, MSHCP
Felis concolor	Mountain lion	MSHCP

Special Status:
Federal:
FE = Endangered
FT = Threatened
FC = Federal Candidate Species
DOD PIF = DOD Partners in Flight Priority Species (May 2011)
BCC = Bird of Conservation Concern

State:
SE = Endangered
ST =Threatened
CSC = California Species of Special Concern
CFP = California Fully Protected Species

Regional:
MSHCP = North County Multiple Species Conservation Plan Covered Species (February 2008).

Species listed as threatened, endangered, or candidate under ESA by the federal government are included in Appendix K and they are addressed in greater detail in Section 3-10 (Federally Listed Species and Critical Habitat) and Appendix L (Species Profiles). Map 3-8 shows locations of other, non-federally listed sensitive species. Appendix L also has additional information on many of the non-federally listed sensitive species.

As a group, most birds are federally protected under the MBTA, but only avian species that have been identified in an additional legal, regulatory, or other capacity are included in Map 3-8. Also called out in Appendix K are state listed threatened or endangered species, species of special concern, or fully protected species; watch species identified in DOD PIF; Birds of Conservation Concern (USFWS 2008); and/or species of concern that are regionally listed by the San Diego North County Multiple Species Conservation Plan.

Photo 31. Red-diamond rattlesnake. (Photo by K. Fischer)

Identification of SAR and other sensitive species in this section informs and facilitates management (Chapter 4). Though Detachment Fallbrook is federally-owned property and does not have the same legal obligation to state wildlife laws, the Navy endeavors to protect SAR and other sensitive species in accordance with the Sikes Act and the DOD implementing regulations (e.g., OPNAV M-5090.1). Protection of SAR and other sensitive species today helps prevent them from becoming federally listed as threatened or endangered in the future. State listed species are also considered during the NEPA process.

3.9.3 Invasive and Other Problem Animals

Invasive animals are those species that dominate an area, outcompeting native species and impairing the structure and function of the ecosystem. Typically an invasive animal is also non-native, or exotic, having been introduced to California after European contact and as a direct or indirect result of human activity. However, a native animal may become problematic or invasive if it has gained a competitive advantage (e.g., in a disturbed system with the loss of natural predators or competitors) or is having undesirable effects on human resources (e.g., crop pests, destruction to infrastructure).

There are a few animal species that can pose a threat to native flora and fauna or can become pests to humans (Photo 32). Table 3-16 lists several animals recorded on Detachment Fallbrook that can become problem species and may need management due to their negative effects on federally listed species and facilities. There are a few species not listed in the table below that are known to occur in the region and have the potential to occur on the Detachment in the future. These "watch list" species include red imported fire ants (*Solenopsis invicta*), goldspotted oak borer, and/or feral pigs (*Sus scrofa*) (Appendix K).

Many of the animal species listed in Table 3-16 are not native to this region and fairly prolific on the Detachment and in surrounding communities (e.g., Argentine ant, crayfish, bullfrogs, starlings, and house sparrows). However, the severity and nature of the impacts from non-native animals on native flora and fauna can vary greatly. By displacing native ants or other insect species, Argentine ants, for example, can greatly impact insectivorous wildlife species and have been linked to declines in the horned lizards (Suarez et al. 2000, Fischer et al. 2002). Bullfrogs are an example of an invasive species that seems to have few predators of its own, but preys on a wide variety of native species, including migratory birds, other amphibians and reptiles, and even the endangered arroyo toad (Varanus 2006a).

Photo 32. Bullfrog. (Photo by K. Mozumder)

Table 3-16. Invasive or problem species known to occur on Detachment Fallbrook.

Common Name	Scientific Name	Origin
Argentine ant	*Linepithema humile*	South America
Red Swamp Crayfish	*Procambarus clarkii*	Eastern North America
Bass	*Micropterus sp.*	Eastern North America
Sunfish	*Lepomis sp.*	Eastern North America
Bluegill	*Lepomis macrochirus*	Eastern North America
Channel catfish	*Ictalurus punctatus*	Eastern North America
Bullfrog	*Lithobates catesbeianus*	Eastern North America
Red-eared slider	*Trachemys scripta elegans*	Eastern North America
Rock Dove	*Columba livia*	Europe, South Asia, Northern Africa
European starling	*Sturnus vulgaris*	Europe, Western & South Asia, Northern Africa
Brown-headed cowbird	*Molothrus ater*	North America
House sparrow	*Passer domesticus*	Middle East
Virginia opossum	*Didelphis virginiana*	Eastern North America
American beaver	*Castor canadensis*	North America
California ground squirrel	*Spermophilus beecheyi nudipes*	Western North America
Black rat	*Rattus rattus*	Asia
Norway rat	*Rattus norvegicus*	Asia
House mouse	*Mus musculus*	Europe, Asia, North Africa
Feral cat	*Felis catus*	Domestic
Feral dog	*Canis lupus familiaris*	Domestic

Typically, native species are not considered pests at Detachment Fallbrook from a resources management perspective, as they are part of the natural community and often play an important ecological role. Occasionally, however, even native species can become problematic (e.g., if populations are not kept in check by natural predators) and/or pests (e.g., causing destruction to property, serving as disease vectors). The ground squirrel is an example of a native species that can become a pest, as their burrows can undermine infrastructure, they can accelerate erosion from magazines, and they are often accused of chewing on and damaging car wiring.

The origins of two species in Table 3-16 that have been considered not native to this region and the subject of control measures have been called into question: the brown-headed cowbird (see Rothstein 2004, Rothstein & Peer 2005) and the American beaver (see Lanman et al. 2013). For this document, both species are classified as not native. Whether native or not, the brown-headed cowbird has been associated with declines of sensitive species, notably, the least Bell's vireo (Kus & Whitfield 2005). As a brood parasite, the brown-headed cowbird lays its eggs in the nests of other birds that then foster cowbird young typically at the expense of the host species own chicks. Although cowbirds have been subject of control in California, including on neighboring MCB Camp Pendleton, their population does not appear to be in decline in the state (Rothstein & Peer 2005). Detachment Fallbrook likely benefits some from cowbird control on MCB Camp Pendleton. Although brown-headed cowbirds occur on the Detachment, they have generally not been observed in high numbers nor do they appear to exhibit excessive parasitism pressure (e.g., no incidences of parasitism have been detected with California gnatcatchers and only few incidence of parasitism

have been observed with the least Bell's vireo; see list of monitoring surveys on the Detachment, Appendix H).

The American beaver has also been the subject of control by MCB Camp Pendleton including along the shared reach of the Santa Margarita River. With their dam building, beavers can dramatically modify the hydrology of the river, potentially causing infrastructure damage (considered a low risk at Detachment Fallbrook) and adversely affecting, among other species, the endangered arroyo toad. That said, beaver dams also create wetland habitat for many species and improve groundwater recharge. Should beavers become accepted as a native species to the area (see Lanman et al. 2013), control measures may still be warranted, but the rationale needs to be revisited.

For profiles of additional non-native, pest, and/or feral animals known to occur or have the potential to occur at Detachment Fallbrook, see Appendix L.

3.10 FEDERALLY LISTED SPECIES AND CRITICAL HABITAT

To date, no federally threatened or endangered plant species have been detected on Detachment Fallbrook (Dudek Associates 1995, TDI 2007, TDI 2013b) and seven federally threatened or endangered animal species have been detected (Table 3-17). The following sections provide detailed descriptions of federally listed wildlife species known to occur, or have the potential to occur, on Detachment Fallbrook.

Table 3-17. Federally listed threatened, endangered, and candidate species that are known to, or have the potential to, occur on Detachment Fallbrook. [a]

Common Name (Scientific Name)	ESA Status; Year Listed	Status on Detachment Fallbrook	Designated CH		Recovery Plan?
			Most Current Listing	On Det FB?	
PLANTS					
Encinitas Baccharis (*Baccharis vanessae*)	Threatened; 1996 (61 FR 52370- 52384)	Not known to be present	No	No	No
Thread-leaved Brodiaea (*Brodiaea filifolia*)	Threatened; 1998 (63 FR 54975-54994)	Not known to be present	2011 (76 FR 6848-6925)	No	No
San Diego Button-Celery (*Eryngium aristulatum* var. *parishii*)	Endangered; 1993 (58 FR 41384-41392)	Not known to be present; Unlikely	No	No	USFWS 1998c
Spreading Navarretia (*Navarretia fossalis*)	Threatened; 1998 (63 FR 54975-54994)	Not known to be present; Unlikely	2010 (75 FR 62192-62255)	No	USFWS 1998c
INVERTEBRATES					
Quino Checkerspot Butterfly (*Euphydryas editha quino*)	Endangered; 1997 (62 FR 2313-2322)	Not known to be present; Unlikely	2009 (74 FR 28776-28862)	No	USFWS 2003c
Riverside Fairy Shrimp (*Streptocephalus woottoni*)	Endangered; 1993 (58 FR 41384-41392)	Not known to be present; Unlikely	2012 (77 FR 72069-72140)	No	USFWS 1998c
San Diego Fairy Shrimp (*Branchinecta sandiegonensis*)	Endangered; 1997 (62 FR 4925-4939)	Not known to be present; Unlikely	2007 (72 FR 70648-70714)	No	USFWS 1998c
FISH					
Southern California Steelhead (*Oncorhynchus mykiss*) [b]	Endangered; 1998 (63 FR 32996-32998)	Present in SMR; migratory (high flow conditions) [b]	2005 (70 FR 52488-52627)	No	NMFS 2012

Common Name (Scientific Name)	ESA Status; Year Listed	Status on Detachment Fallbrook	Designated CH		Recovery Plan?
			Most Current Listing	On Det FB?	
Unarmored Threespine stickleback (*Gasterosteus aculeatus williamsoni*)	Endangered; 1970 (35 FR 16047 16048)	Historical; unlikely future	2002 (67 FR 58580 58582)	No	USFWS 1985b
AMPHIBIANS					
Arroyo Toad (*Anaxyrus californicus*)	Endangered; 1994 (59 FR 64859-64867)	Present in SMR	2011 (76 FR 7245-7467)	No	USFWS 1999
California Red-legged Frog (*Rana draytonii*)	Threatened; 1996 (61 FR 25813-25833)	Not known to be present; unlikely	2006 (71 FR 19244-19346)	No	USFWS 2002b
REPTILES					
None at this time.					
BIRDS					
Yellow-Billed Cuckoo (*Coccyzus americanus occidentalis*)	Threatened; 2014 (79 FR 59991-60038)	Not known to be present; migratory; potential breeder	2014 (79 FR 48547-48652)	No	No
California Least Tern (*Sternula antillarum browni*)	Endangered; 1970 (35 FR 8491-8498)	Present occasionally; no breeding habitat	No	No	USFWS 1985a
Southwestern Willow Flycatcher (*Empidonax trailli extimus*) [c]	Endangered; 1995 (60 FR 10695-10715)	Presumed present as transient; migratory; potential breeder.	2013 (78 FR 343-534)	No	USFWS 2002a
Least Bell's Vireo (*Vireo bellii pusillus*)	Endangered; 1986 (51 FR 16474-16482)	Present in riparian; migratory	1994 (59 FR 4845-4867)	No	Draft USFWS 1998a
Coastal California Gnatcatcher (*Polioptila californica californica)*	Threatened; 1993 (58 FR 16742-16757)	Present in CSS	2007 (72 FR 72010-72213)	No	No
MAMMALS					
Stephens' Kangaroo Rat (*Dipodomys stephensi)*	Endangered; 1988 (53 FR 38465-38469)	Present in grasslands	No	No	Draft USFWS 1997a

[a] Acronyms in Table: Critical Habitat (CH), coastal sage scrub (CSS), Detachment Fallbrook (Det FB), Endangered Species Act (ESA), Santa Margarita River (SMR)

[b] Although Steelhead has never been documented along stretch of SMR bordering Detachment Fallbrook, this anadromous species was discovered upstream of the installation, which implies migratory corridor along SMR.

[c] Willow flycatchers of undetermined subspecies have been observed and it is presumed that southwestern willow flycatchers disperse and migrate through suitable habitat on the Detachment. This species is known to breed in the SMR downstream of the Detachment on MCB Camp Pendleton.

3.10.1 Southern California Coast Steelhead

Species Description, Range, Brief Life History

The Southern California steelhead (*Oncorhynchus mykiss*) is an anadromous rainbow trout that has an average size of 20 to 30 inches but can reach up to 45 inches in length. A mature steelhead can weigh as much as 55 pounds in weight but average around 8 to 9 pounds. They are dark-olive in color, shading to silvery-white on the underside with a heavily speckled body and a pink to red stripe running along their sides. (NMFS 2009)

Historically, the steelhead ranged throughout the eastern Pacific Ocean from the Kuskokwim River in Alaska to the Rio del Presidio in Baja California. Southern steelhead (those occurring south of San Francisco Bay) were formerly found in coastal drainages as far south as the Santo Domingo River in northern Baja California. Southern steelhead were formerly found in streams and rivers of Los Angeles, Orange, and San Diego counties (McEwan & Jackson 1996). Steelhead were thought to be extirpated from much of their historic range in southern California south of Malibu Creek until documentation of the presence and spawning of steelhead in the more southern Topanga and San Mateo Creeks, which prompted the extension of the Distinct Population Segment (DPS) boundary to the U.S.-Mexico border in 2002 (NMFS 2002, NMFS 2006).

Southern California steelhead can survive a wide range of temperature conditions, but require streams with adequate dissolved oxygen. Spawning habitat consists of gravel substrates free of excessive silt. Adult steelhead migrate from the ocean into freshwater streams to spawn between December and June in southern California when streams have adequate water levels. Juvenile steelhead typically spend one to two years in freshwater before migrating to estuarine areas as smolts and then into the ocean to feed and mature. Steelhead can then remain at sea for up to three years before returning to freshwater to spawn.

Threats

The major threats affecting the Southern California Coast Steelhead DPS are the introduction of non-native species, point and non-point source pollution, livestock grazing, dams, water diversions, and loss of watershed habitat either from urban development, blocked access to headwater spawning areas, and/or dewatering of streams by diversions and groundwater pumping.

Listing and Recovery

The evolutionarily significant unit (ESU) of the Southern California Steelhead was federally listed as an endangered species by the National Marine Fisheries Service in 1997 (NMFS 1997), and by the USFWS in 1998 (USFWS 1998d). Critical habitat was designated for the Southern California ESU of steelhead in 2000 and did not include any rivers or streams within San Diego County (NMFS 2000). After the DPS range extension in 2002, critical habitat was revised but still did not include lands in San Diego County (NMFS 2005).

On 2 September 2005, the NOAA-NMFS issued a final rule designating critical habitat for five ESUs of steelhead. Detachment Fallbrook was not specifically identified in the ruling; however, Santa Margarita River was excluded along the shared reach with Camp Pendleton based on Camp Pendleton's INRMP pursuant to Section 4(a)(3) of the ESA (NMFS 2005).

A recovery plan for the Southern California Steelhead DPS, which encompasses *O. mykiss* populations in the Santa Margarita River watershed, has been published (NMFS 2012).

Status on Detachment Fallbrook

The Southern California steelhead is presumed present within the Santa Margarita River, with the potential to occur within the portion of the river bordering the Detachment during times of elevated river discharge (high flow), which triggers migratory behavior for the species. No streams or drainages within the interior (non-Santa Margarita River areas) of the installation have been found to harbor this species.

Prior to 2009, steelhead had not been documented within the Santa Margarita River in decades (e.g., Warburton et al. 2000). In the spring of 2009, "there were multiple reports of fly fisherman catching 8-10" trout" in the Santa Margarita River just downstream of the Sandia Creek crossing, which is upstream of Detachment Fallbrook (p. 1 of USMC 2009). Tissue from one of the specimens was genetically tested and found to be of steelhead ancestry with no indication of

hatchery origin (NMFS 2010). This finding, along with documented observations of steelhead by biologists from agencies including California Department of Fish and Game and U.S. Forest Service, led NMFS to conclude that a population of endangered steelhead resides in the Santa Margarita River watershed (NMFS 2010).

Habitat within the reach of the Santa Margarita River along Detachment Fallbrook likely serves as a migratory corridor both for adult steelhead transiting to/from the ocean to spawn in fresh water further upstream and for their offspring returning to the ocean to forage until maturity.

Appendix L contains a more detailed discussion of steelhead.

3.10.2 Arroyo Toad

Species Description, Range, Brief Life History

Photo 33. Arroyo Toad. (Photo by K. Mozumder)

The arroyo toad (*Anaxyrus* (=*Bufo*) *californicus*) is a relatively small (1.9 to 3.2 inches), stocky, blunt-nosed toad with spotted greenish gray to tan warty skin (Stebbins 2003) (Photo 33). The arroyo toad is one of three members of the southwestern toad complex (*Bufo microscaphus*) in the *Bufonidae* family. At the time it was federally listed as endangered in 1994 (59 FR 64859–64867), the arroyo toad was considered a subspecies of southwestern toad (*B. m. californicus*). Recent taxonomic work has divided the North American "*Bufo*" into several genera including the new genus *Anaxyrus* (Frost et al. 2006).

The arroyo toad is endemic to the coastal plains, mountains, and desert slopes of central and Southern California and northwestern Baja California from near sea level to about 8,000 feet). In the 5-Year Review for the species, populations were reported to occur in the following counties: Monterey, San Luis Obispo, Santa Barbara, Ventura, Los Angeles, San Bernardino, Riverside, Orange, San Diego, and Imperial (USFWS 2009b). Since publication of the 5-year Review, the USGS determined from unpublished data that the putative arroyo toad populations in Imperial County are not valid records and, as a result, Imperial County is no longer considered a part of the species' distribution (R. Fisher, pers. comm. 2012).

Arroyo toads are nocturnal and spend the day buried in primitive burrows, often just below the soil surface but usually not more than five inches underground (Mitrovich et al. 2011). In coastal San Diego County, arroyo toads may be active throughout the year. Outside of the breeding season arroyo toads are rarely active when temperatures fall below 46 degrees Fahrenheit (°F). They may be active in limited numbers when relative humidity exceeds 80% and temperatures exceed 52 °F; however, they are often active in large numbers during moderate to heavy rain when temperatures exceed 52°F (Varanus 2004b).

Arroyo toad breeding period occurs from late January or February to early July, although it can be extended in some years depending on weather conditions (USFWS 1999). Breeding occurs in quiet, clear backwaters of streams as waters recede from the higher flows of the wet season. Breeding sites are typically near or adjacent to "upland" terraces. These terraces often have open sandy areas surrounded by patches of riparian vegetation (mule fat and arroyo willow [*Salix lasiolepis*] are typical components) or coast live oak woodlands. Beyond these terraces, arroyo toads may invade other upland associations including alluvial and sage scrubs, open chaparral (for example, chamise chaparral), and oak woodlands. Adult females and sub-adults typically remain to forage in upland

habitats, the females moving to breeding sites when sufficiently nourished to have fully developed eggs, rarely only to soak in quiet pools or meanders. Females are able to deposit eggs only once per breeding season (Sweet 1992); they may visit a breeding site often no more than once each year, spending the remainder of the year in uplands near breeding sites (Varanus 2004b). During extremely dry periods, when breeding conditions are lacking, and when forage is poor, arroyo toads remain in upland habitats; during the driest years they remain primarily on sandy terraces adjacent to breeding sites (Varanus 2004b).

The extent of perpendicular arroyo toad movements away from the stream channel is influenced by rainfall amounts, availability of surface water, width of streamside terraces and floodplains, vegetative cover, and topography (Griffin et al. 1999; Cadre 2002, 2003). Arroyo toads wander farthest abroad when rainfall is distributed throughout the non-breeding season (Varanus 2004b). Some individuals may disperse up to three miles from the streambed breeding sites (Holland & Goodman 1998, USFWS 1999). Long-distance movements are typically documented along easily accessible and open thoroughfares including roads; hiking and game trails; areas cleared of vegetation by wildfire; or along rivers, streams, and creeks (Varanus 2004b). Toads that stray far from the friable soils near rivers and streams, however, may succumb to desiccation during extended dry periods, especially in hostile soils (e.g., predominantly clay soils) (Varanus 2006b).

Threats

Numerous factors can affect the presences of arroyo toads, in addition to changes in hydrologic regime. The introduction of numerous exotic plant and animal species has contributed to the decline of the arroyo toad. Non-native fish (for example, bluegill and red swamp crayfish) may eat eggs and larvae while bullfrogs may devour arroyo toads at any stage of development. Thick mats of watercress (*Rorippa nasturtium-aquaticum*) may prevent arroyo toads from accessing otherwise suitable breeding sites (Varanus 2004b). Eggs and larvae of the arroyo toad are highly susceptible to sedimentation and upstream deposition of sediments in the vicinity of breeding pools may reduce or eliminate arroyo toad fecundity (Sweet 1992). More widespread threats include impacts from off-road vehicle use, foot traffic by humans and livestock.

Listing and Recovery

The arroyo toad was listed as a federally endangered species on 16 December 1994 (USFWS 1994b). The 5-year review resulted in a recommendation to change the status of the species from endangered to threatened (USFWS 2009b). On 27 March 2014, the USFWS issued a proposed rule to downlist the arroyo toad to threatened (USFWS 2014a). If the species is downlisted, the protections afforded it by the ESA do not change.

Critical habitat was first designated on 7 February 2001 and encompassed approximately 182,360 acres (USFWS 2001). Critical habitat was subsequently challenged and re-designated two times (USFWS 2005a, USFWS 2011a). The current Final Rule on critical habitat for arroyo toads is dated 9 February 2011 and covers approximately 98,366 acres of habitat in Santa Barbara, Ventura, Los Angeles, San Bernardino, Riverside, Orange, and San Diego Counties, California (USFWS 2011a). Detachment Fallbrook is located within Unit 12 (Lower Santa Margarita River) and is exempt from critical habitat under Section 4(a)(3) of the ESA.

A recovery plan has been approved for this species (USFWS 1999). For downlisting from endangered to threatened, 20 self-sustaining metapopulation or subpopulations are required, two of which should be on the adjacent MCB Camp Pendleton (San Mateo/San Onofre Creek and Santa Margarita River basin). Delisting requires 15 additional metapopulations or subpopulations.

Status on Detachment Fallbrook

On Detachment Fallbrook the arroyo toad is found only along the Santa Margarita River (Map 3-9). No streams or drainages within the interior of the installation have been found to harbor this species. Appendix L contains a more detailed discussion of the survey efforts and locations of arroyo toads on the installation.

The arroyo toads on Detachment Fallbrook are part of a population that has a current distribution that ranges from the lower portion of Temecula Gorge to the Pacific Ocean. They are found with the Santa Margarita floodplain, and, to a limited extent, the associated upland habitat on Detachment Fallbrook. Over the years, the number and location of arroyo toad observations varies within this stretch of the Santa Margarita River. With the steep canyon walls and narrow floodplain, the hydrology in this highly channelized stretch of the Santa Margarita River can be especially dynamic.

All life stages of arroyo toads have been observed in the Santa Margarita River along the boundary of Detachment Fallbrook; however, evidence for arroyo toad breeding has been variable and limited over the years, with no evidence of breeding observed in some year's altogether (Appendix L). Breeding sites along the Santa Margarita River are typically near or adjacent to "upland" terraces.

The extent of arroyo toad movement into, and utilization of, upland habitat on Detachment Fallbrook is not well understood. Because this species is nocturnal, can remain dormant underground for long periods, may occur at very low densities, and is subject to rainfall and other annual variations, it is especially challenging to study arroyo toad within its upland habitat. A combination of habitat evaluations, predictive modeling, and past surveys for arroyo toad at Detachment Fallbrook has yielded a distribution map of potential upland occupation. The accumulation of survey data over time is expected to produce refinements to habitat suitability and occupancy maps for the installation. The effects on the arroyo toad of live stream discharge from upstream water districts are currently unknown.

In an effort to map the potential extent of arroyo toad distribution on Detachment Fallbrook, a spatially explicit predictive model was developed by Varanus (2004b) based primarily on topographic slope, potential travel corridors between the floodplain and upland habitat, and distance from the river. The model has been tested and modified over the years (e.g., ICF & BEC 2013, Hollingsworth & Stepek 2015), and will continue to evolve as new information becomes available. See Appendix L for greater description of the model and an account of the process used to create and modify the model.

3.10.3 California Least Tern

Species Description, Range, Brief Life History

The California least tern (*Sterna antillarum browni*) is the smallest (10 inches, 1.5 ounces) tern found in the United States. Males and female both have a black cap, gray wings with black wingtips, orange legs, and a black-tipped yellow bill (USFWS 1985a). This species is migratory arriving in southern California by the last week of April and leaving in August (USFWS 1985a).

This species breeds on sandy beaches from San Francisco south to the border with Mexico (USFWS 2006a). Their winter range extends into Baja California, Mainland Mexico, and South America but information is patchy on their wintering range (USFWS 2006a). On the breeding grounds, least terns nest in colonies on open sandy beaches and will forage over any open water source in the vicinity, typically within 2 miles of the breeding colony (USFWS 1985a). The nearest breeding colonies occur on MCB Camp Pendleton.

Threats

The main threats to the species include human disturbance, exotic species incursion and invasion, predation, food shortages, and environmental contamination (USFWS 2006a).

Listing and Recovery

The California least tern was listed as an endangered species by the USFWS in 1970, and listed as an endangered species by CDFW in 1971 (USFWS 1970). The 5-year review issued in September 2006 determined that downlisting to threatened status is warranted as the impact to the habitat has been reduced, the population has increased and the remaining breeding colonies are on lands with intensive management programs (USFWS 2006a).

Critical habitat has not been designated for this species. A recovery plan was published by the USFWS on 27 September 1985 (USFWS 1985a).

Status on Detachment Fallbrook

California least terns are occasionally seen circling over Depot Lake and Lower Lake. These may be juveniles or dispersing individuals. It is unknown if they successfully forage in the lakes and ponds but these areas appear to provide some type of foraging habitat for the species. There is no breeding habitat on Detachment Fallbrook.

3.10.4 Southwestern Willow Flycatcher

Species Description, Range, Brief Life History

The southwestern willow flycatcher (*Empidonax traillii extimus*) is a small (5.9 inches, 0.4-0.5 ounces) neotropical migrant songbird that has an extremely limited breeding range within the southwestern United States. There are four recognized subspecies of willow flycatcher (*Empidonax traillii*): *E. t. extimus*, *E. t. brewsteri*, *E. t. adastus*, and *E. t. traillii*. Three of the four species breed in California. *E. t. adastus* breeds in the northern inland (trans-montane) part of California. *E. t. brewsteri* breeds in the central and northern coastal (cis-montane) part of California. *E. t. extimus* breeds in the southern part of California so any willow flycatchers breeding San Diego County can be positively identified as *E. t. extimus.* The willow flycatchers are in a group of closely related songbirds of the genus *Empidonax* that are very difficult to distinguish by visual characteristics alone. Southwestern willow flycatchers arrive in San Diego County from their wintering grounds in early May. Breeding activity may be initiated as early as mid-May, and adults and young of the year usually depart by early September.

The southwestern willow flycatcher breeding range extends from southern California to west Texas; portions of southern Nevada, Utah, and Colorado; and possibly the northern extremes of Baja California and northwestern mainland Mexico. Their winter range extends along the Pacific slope of southern Mexico south to Costa Rica, and possibly into Panama (Unitt 2000).

On the breeding grounds, southwestern willow flycatchers inhabit both native and non-native dominated riparian habitats (Finch & Stoleson 2000) along rivers, streams, or other wetlands, with dense growths of shrubs and trees, including willows, mule fat, arrowweed (*Pluchea* sp.), tamarisk, or cottonwood (*Populus* sp.). When migrating they utilize similar habitats but may also use desert washes and oases (Finch & Stoleson 2000, Small 1994). In San Diego County, most willow flycatcher observations are migrants of the northwestern subspecies, *E. t. brewsteri*. Only those individuals exhibiting territorial behavior outside of the migration period (i.e., after June 21) or individuals for which breeding is confirmed, are definitively considered southwestern willow flycatchers. In San Diego County, populations have been reduced to two modest colonies and a few scattered pairs (Unitt 2004). The two largest colonies are along the upper San Luis Rey River

below Lake Henshaw Dam and on MCB Camp Pendleton along the Santa Margarita River (Unitt 2004). Others are scattered in the central, southern and eastern portions of the County (Unitt 2004).

Threats

Once widely distributed in California (Grinnell & Miller 1944), adverse land use practices, loss of habitat, alterations of watershed hydrology, and possibly nest parasitism by brown-headed cowbirds have resulted in the precipitous decline of the southwestern willow flycatcher (Unitt 2004). Excessive runoff and catastrophic flooding can render riparian uninhabitable for southwestern willow flycatchers, and extended drought leading to dry rivers also reduces the suitability of such areas. Southwestern willow flycatchers are semi-colonial and tend to clump territories near each other.

Listing and Recovery

The southwestern willow flycatcher was listed as an endangered species by the CDFW in 1990, and federally listed as an endangered species by the USFWS on 27 February 1995 (USFWS 1995). The 5-year review issued on 4 September 2014 determined that downlisting is not warranted at this time as the criteria for downlisting have not been met (USFWS 2014b).

On 22 July 1997, the USFWS designated critical habitat for this species, but it was later remanded and vacated (USFWS 1997b). On 19 October 2005, the USFWS issued a revised designation of critical habitat, which excluded Detachment Fallbrook from the final critical habitat designation pursuant to Section 4(a)(3) of the ESA based on a legally operative INRMP that provides a benefit to the southwestern willow flycatcher (USFWS 2005b). The exclusion of Detachment Fallbrook was continued when critical habitat was revised again for this species on 3 January 2013 (USFWS 2013).

A recovery plan was published by the USFWS on 30 August 2002 (USFWS 2002a).

Status on Detachment Fallbrook

The southwestern willow flycatcher subspecies has not been confirmed on Detachment Fallbrook; however, several observations of willow flycatchers of undetermined subspecies have been observed over the years and it is presumed that southwestern willow flycatchers disperse and migrate through suitable habitat on the Detachment (Map 3-10). Moreover, this species is known to breed just downstream of the Detachment within the Santa Margarita River on MCB Camp Pendleton. The Santa Margarita River provides the most suitable breeding habitat for the species on the installation, and the southwestern willow flycatcher has the potential to breed on Detachment Fallbrook in the future.

3.10.5 Least Bell's Vireo

Species Description, Range, Brief Life History

The least Bell's vireo (*Vireo bellii pusillus*) is a small (4.7 inches, 0.4 ounces) neotropical migrant songbird that is a summer migrant that breeds at Detachment Fallbrook (Photo 34). There are four subspecies of Bell's vireo (*Vireo bellii*) and the westernmost subspecies, least Bell's vireo, breeds in California. Least Bell's vireos usually arrive on their breeding grounds from mid- to late March and may begin to depart by late July; most have left by September, but a few birds occasionally remain until late September or even early October (Kus 2002). The males tend to arrive first and establish territories with the females arriving within a few days. Site fidelity is high among adult least Bell's vireos, with many birds returning to the same territory each year and even using the same shrub for nesting as in previous years (Greaves 1987; Kus 2002; Kus et al. 2010).

Photo 34. Least Bell's vireo and nest. (Photo by K. Fischer)

Dense riparian vegetation is the preferred habitat for this species for nesting and foraging. A diverse canopy height is typically required for foraging, with willows often dominating the canopy layer (Salata 1983). In southern California, least Bell's vireo nest sites were most frequently located in riparian stands between 5 and 10 years old (SANDAG and RECON 1990). Based on an analysis of least Bell's vireo habitat structure and composition, this species appears to preferentially select sites with large amounts of shrub and tree cover, a large degree of vertical stratification, and small amounts of aquatic and herbaceous cover (SANDAG and RECON 1990).

The least Bell's vireo has increased in numbers 10-fold since its listing in 1986 (USFWS 2007b). Population growth has been greatest in San Diego and Riverside counties and 54 percent of the population occurs in San Diego County (USFWS 2006b).

Threats

Significant threats to least Bell's vireo continue to be loss or degradation of its breeding habitat in southern California and brown-headed cowbird brood parasitism (USFWS 1998c, 2007b). Fire is also a threat to this species.

Listing and Recovery

The USFWS listed the Least Bell's vireo as an endangered species on 2 May 1986 (USFWS 1986). Results of a 5-year review by the USFWS competed on 14 February 2007 recommended downlisting this species from endangered to threatened status, but the downlisting process for this species has not been initiated yet (USFWS 2007b).

Critical habitat for the Least Bell's vireo was designated in 6 southern California counties on 2 February 1994 (USFWS 1994a). Critical habitat was not designated on Detachment Fallbrook, although rationale for exemption of the installation was not specifically addressed. Neighboring MCB Camp Pendleton was excluded from critical habitat designation due to a Memorandum of Understanding (MOU) with the USFWS. With the shared management of the Santa Margarita River, Detachment Fallbrook appears to have received protection from critical habitat designation with the MOU.

A draft recovery plan was released by the USFWS on 6 May 1998, but was never finalized (USFWS 1998c).

Status on Detachment Fallbrook

Least Bell's vireos are known to regularly occur in and breed along the Santa Margarita River, Fallbrook Creek, and along the southeastern boundary of the installation with Fallbrook (Map 3-10). There have been several sightings of transitory vireos along other riparian stretches on the installation. Suitable breeding habitat on the interior drainages of Detachment Fallbrook is limited outside of the Santa Margarita River. Numbers on the interior drainages have always been relatively low, often less than five pairs (Appendix L). The interior drainages appear to be narrow and incised and lack conditions that allow for an increase in habitat to the outer edge of the floodplain.

Between 1993 and 2002, least Bell's vireos were documented on several drainages within the interior of the Detachment during annual surveys at permanently-established point count stations; however, these point counts did not track the number of vireos nor were breeding pairs distinguished from migrant or transient vireos. From 2003 to 2010, several survey efforts were undertaken to survey interior drainages and the Santa Margarita River. In 2009, a monitoring protocol was developed to standardize the methods for the stationwide surveys that occur once every five years in accordance with the 2003 WFMP BO (the "5-year" survey) and the annual abbreviated surveys (USDON 2014a, Appendix L). In addition to providing comparable data from year to year for trend assessments, the monitoring protocol is designed to provide improved mission support through better documentation of the usage of the installation by the least Bell's vireo.

Between the 2013 DeLuz and the 2014 Tomahawk Fires, more than half of the least Bell's vireo territories on the installation burned (USDON 2014a). Depending on precipitation, the habitat is expected to re-grow relatively quickly; however, post-fire monitoring will help track species recovery.

Monitoring surveys have found that cowbird parasitism of least Bell's vireos occurs, but is rare on Detachment Fallbrook. Further discussion of brown-headed cowbirds can be found in Appendix L.

3.10.6 Coastal California Gnatcatcher

Species Description, Range, Brief Life History

The coastal California gnatcatcher (Polioptila californica californica) is a small (4.3 inches, 0.2 ounces), long-tailed member of the gnatcatcher family Polioptilidae (Photo 35). There are three subspecies of California gnatcatcher (*Polioptila californica*) and the northernmost subspecies, coastal California gnatcatcher, is found breeding within California. This species is a year-round resident species in southern California. The bird's plumage is dark, blue-gray above and grayish-white below, with the female having more brown feathers than the male (Pyle & Unitt 1998). The tail is mostly black above and below with a narrow white edge on the outer tail feathers. The male has a distinctive black cap that is absent during the winter.

Photo 35. Coastal California gnatcatcher male. (Photo by K. Fischer)

Historically, coastal California gnatcatcher's range extended from southern Ventura County southward through Los Angeles, Orange, Riverside, San Bernardino, and San Diego counties, and into Baja California, Mexico, to approximately 30 degrees north latitude near El Rosario (Atwood 1990, USFWS 2010a). Although gnatcatchers have a close association with sage scrub, this species has also been documented using coastal sage-chaparral scrub, chamise chaparral, and other scrub habitat types (Campbell et al. 1998, Bontrager 1991, K. Fischer pers. obs.).

The gnatcatcher breeding season extends from mid-February through mid-August, although earlier starts and later seasons have been observed (USFWS 1993a). During the breeding season, territories range from 2 to 14 acres (USFWS 2010a) and during the non-breeding season can be as big as 35 acres (Preston et al. 1998).

Threats

Habitat destruction, fragmentation, and modification have led to this species' decline (USFWS 1993a). Loss of habitat to agriculture and urban development were leading challenges to conserving the species until the interval between 2003 and 2007 when widespread fires consumed one-third of the habitat in the U.S range of the species that the U.S. Fish and Wildlife Service believed to be suitable for the coastal California gnatcatcher (USFWS 2010a). Wildfire is a constant threat to this species as the islands of preserved habitat upon which this species survives continue to be threatened with the increased risk of fire from the adjacent residential communities.

Listing and Recovery

The USFWS designated the coastal California gnatcatcher as threatened on 30 March 1993 (USFWS 1993a). Although California's Natural Community Conservation Planning (NCCP) and the federal Habitat Conservation Planning (HCP) programs have made substantial contributions towards the conservation of the gnatcatcher, the USFWS recommended no change in status for the coastal California gnatcatcher in the five-year review (USFWS 2010a). There has been controversy over the recognition of the coastal California gnatcatcher as a subspecies and challenges over the years to the designation of this subspecies as threatened (USFWS 2010a). In response to a petition to delist the gnatcatcher, the USFWS published a 90-day finding on 26 October 2011 in which they concluded that the coastal California gnatcatcher is a valid subspecies and its listing as threatened is still warranted (USFWS 2011c).

The USFWS designated critical habitat for the coastal California gnatcatcher in 2000 in the southern California ecoregion, which included federal lands (USFWS 2000). At that time, 8,681 acres of Detachment Fallbrook were designated as critical habitat. In response to a court challenge, the USFWS published a revised proposal (USFWS 2003b), which still included Detachment Fallbrook within the boundaries of critical habitat designation. On 19 December 2007, a final ruling for California gnatcatcher critical habitat was published that provided Detachment Fallbrook an exemption from critical habitat under Section 4(a)(3)(B) of Endangered Species Act (ESA) based on the approved INRMP (USFWS 2007).

Currently, a recovery plan for the coastal California gnatcatcher has not been developed.

Status on Detachment Fallbrook

Coastal California gnatcatchers are found in coastal sage scrub throughout Detachment Fallbrook (Map 3-11). Stationwide survey efforts in 1990 (USFWS 1992), 1994 (Varanus 1994), and 2000 (Varanus 2002) indicated fairly dramatic fluctuations in numbers of gnatcatcher pairs historically (Appendix L); however, there was not a standardized survey protocol for the Detachment at that time and it is difficult to know how much variation could be explained by methodology. In 2009, a monitoring protocol was developed to standardize the methods for the stationwide survey that occur once every five years in accordance with the 2003 WFMP BO (the "5-year" survey) and the annual abbreviated surveys (USDON 2014b, Appendix L. Since implementation of more standardized survey methods, considerable fluctuation in number of gnatcatcher pairs has still been documented with an overall increasing trend in the estimated population size prior to the 2013 and 2014 drought as well as the FY14 fires (Appendix L).

Between the 2013 DeLuz and 2014 Tomahawk fires, nearly 70% of the coastal California gnatcatcher territories on the installation are estimated to have burned entirely or partially (USDON 2014c). Post-fire monitoring will help reveal the actual status of the population and track recovery.

Monitoring surveys have never documented cowbird parasitism of coastal California gnatcatchers on Detachment Fallbrook.

3.10.7 Stephen's Kangaroo Rat

Species Description, Range, Brief Life History

Photo 36. Stephens' kangaroo rat. (Photo by C.M. Wolf)

The Stephens' kangaroo rat (*Dipodomys stephensi*) is a nocturnal medium sized kangaroo rat with a total body length (from the head to the tip of the tail) up to 13 inches and a tail that can be twice as long as the body (Photo 36). They have a large head, external cheek pouches, elongated rear legs with relatively small front legs (Bleich 1977). This small mammal inhabits underground burrows that serve as daytime sleeping quarters, nesting sites and food caches. Stephens' kangaroo rat may breed throughout the year and up to three litters may be produced annually (Nowak & Paradiso 1983). Stephens' kangaroo rats forage for fresh vegetation, dry seeds, and sometimes insects.

The historical range of Stephens' kangaroo rats included western Riverside, southwestern San Bernardino, and northern San Diego Counties. The current range in inland San Diego County extends south to Ramona and in coastal San Diego County to MCB Camp Pendleton and Detachment Fallbrook (USFWS 2010b).

Stephens' kangaroo rats are associated primarily with open habitats, perennial and annual grasslands of low cover and a prominent forb component intermixed with patchy bare ground (Bleich 1973, 1977; Thomas 1975; O'Farrell & Clark 1987; O'Farrell & Uptain 1989). Because of its affiliation with habitats exhibiting low vegetative cover, the Stephens' kangaroo rat is capable of colonizing habitat that has been modified by anthropogenic factors such as cattle and sheep grazing, areas cleared of vegetation for roads, and fields associated with dryland agriculture (Kelt et al. 2005, Montgomery & CH2MHill 2008, O'Farrell 1992).

Threats

A number of threats to Stephens' kangaroo rat exist throughout its current range including habitat loss, predation by domestic and feral cats, and habitat fragmentation. Stephens' kangaroo rat requires the same soil types and topography that are associated with agricultural and urban development. Additionally, much of its habitat is in private holding, limiting the ability of the USFWS to restrict actions which may result in adverse effects to the species. Throughout much of its current range, Stephens' kangaroo rat occurs in close proximity to residential areas, increasing the chance of predation by urban predators such as cats (Friesen 1985). Barn and long-eared owls appear to be important natural predators of the animal (Bleich 1977).

Listing and Recovery

The USFWS designated the Stephens' kangaroo rat as federally endangered on 30 September 1988 (USFWS 1988). On 19 August 2010, a petition to remove the Stephens' kangaroo rat from the Federal List of Endangered and Threatened Wildlife was found to be not warranted after a 12 month review (USFWS 2010b). The 5-year review completed on 22 July 2011, recommended that the Stephens' kangaroo rat be downlisted to threatened (USFWS 2011d). A proposed downlisting rule has not been published.

Critical habitat has not been designated for this species. Within the 5-year review, the USFWS discusses the population at Detachment Fallbrook and states that the INRMP provides for the long-term management of the species.

A draft recovery plan was published on 23 June 1997 (USFWS 1997a).

Status on Detachment Fallbrook

The Stephens' kangaroo rat was first documented on the Detachment in the early 1970s, and has persisted throughout many of the disturbed annual grassland and sparse sage scrub habitats (Bleich 1973). Since the initial discovery, several stationwide habitat mapping surveys have been conducted to assess the distribution of Stephens' kangaroo rat. The first survey effort occurred in 1990-1992 and reported an estimated 2,300 acres of suitable unoccupied habitat and 2,700 acres of occupied habitat (USFWS 1993b). The second survey effort conducted from 2001-2002 reported over 3,300 acres of suitable unoccupied Stephens' kangaroo rat habitat, and 385 acres of occupied habitat distributed among several relative occupation density categories that were determined through burrow counts (Map 3-9) (SJM Biological Consultants 2005, with occupied acreage adjusted slightly based on errata sheet). The second survey was used as a baseline for a consultation with the USFWS on the Detachment Fallbrook's Wildland Fire Management Plan (USDON 2003a).

In the decade between the 1990-1992 and 2001-2002 habitat mapping efforts, there was an apparent 86% reduction in Stephens' kangaroo rat occupied habitat at Detachment Fallbrook. However, the 1990-1992 survey was conducted at a time when the ecology of this species was less understood and used a "broader-brush" approach to habitat mapping (i.e., areas of occupied habitat were more generously mapped based on fewer active burrows). Thus, a considerable amount of the apparent decline could be due to differences in methodology between the USFWS (1993b) and SJM Biological Consultants (2005). Nonetheless, the particularly large discrepancy between the results of the two surveys suggests that at least some of the observed population decline was real, due possibly to a change in habitat quality or other biological factors.

Following the 2001-2002 survey effort, an abbreviated methodology using fixed monitoring plots was developed to facilitate detection of major changes in the Stephens' kangaroo rat population between the 5-year stationwide mapping efforts (Montgomery et al. 2008). Based on the plot monitoring data, the population appeared to exhibit continued declines until it appeared to plateau 2009-2011, and show signs of increase by 2013 (SJM Biological Consultants 2016). The population plateau and eventual increase coincided with habitat treatments in 2008-10 (Innovative Inclosures 2013, Tetra Tech 2013) and the reintroduction of grazing in 2010. Appendix L has more detailed information on the annual numbers.

3.10.8 Additional Federally Listed Species with Potential to Occur

There are a few federally listed threatened and endangered species whose ranges may indicate a potential for them to occur on Detachment Fallbrook. This section presents those species and the likelihood of their occurrence on the installation. None of the species in this section have been detected to date on Detachment Fallbrook.

3.10.8.1 PLANTS

There are four federally listed plant species with the potential to occur due to their presence on MCB Camp Pendleton: San Diego button-celery (*Eryngium aristulatum var. parishii*), spreading navarretia (*Navarretia fossalis*), Encinitas baccharis (*Baccharis vanessae*), and thread-leaved brodiaea (*Brodiaea filifolia*). These species have not been documented on Detachment Fallbrook.

San Diego button-celery and spreading navarretia occur within vernal pools. Although these plant species had not been documented during past fairy shrimp surveys (Cobb 2009), future vernal pool surveys can explicitly include presence/absence surveys for both flora and fauna. Given the relatively new number of vernal pools, and that most are manmade and were subject to a high level of historical disturbance, it is unlikely that either San Diego button-celery or spreading navarretia occur on the installation.

Encinitas baccharis is a shrub of chaparral brushlands, restricted to a patchy distribution along the coast and occasionally interior areas of San Diego County, California. Encinitas baccharis has been confirmed approximately 9 miles from the boundary with MCB Camp Pendleton.

Thread-leaved brodiaea has been confirmed within a mile of the boundary with MCB Camp Pendleton and has the highest potential of the four listed plant species to occur on Detachment Fallbrook. This species was included in several general rare plant surveys on the installation, and was specifically targeted in a project level survey within the SMR CUP footprint, and has not been detected to date. See Appendix H for list of rare plant surveys and Appendix L for more information on these species.

3.10.8.2 INVERTEBRATES

There are three federally listed invertebrate species with the potential to occur due to their presence in the vicinity of Detachment Fallbrook: Quino Checkerspot butterfly (*Euphydryas editha quino*), Riverside fairy shrimp (*Streptocephalus woottoni*), and San Diego fairy shrimp (*Branchinecta sandiegonensis*).

Quino Checkerspot butterfly has never been detected on Detachment Fallbrook. Although the installation is outside of the USFWS mandatory survey area for this species (USFWS 2002c), Quino Checkerspot was specifically targeted during a 2013-1015 Lepidoptera survey (Osborne Biological Consulting and Amec Foster Wheeler 2016) because of the proximity of the mandatory survey area on neighboring MCB Camp Pendleton and because of presence of the host plant species. Results of several presence or absence surveys for the species conducted on adjacent MCB Camp Pendleton between 1996 and 1999 determined this species is not known to occur on MCB Camp Pendleton (Redak et al. 1997, 2000).

Riverside and San Diego fairy shrimp occur on neighboring MCB Camp Pendleton. However, neither species was detected during focused fairy shrimp surveys during 2002-2003 and 2004-2005 wet seasons, and both are considered to be absent from Detachment Fallbrook (Cobb 2009). Lindahl's fairy shrimp (*Branchinecta lindahli*), which is not listed by either California state or federal governments, was confirmed in the vernal pools and ephemeral ponds on Detachment Fallbrook (Cobb 2009).

3.10.8.3 FISH

There are no additional federally listed fish species with the potential to occur on Detachment Fallbrook.

3.10.8.4 AMPHIBIANS

California red-legged frog (*Rana draytonii*) has been detected 9.5 miles away in Cole Canyon, Riverside County (CNDDB 2014). This species is unlikely to occur on Detachment Fallbrook as they are found within deep pools and there is not a connection between the sightings and the Santa Margarita River to allow for the species to move into the Detachment.

3.10.8.5 REPTILES

There are currently no known federally listed reptile species with the potential to occur on Detachment Fallbrook.

3.10.8.6 BIRDS

There is one additional federally listed avian species with the potential to occur on Detachment Fallbrook, the yellow-billed cuckoo (*Coccyzus americanus*). The USFWS listed the western distinct population of the yellow-billed cuckoo as threatened on 3 October 2014 (USFWS 2014c).

Yellow-billed cuckoo individuals were observed in the upper Santa Margarita River in 1947, 1948, and 1950 and near Gird Road on the San Luis Rey River in 2011 and 2015 (CNDDB 2015, eBird 2015). Since 1980, there have only been a few recorded observations of yellow-billed cuckoo individuals along Santa Margarita River on MCB Camp Pendleton, downstream of Detachment Fallbrook, and no evidence of breeding (S. Sullivan, pers. com. 2015).

The most suitable habitat for the yellow-billed cuckoo on Detachment Fallbrook is within the Santa Margarita River. Annual monitoring surveys for least Bell's vireo conducted by MCB Camp Pendleton, and 5-year surveys conducted by the Navy, within the river may provide opportunities for incidental detections of potential breeding yellow-billed cuckoos; however, this species is a late migrant to the region, arriving in mid-June to early July and may be missed (Halterman et al. 2015). See Appendix L for more information on this species.

3.10.8.7 MAMMALS

There are currently no additional federally listed mammalian species with the potential to occur on Detachment Fallbrook.

3.10.9 Federal Candidate Species

Federally listed candidate species are plants and animals that may become listed as threatened or endangered in the future. The conservation of candidate species may preclude their listing and minimize potential restrictive land use policies and costs of recovery in the future. There are no federally listed candidate species that are currently known to occur on or within the vicinity of Detachment Fallbrook.

3.10.10 Critical Habitat

Critical Habitat is the area recognized by the USFWS as essential to the conservation of a federally listed species. It must contain "primary constituent elements" required by a species during its life cycle. These areas may require special management consideration and federal landowners must consult with USFWS prior to altering or disturbing critical habitat.

Currently, there is no designated critical habitat on Detachment Fallbrook. As long as the INRMP provides adequate management or protection such that a critical habitat designation is unnecessary, critical habitat will not be designated on the installation. (Section 318 of the National Defense Authorization Act (NDAA) of 2004 amended ESA Section 4 in regards to critical habitat). The INRMP must provide a conservation benefit to the species, provide certainty that the management plan will be implemented, and provide certainty that the conservation effort will be effective. This INRMP provides the outline of how these three criteria are met on Detachment Fallbrook.

3.11 LANDSCAPE LINKAGES AND WILDLIFE CORRIDORS

Detachment Fallbrook and its neighbors comprise the largest remaining open space and wildlife habitat in coastal southern California. The South Coast Missing Linkages Project, a collaborative effort among federal, state, and private agencies that developed after a statewide November 2000 conference on wildlife corridors, identified 15 linkages for the South Coast Ecoregion. One such linkage is the Santa Ana – Palomar Mountains Linkage which connects the coastal Santa Ana Mountains with the inland Palomar Mountains (Map 3-12). This linkage is the largest contiguous block of coastal habitat remaining in the Ecoregion. The Santa Margarita River winds through the linkage connecting several creek drainages. MCB Camp Pendleton and Detachment Fallbrook make up the primary parcels of land at the linkage's western end and the Cleveland National Forest's Palomar District lies at the eastern end. In particular, the northern boundary of Detachment Fallbrook, the Santa Margarita River corridor, is a key component of this linkage.

These corridors are considered vital to maintaining ecological processes in an increasingly fragmented landscape. They are intended to ensure that plant and wildlife populations inhabiting the largest remaining wildland tracts do not become isolated by creating dispersal corridors between important land parcels. By identifying locations of these corridors and determining their most effective design, conservation efforts can focus on acquiring and preserving the most critical parcels of land within the corridor. Twenty-one focal species were chosen to represent the array of species and ecological processes that will benefit from the linkage design. These species included plants, insects, amphibians, reptiles, birds, and mammals, many of which are found on Detachment Fallbrook including but not limited to the southwestern pond turtle and the mountain lion (SDSU and SCWP 2003).

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CHAPTER 4
NATURAL RESOURCES MANAGEMENT

4.1 OVERVIEW

This chapter describes the management goals, approach, strategies, and objectives for this INRMP, and is intended to provide a comprehensive vision and clear direction for the natural resources management program at Detachment Fallbrook. The program reflects the legal, regulatory, and mission drivers as presented in Chapter 1. The principle driver of this INRMP, the Sikes Act, states: "The Secretary of Defense shall carry out a program to provide for the conservation and rehabilitation of natural resources on military installations" (§101(1)(A), Sikes Act, 16 USC 670a).

All aspects of the natural resources management program described in this chapter are expected to directly or indirectly provide a conservation benefit to federally listed and sensitive species on the installation, including avoidance and minimization measures, surveys and monitoring, and conservation and research.

The key to achieving overarching management goals as well as program-specific goals and objectives is ecosystem management, a more comprehensive approach than targeting individual species or issues. Ecosystem management, which is discussed in Section 4.2, requires integrating scientific knowledge of ecological relationships within a complex environmental and sociopolitical framework, and has the goal of protecting and enhancing the native ecosystem integrity over the long term.

Ultimately, the success of the program is reflected in the resiliency of native diversity and the ecosystem, the maintenance of regulatory compliance, and the ability of the Navy to accommodate and integrate present and future mission requirements. Successful interface and integration between land use and natural resources management requires the proper planning, review, and support of mission and mission-related projects and operational requirements. All aspects of the natural resources management program directly or indirectly support the installation's mission.

This chapter initially prescribes management goals, and then explains the management approach and strategies of the various program elements to achieve natural resources management objectives that in turn support the overarching goals. INRMP implementation, including the planning and execution of management actions in this chapter, requires an adaptive approach to the greatest extent feasible due, in part, to dynamic and complex ecosystems.

4.1.1 Natural Resources Management Goals

The goals presented in Section 1.2.2, and restated below for ease of reference, reflect requirements of the Sikes Act and Navy policy and provide focus and direction for natural resources management:

- **Ensure military mission sustainability and environmental compliance**. – Manage for "no net loss" of capacity of the Detachment Fallbrook lands to support mission operations, while meeting all environmental compliance responsibilities. Sustain the current and future military mission by providing stewardship of open space and natural resources that include land, water, and wildlife. Foster an ethic of compliance and stewardship through education, outreach, and awareness.
- **Manage, protect, and enhance sensitive populations and resources**. – Provide ecosystem-based management to preserve, protect, and enhance natural resources and native

biodiversity for long-term sustainability and the continued benefit for present and future generations to include high-value, scarce, and at-risk species and habitats.

- **Provide the organizational support and develop partnerships necessary for effective planning and implementation of this INRMP.** – Provide sufficient staffing, funding, and resources necessary for effective strategic planning and implementation of this Plan. Partner with others to realize management goals, inspire innovative solutions, and contribute to the regional community.

The Navy has the responsibility for stewardship of natural resources and maintaining the military mission.

4.1.2 Management Approach and Strategies

The natural resources management approach involves a combination of guiding principles and strategies used for program planning, decision making, process development, and implementation in support of the established goals (See Section 4.1.1).

The following guiding principles provide criteria upon which to base natural resources management decisions and program strategies:

- Support mission readiness, facilities, and explosives safety requirements.
- Strive for continual improvement through adaptive management and evidence-based decision making.
- Evaluate natural resources management program for climate change adaptation opportunities where feasible, cost-effective, and compatible with management objectives.
- Seek land management solutions that reduce habitat fragmentation and favor native landscapes and functioning, resilient ecosystems.
- Foster environmental conditions that favor optimal species richness and native diversity.
- Protect sensitive species priority management areas and associated buffer zones from catastrophic disturbance, such as a fire.
- Maintain functional wildlife corridors and habitat linkages between critical biological resources and regional open space.
- Promote the use of focal species that include species of regional conservation or management concern, and species that may serve as a proxy for monitoring ecological change.
- Facilitate cooperative partnerships and support interagency and regional partnering efforts consistent with military mission requirements.

The following strategies provide the basis for implementing the majority of the natural resources management program elements:

- Avoidance and minimization
- Surveys and monitoring
- Conservation and research

These strategies reflect a progression of engagement in the field. Further detail on each strategy and how it provides a conservation benefit to species and their habitats is provided below. In

subsequent sections of this chapter, many of the program elements are explained in depth based on these three strategies.

4.1.2.1 AVOIDANCE AND MINIMIZATION

One of the most important and fundamental strategies is first "do no harm" to the greatest extent feasible by exercising the avoidance of potential adverse impact of land use and other disturbances. It is the first step in the mitigation hierarchy and a management tool that is often the least costly, lowest risk, and most effective. If an impact is unavoidable, the next best thing is minimizing its adverse effect (e.g., reducing duration or extent). When effectively implemented, this strategy may reduce risks and impacts to negligible levels.

Avoidance and minimization occur at many levels of land use and natural resources management (see "Avoidance and Minimization" within program element subsections in this chapter). In the context of supporting military projects, the planning and review aspects of the National Environmental Policy Act (NEPA) process are also intended to avoid and minimize potential adverse effects to sensitive resources (see Chapter 5).

Avoidance and minimization measures must take into account potential direct, indirect, long-term, and cumulative effects of any planned action. Specific measures vary depending on the nature and scope of a proposed action; common avoidance and minimization measures identified during the NEPA review process are presented in Chapter 5 and Appendix E.

4.1.2.2 SURVEYS AND MONITORING

The collection of data for short and long-term objectives is essential for scientifically defensible decision making and for adaptive management. Insufficient or erroneous knowledge can be crippling and even counter-productive to effective conservation.

Surveys and monitoring provide data that can greatly inform avoidance and minimization strategies. Surveys and monitoring also enable better understanding of the current status of resources and whether current management efforts are even helping to protect or improve the ecological integrity or functional value of an ecosystem.

Below are guiding principles for the development of survey methods and monitoring protocols:

- Consider goals and objectives of survey before determining methods.
- Maintain compliance with existing survey or monitoring agreements (e.g., Wildland Fire Management Program Biological Opinion [WFMP BO]).
- Emphasize methodological rigor and repeatability in baseline surveys and monitoring protocols for comparability and trend assessments through time.
- Contribute to regional and other large-scale efforts to research and monitor populations to the extent compatible with management objectives.
- Maximize the benefits of field surveys and leverage field surveyor expertise to optimize vigilance and incidental observations of focal species.
- Maximize the benefit of surveys for providing spatially explicit occupancy information that supports day-to-day mission avoidance and minimization.
- Evaluate survey protocols through the lens of climate informed monitoring, and implement program improvements where feasible and cost effective.
- Conduct monitoring surveys at relevant temporal and spatial scales that enable informed (evidence-based) decision making and adaptive management.

4.1.2.3 CONSERVATION AND RESEARCH

While avoidance and minimization measures reduce impacts, and surveys and monitoring provide valuable feedback and enable trend detection, environmental stewardship inevitably requires proactive conservation and research.

The landscape and its resources entrusted in our care are not pristine and do not exist in isolation. Many habitats at the Detachment reflect a legacy of past land use impacts, and are at present directly or indirectly subjected to stressors and disturbances at different temporal and spatial scales. Some examples include edge effects from fragmentation and neighboring urbanization, background levels of pollution, invasive and exotic species, wildland fire, climate change, loss of regional connectivity, depressed populations, and reduced gene pools.

Such stressors, along with anthropogenic impacts (i.e., human activity), can significantly reduce the capacity of ecosystems to provide essential services and support the military mission. Proactive conservation includes rehabilitation of degraded habitats and fosters a healthy sustainable ecosystem that is more resilient to current and future stressors.

Investigative research and studies are often integral to successful management and conservation initiatives. Similar to surveys ("What is where?") and monitoring ("How is it changing?") in the provision of data to inform management, investigative studies generally involve more rigorous hypothesis testing and the evaluation of assumptions upon which management decisions are based. Investigative studies can be relatively simple and localized (e.g., creating plots to determine which erosion treatments are most effective, studying the maximum longevity of dormant seeds of an invasive species), or complex and regional (e.g., determining genetic diversity and relative isolation of a regionally sensitive species).

4.1.3 Chapter Organization

Subsections within this chapter contain detail on individual elements of the natural resources management program (Table 4-1). Program elements that provide an overarching context for larger ecological or disturbance processes (Ecosystem Management, Wildland Fire, and Livestock Grazing) are addressed first, followed by program elements that provide a foundation for species and habitat management (Soil Resources and Vegetation Communities and Habitats). Program elements that focus on plants are presented before program elements focused on animals. The remaining chapter subsections (program elements) address specific management issues (e.g., Federally Listed Species, Invasive and Exotic Species, Bird/Animal Aircraft Strike Hazard, Coastal/Marine Management).

Ecosystem Management is a very broad program element, directly or indirectly influencing other program elements. Section 4.2 focuses on Ecosystem Management and captures various topics: (1) adaptive management, (2) avoidance and minimization associated with general land use and/or affecting multiple resources, (3) the use of a focal species approach in management, (4) long-term monitoring that supports assessment of ecological changes, (5) implementation of a "watch list" program, (6) the management of pollinators, (7) climate change adaptation considerations, and (8) regional partnering and involvement.

Table 4-1. Program Elements

Sec.	ELEMENT	LEVEL
GENERAL		
4.2	Ecosystem Management	Overarching Element
4.3	Wildland Fire Management	Overarching Element
4.4	Agricultural Outlease (Livestock Grazing)	Overarching Element
4.5	Soil Resources	Foundation Element
PLANTS		
4.6	Vegetation Communities and Habitats	Foundation Element
4.7	Rare and Sensitive Plants	Individual Species
ANIMALS		
4.8	Invertebrates	Higher Taxonomic Group
4.9	Fish	Higher Taxonomic Group
4.10	Amphibians and Reptiles	Higher Taxonomic Group
4.11	Birds	Higher Taxonomic Group
4.12	Mammals	Higher Taxonomic Group
SPECIFIC PROGRAM AREAS		
4.13	Federally Listed Species	Specific Program Area
4.14	Pest Management and Animal Control	Specific Program Area
4.15	Invasive and Exotic Species	Specific Program Area
4.16	Wildlife Law Enforcement	Specific Program Area
4.17	Outdoor Recreation	Specific Program Area
4.18	Bird/Animal Aircraft Strike Hazard	Specific Program Area
4.19	Coastal/Marine Management	Specific Program Area
4.20	Floodplain Management	Specific Program Area
4.21	Documents, Records, and Data Management	Specific Program Area

Considerable overlap exists between the various elements which collectively support the mission and ecosystem management. Similarly, program funding and contracting language is often crafted to implement multiple objectives (e.g., rare plant surveys provide an opportunity for vigilance of novel or high risk invasive species). Cross-referencing between sections (program elements) is frequently provided in an effort to reduce document redundancy.

Material presented within each program element generally follows the same format, starting with background material relevant to the specific program element, followed by a description of the management approach, and closing with a summary of management actions (Table 4-2). Descriptions of past and ongoing management projects and activities are incorporated throughout each program element to exemplify the actions preformed in support of INRMP implementation and to provide a reference for program managers.

Table 4-2 Example of structure and content of a Program Element

Structure/Content	Description
BACKGROUND	
"BLUF" (Bottom Line Up Front)	Includes major legal and regulatory drivers and the significance of program element to the mission and natural resources management.
Objective	The program element objective is similar to a traditional project goal (not strictly quantitative) and provides the desired outcome towards which management is directed.
Key Considerations	Factors that may help or hinder achievement of the objective and should be taken into consideration during management.
Management Context	Background information that is specific to management of the program element at Detachment Fallbrook (e.g., historical management issues, management gaps, and anticipated management focus).
MANAGEMENT APPROACH	
Example subsections: • Avoidance and Minimization • Surveys and Monitoring • Conservation and Research	The management approach for a program element is typically presented in subsections that follow the three-tiered theme described in Section 4.1.2 (see example in column to the left). For some program elements (e.g., Wildland Fire Management), the management approach is presented slightly differently (e.g., Pre-suppression, Suppression, Post-suppression) or is not subdivided at all (e.g., Outdoor Recreation). Description of the management approach often includes examples of past, ongoing, and anticipated future management.
MANAGEMENT ACTIONS	
Management Actions	Management actions are a distillation of the management approach, summarizing the specific actions that are anticipated to be pursued and implemented, to the extent feasible and appropriate, in support of the program element objective. Actions are not presented in a specific order of priority. In general, management actions associated with certain regulatory or mission drivers, which are typically specified (e.g., BO conservation measure), receive priority. Nonetheless, management actions are subject to prioritization during execution planning depending on compliance requirements, environmental conditions, mission support needs, and available resources. Management actions provide a basis for natural resources funding requests.

4.2 ECOSYSTEM MANAGEMENT

The goal of DOD ecosystem management is to ensure military lands support present and future training and testing requirements while preserving, improving, and enhancing ecosystem integrity (DODINST 4715.03). The DOD recognizes the value of ecosystem management and has established principles and guidelines for natural resource managers on military installations (OPNAV M-5090.1, Section 1.1.2). Over the long term, this approach maintains and improves the sustainability and biological diversity of terrestrial and aquatic ecosystems while supporting sustainable economies, human use, and the environment required for realistic military training operations.

Objective: Monitor, maintain, and restore ecological structure, function, and disturbance processes to protect ecosystem services, resiliency, and native biodiversity.
Key Considerations: • Habitat degradation to include anthropogenic disturbances, increased habitat fragmentation, loss of habitat connectivity, and the prevalence of invasive and exotic species. • Data collection that provides a "feedback loop" and enables hypothesis testing for the evaluation of ecosystem integrity, program efficacy, and adaptive management. • Monitoring and management of focal species, especially special status species, for community benefits. • Standardization of protocols for repeatable surveys and comparable data enabling long-term trend analysis. • Potential effects of future climate scenarios on species and ecological processes. • Cross-boundary and regional partnerships that may lend a broader perspective and collaborative benefits from shared research and management interests.

Ecosystems are complex and dynamic by nature with interrelated components operating at different rates and different temporal and spatial scales. The distribution and abundance of species and underlying ecological and physical processes occur irrespective of land ownership or management boundaries.

Stressors, such as climate change, "need to be managed in a way that allows for mitigation, adaptation, and long-term sustainability on a regional basis" (OPNAV M-5090.1, p. 12-8). Conservation management programs that operate within arbitrary boundaries fail to recognize the interconnectedness of processes within the larger temporal and spatial context of an ecosystem and may unduly waste scarce resources or, worse, contribute to greater ecological problems in the long term.

Three main principles of ecosystem management are (OPNAV M-5090.1, p. 12-8):

(1) a shift from single species to multiple species conservation,

(2) formation of partnerships to consider and manage ecosystems that cross boundaries, and

(3) use of the best available scientific information in decision making and adaptive management.

Although regulatory requirements often necessitate a greater emphasis on species-specific management, Detachment Fallbrook regularly seeks opportunities to apply the principles of ecosystem management. This chapter includes a number of program elements (e.g., Soil Resources, Wildland Fire Management) presented in subsequent sections that go beyond single species conservation management.

One of the challenges of ecosystem management is that threats to biodiversity affect entire ecological communities that are comprised of species that respond differently to threats and management. Thus strategies must balance trade-offs among species to develop optimal management (Lawson 2011a). However, managing a single species or habitat (e.g., using avoidance/minimization, maintaining landscape connectivity, reducing habitat fragmentation, or conducting invasive and exotic species control) often benefits the larger community as well. See 4.2.2 (Avoidance and Minimization) and 4.2.3 (Focal Species Approach) for additional information.

Successful ecosystem management requires cross-boundary partnering and a regional perspective. It requires cooperating and participating with external agencies, and forming partnerships necessary to effectively assess and manage ecosystems and environmental processes which cross political boundaries. See 4.2.8 (Regional Partnering and Involvement).

Adaptive management, coupled with the best available scientific information, is fundamental to ecosystem management. In the face of uncertainty, flexibility and adaptation are critical. At the heart of adaptive management is the need to approach decisions as experiments to be tested (Leslie et al. 1996). Systematic assessments of the efficacy of management techniques, and incorporation of knowledge gained over time are key to successful adaptive management. Adaptive management has been defined as both active (hypothesis testing) and passive (observational) (Shea et al. 2002).

Needless to say, applying experimental hypothesis testing or conducting rigorous observational studies for every management decision is unrealistic. Moreover, when studies are conducted, high variation can obscure and ecosystem response and it is not uncommon for study results to be inconclusive or to raise more questions than they answer (Moir & Block 2001). Therefore, the constraints of time and funding often require a more pragmatic approach to management. Nonetheless, it is important to recognize as working hypotheses the assumptions that underlie management decisions, and to seek opportunities for experimental and observational approaches to management decisions wherever feasible. Even where adaptive management programs are only partially implemented, valuable products and useful insights into the systems under consideration are often developed (Gunderson 1999, Meretsky et al. 2000), demonstrating the utility of the approach.

The ecosystem at the Detachment is not pristine. These lands have a long history of unnatural, or anthropogenic, disturbances that have directly and indirectly altered the landscape and habitat communities visible today (e.g., annual exotic-dominated grasslands, channelized stream banks, manmade ponds, erosion).

Often these legacy impacts have long lasting influences. As exemplified in a study by Harding et al. (1998), land use in the 1950s, particularly agriculture, was a better predictor of present day stream invertebrate and fish diversity in 24 tributary watersheds in North Carolina than land use in the 1990s, regardless of reforestation of riparian zones.

Maintaining the military mission and mission support activities require that some level of disturbance continue. While the natural resources management program cannot turn back the clock, sound management and certain restorative measures can foster a diverse, ecologically functional, and resilient ecosystem.

4.2.1 Adaptive Management

A dominant theme of ecosystem management is adaptive management, which at its basic level simply means learning while doing and being able to adjust to change. For adaptive management to evolve in the direction of attaining management goals, such changes must be based on informed decisions. Adaptive management is fundamentally about dealing with the high uncertainty

associated with dynamic and complex ecosystems. Management of renewable natural resources requires a continual learning process that recognizes uncertainty and optimizes decisions (Walters 1986).

The formal adaptive management process identifies uncertainties, treats management decisions as hypotheses, and provides a process (scientific method) to test the hypotheses and find better ways to meet natural resources management goals (Walters 1986, Allan & Stankey 2009, Rist et al. 2013). In this sense, adaptive management is different from typical "trial-and-error" management which uses the best available knowledge to generate a "best guess" management strategy. The "trial-and-error" approach is a legitimate mode of learning, and is often pragmatically applied to mitigate particular problems, but it may not produce consistent results and it is not considered adaptive management in the more formal sense of the concept (Lee 1999).

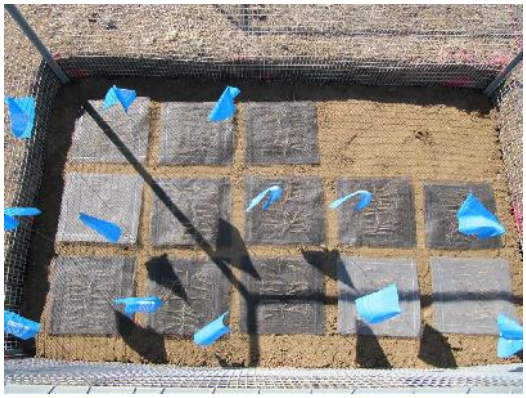

Photo 37. Goatgrass seed longevity study plots help to inform duration of eradication treatments for adaptive management. (Photo by D.M. Lawson)

Ideally, management decisions are informed by the results of quantitative findings derived from the scientific method of hypothesis testing. Of course, such rigor is not feasible for most decisions. An adaptive management approach acknowledges that conservation and management actions are often implemented by necessity with imperfect knowledge. However, it is still important to identify areas of uncertainty, articulate assumptions, and monitor resources over time. Monitoring and research can progressively improve knowledge and enhance decision-making capabilities.

At the Detachment, the application of adaptive management has been exemplified in recent years with the experimental treatments for Stephens' kangaroo rat habitat enhancement at former napalm storage sites (Montgomery & CH2MHill 2008, Tetra Tech 2013), a seed longevity study designed to inform treatment duration and timing at the barbed goatgrass eradication site (Lawson et al. 2012, Photo 37), and erosion treatment test plots at the barbed goatgrass eradication site (Lawson & Wolf, in prep). The cattle grazing program also has feedback monitoring with the use of residual dry matter measurements, including control plots (samples taken from within exclusion cages), to help assess stocking rates.

Adaptive management, at its basic level of adjusting to change and working towards a goal, is facilitated by the plan-do-check-act process of the Environmental Management System (EMS), which has the goal of continual improvement in meeting environmental responsibilities and helping to achieve both mission support and environmental excellence (see Section 5.2).

4.2.2 Avoidance and Minimization

In the context of ecosystem management, the "do no harm" strategy of avoidance and minimization takes into account the effects of land use as a whole, as well as the cumulative benefits of locally administered measures. The following are examples of overarching factors and measures that are common among several program elements that avoid and/or minimize adverse effects of land use on natural resources:

- *Low level of development*. – Less than 10% of Detachment Fallbrook is developed (buildings, parking lots, roads, etc.). Although the widely dispersed network of magazines, roads and sundry outlying structures do increase "edge effects" (changes in populations or

communities along habitat or land cover boundaries) and introduce potential boundaries to wildlife movement (McGregor et al. 2008), the low traffic levels on most roads and relatively low level of development does allow largely contiguous open space and high habitat connectivity.

- *Low-impact operations*. – In regards to the potential effect of operations on natural resources, the Detachment has a relatively low-impact military mission with most of the installation within Explosive Safety Quantity Distance arcs and limited authorized activities within these areas. See Section 2.4.1.

  Although there were more military-related activities historically (as evidenced today by miscellaneous debris, IRP/MRP sites, and landscape scarring from old ground disturbances), current land use is highly restricted. There is currently minimal off-road vehicular traffic; no active training, live fire ranges, or aerial operations (thus no Bird/Animal Aircraft Strike Hazard program); and no public access or recreational activities outside of the Administrative Area (thus no hunting/fishing program).

  Current mission and mission support operations are generally limited to daytime activities that utilize existing roads, magazines, buildings, and related infrastructure. Among the contemporary land uses, the fire management program (which includes cattle grazing, firebreak maintenance, and clear zone mowing) has perhaps the single largest effect on the landscape (see bullets below).

  The Detachment's northern perimeter fencing is inset from the installation's actual boundary, which is defined by the centerline of the Santa Margarita River. Land use in the area between the fence and actual boundary is naturally limited by the steep terrain leading to the floodplain and riparian habitat associated with the river. Presently, and in the foreseeable future, the Navy has virtually no mission related activities within the river except natural resources surveys and management. Although MCB Camp Pendleton owns the northern half of the river, Marine Corps usage of this shared reach of the river appears to be infrequent and predominantly aerial-based (e.g., helicopter flyovers above 200 ft above ground level).

- *Artificial night lighting*. – Although nighttime activities are almost exclusively limited to security patrols and occasional nocturnal environmental surveys, land use does entail limited artificial nighttime lighting for security and safety at certain discrete locations such as administrative buildings and certain ordnance holding/storage areas. Artificial night lighting has been shown to have negative, sometimes deadly, effects on a wide range of living organisms. It is restricted to the greatest extent feasible on the installation. See Section 2.4.1.

  Where night lighting is required for physical security and/or safety, efforts are sought to increase the efficacy of the lighting (e.g., over lighting and glare hinder visibility) and to reduce unnecessary and unwanted radiance (e.g., decreased brightness, shielding, recessed luminaires). Temporary artificial night lighting to support short-term projects, such as road paving at night to avoid peak traffic hours, is rare at Detachment Fallbrook and requires approval from the Environmental Office. See Section 5.4 (Project Planning, Reviews and Approvals).

- *Firebreaks, magazine mowing, and other clear zones*. – The maintenance of firebreaks and vegetation clear zones is a physical security and/or safety requirement (e.g., pre-suppression fire management) in certain areas (e.g., along designated fence lines, the sides of major roads and parking lots, as well as atop and at the base of magazine bunkers. See Section 2.4.2. Disturbances caused by the disking and mowing associated with firebreaks and clear zones reduces habitat for many species, creates opportunities for weed infestations, and may directly harm or harass wildlife including nesting birds or burrowing animals.

Avoidance and minimization measures associated with firebreak and clear zone maintenance include: (1) footprint reduction (e.g., fewer firebreaks than historically present); (2) continued maintenance to impede habitat growth and minimize suitability for many species, thereby reducing the likelihood of direct harm and harassment; (3) avoidance of potential kangaroo rat burrows and biomonitoring during firebreak disking (see Section 4.13.7); and (4) weed control to abate the prevalence and spread of noxious invasive plants. If clear zones are not maintained and native habitat becomes established, then restoring clear zones is subject to review and approval. If clear zones are not maintained and native habitat becomes established, then restoring those areas is subject to review and approval from the Environmental Office. See Chapter 5.

The potential effects on federally listed species of activities associated with fire management are covered in the WFMP BO (USFWS 2003a). See also Section 4.3 (Wildland Fire Management).

- *Cattle grazing (range) management.* – The primary purpose of the cattle grazing activity on the Detachment is to support wildland fire management with fine fuels reduction. Cattle grazing is a pervasive impact on the landscape with pastures covering over 80% of the installation. That said, strategic management of the grazing program can help avoid and minimize adverse impacts while providing natural resources management benefits (e.g., control of exotic plants, increasing native diversity, creation of bare ground for Stephens' kangaroo rats).

  The Navy endeavors to maximize the benefits and minimize environmental costs of cattle grazing through measures such as the management herd size, seasonal grazing, exclusion fencing in sensitive areas, and strategic placement of water, salt licks, and feed supplements to passively manage animal distribution. The potential effects on federally listed species of cattle grazing are covered in the WFMP BO (USFWS 2003a). See also Section 4.4 (Agricultural Outleasing).

- *Federally listed species, SAR, and protected habitats*. – In accordance with Endangered Species Act (ESA), and to help preclude designation of Critical Habitat and the need for listing of species at risk (SAR), the Detachment seeks to avoid and minimize impacts to federally listed threatened or endangered species, SAR, and their habitats. Most of the plant communities receive some level of federal regulation because they either contain federally listed species or because they are jurisdictional wetlands or waters regulated under Sections 401 and 404 of the Clean Water Act.

  The Detachment supports avoidance and minimization measures that are both compatible with the mission and may aid in the recovery of federally listed species and SAR. More detail is provided in Section 4.13. Many times these same measures provide umbrella protection for non-listed sympatric or co-occurring species. To comply with Section 7 of ESA, the Detachment must consult with the USFWS for activities that may affect federally listed species.

- *Installation rules*. – Installation rules and standard operating procedures directly or indirectly facilitate avoidance and minimization of adverse effects on the environment. Installation rules include, but are not limited to, no smoking outside designated areas, no unauthorized off road driving, and no recreation beyond the Administrative Area. As a general rule, personnel are required to comply with all applicable environmental laws and regulations.

  Personnel are prohibited from harming or harassing any wildlife or disturbing natural resources (e.g., coastal sage scrub habitat, wetlands) without prior authorization, and are encouraged to report potentially significant wildlife injuries and mortalities (e.g., dead birds, deer, and other megafauna roadkill). The harm, harassment, collection, possession, and/or trade of wildlife and plants is regulated under one or more state or federal laws. Potential

conflicts with wildlife or habitat in the work place are referred to the Environmental Office for guidance. See Chapter 5 and Appendix E.

- *Project review and approval.* – Any project or activity that may have an effect, positive or negative, on natural resources is subjected to a review and site approval process in accordance with the National Environmental Policy Act. This process provides a mechanism for a thorough evaluation of a project for potential effects, determines what avoidance and minimization measures may be warranted, and whether regulatory consultations or permitting is necessary. See Chapter 5 (Implementing Project Reviews).

- *Seasonal or other temporal avoidance and minimization.* – Often the potential adverse effects of a project or activity can be minimized, and sometimes avoided altogether, by implementing seasonal or other temporal restrictions.

  Wildlife may be especially vulnerable to stressors during certain times of year, such as breeding seasons, peak movement/migration periods, or certain times of the day. Most birds, for example, typically nest between February and August. Birds can nest in buildings, trees, shrubs and on the ground. Disturbance of nesting adult birds can alter their behavior and cause nest failure, possibly affecting the pair's reproductive output for the year. Similarly, avoidance of nighttime operations minimizes potential adverse effects to nocturnal wildlife, such as the disruption of normal foraging or hunting activities.

  Should it not be feasible to implement seasonal or other temporal avoidance (or for which such measures are less effective, e.g., species that breed year round), additional measures may be implemented to avoid and minimize potential adverse effects. Avoidance and minimization measures will vary and are determined on a project specific basis depending on nature of the activity and the environmental context.

- *Wildland fire management.* – Wildland fire is considered a primary ecosystem issue in this INRMP. Although fire within a specific range of frequency and intensity is a natural disturbance feature in Mediterranean type ecosystems, increases in habitat loss, fragmentation, and fire frequency complicate the ecological benefits of fire and fire management. In general, long periods without fire appear to carry less ecological risk as compared to short fire intervals, and smaller fires carry less ecological risk than larger fires (see discussion in Chapter 3).

  Land use and fire management that reduce fire frequency (return intervals) and fire size serves the dual benefit of mission support and minimizing adverse effects to sensitive species and other components of the ecosystem (see Section 4.2).

  While some species, such as the Stephens' kangaroo rat, may be less susceptible to the adverse effects of fire and likely indirectly benefit from it, other species are more vulnerable. The coastal cactus wren, for example, has high habitat specialization (cholla and prickly pear cactus thickets), sedentary behavior, and potentially limited dispersal capabilities (Solek & Szijj 2004). Intense burns or high fire frequency may remove or reduce the cactus habitat for long time periods since these plant species can take up to ten years to grow to mature status (Solek & Szijj 2004, Bontrager et al. 1995). In addition, large fire sizes with insufficient unburned refugia may result in increased delays in recolonization (Berry et al. 2015). Post suppression fire management and restoration practices, such as weed control, can facilitate habitat recovery.

- *Education and outreach.* – Regulatory compliance and environmental stewardship are facilitated with natural resources training and awareness, which are provided for personnel and visitors to the Detachment in a variety of ways. Examples include command and "new hire" briefs for personnel newly stationed on the installation, environmental slides in annually required hazard control briefs, ECATTS online training modules, "all hands" awareness emails, postings on the Seal Beach Facebook page, and newsletter contributions

(e.g., Green Gazette, NAVFAC newsletter, Buena Vista Audubon Society Lagoon Flyer), and tailored educational briefs provided upon request.

The natural resources program also seeks external community involvement to the extent it is compatible with public access restrictions posed by safety and security requirements. Once or twice per year, regulated public access has enabled the hosting of events, such as Earth Day and National Public Lands Day projects. Other events have included habitat restoration in the form of exotics removal, erosion control, native planting, and clean-up activities as well as the building of bird and bat boxes. These hands-on public events often attract a range of participants, and are a great way to simultaneously raise awareness, promote stewardship, and improve the installation's habitat. It is worth noting, however, that the opportunities for habitat enhancement from volunteer labor is often severely limited at the Detachment as such programs are typically restricted to administrative (non-ESQD arc) areas only.

Additional examples of avoidance and minimization measures are provided in the other program elements in this chapter. It is also recognized that natural resources management itself, such as weed control and surveys, has the potential to both positively and negatively affect the environment because community assemblages contain species that respond differently to threats and management. A fundamental objective of natural resources management is to conserve and restore habitats, thus the benefits of any management activity should outweigh any costs. Individual natural resources management projects are evaluated on a case by case basis and project-specific NEPA review and regulatory consultation may be pursued.

4.2.3 Focal Species Approach

Switching from single to multi-species management in support of ecosystem management is not a simple matter. Clearly, not all species can be included in the development of management plans. Because of this, surrogates are necessary, but their selection is often biased, if for no other reason than the fact that more data exist for certain types of species such as those that are charismatic or legally protected. This can leave plans with incomplete coverage of ecosystem components and processes.

Natural resources management at Detachment Fallbrook includes a multi-species strategy that employs focal species to serve as surrogates to help provide umbrella protection and monitor ecosystem "health." The term "focal species," as coined by Lambeck (1997), was framed around the concept of umbrella species, whose requirements are believed to encapsulate the needs of other species as a means of monitoring and managing within ecosystem or landscape-level programs.

In subsequent years, the term focal species became more generally applied. Chase and Geupel (2005) use the term to describe any individual species chosen for special attention in a multi-species conservation effort, and they list five classes of focal species: flagship (e.g., charismatic, publically popular), keystone (e.g., ecologically important), special-status (e.g., threatened or endangered), indicator (e.g., an index of environmental conditions), and umbrella (e.g., provides protection coverage for other species). At Detachment Fallbrook, application of the focal species concept is also more generally encompassing with greater emphasis on special-status, potential indicator, and potential umbrella species.

There are problems associated with reliance on focal species to assess habitat quality, to infer population trends of other species, to infer species richness in land use planning, etc. (e.g., Chase et al. 2000, Landres et al. 1988, Lindenmayer et al. 2002, Prendergast & Eversham 1997). However, a judicious use of multiple focal species, while acknowledging limitations in extrapolations, is still considered a useful and cost-effective tool for providing broad protections and/or detecting change in otherwise complex ecosystems (e.g., Lambeck 1997, Chase et al. 2000). Together, the use of

focal species is intended to complement other monitoring and management tools at Detachment Fallbrook.

To maximize the benefit of an umbrella or indicator focal species approach, ideally systematic criteria for identifying species are employed. For umbrella species to be optimally effective, for example, the species would be wide ranging, spanning multiple environmental gradients (e.g., elevation, slope, aspect), and covering the distribution of sympatric species (Caro & O'Doherty 1999; Lindenmayer et al. 2002).

For indicator species, the following are commonly applied selection criteria (Patton 1987; Lambeck 1997; Landres et al. 1988; Morrison et al. 1992; Marcot et al. 1994, Hilty & Merenlender 2000):

- Surveying for the species and analyzing datasets should be cost-effective, so long-term monitoring of the species status is feasible.
- The species should inhabit ecological niches or communities of management interest.
- The species should cover the range of responses to ecosystem threats and processes.
- The species should represent different places on the food chain or levels of ecological scale.
- The species should have a relatively high reproductive rate and lower longevity.
- The species should be sufficiently sensitive to disturbances that it provides a marker of environmental degradation or health.
- The species should be a keystone upon which the diversity of a large part of a community depends.
- The species should be a narrow habitat specialist that consistently uses one habitat type or condition, or a certain combination of habitats to complete its life cycle.
- The species should have populations of sufficient size or density to be reasonably detected and monitored.
- The species should be a year-round resident or, if migratory, is known or strongly suspected of being primarily affected by local disturbances.

In reality, few indicator or umbrella species meet the optimal criteria listed above, and the degree to which their management provides umbrella protection or an indication of ecosystem health can vary greatly. This is why a suite of focal species is often recommended for monitoring and management (e.g., Lambeck 1997, Chase et al. 2000, Chase & Geupel 2005). A set of species could better represent different aspects of the landscape. Multiple species could cover a greater range of responses to threats and management within the system under consideration (Lambeck 1997). For example, in the fire prone landscape that comprises Detachment Fallbrook, there are multiple species responses to fire interval. Ideally, a set of focal species would include species that are promoted by shorter and longer fire intervals, and species that recover endogenously and those that must recolonize (Lawson 2011a). The trade-off, however, is that intensive monitoring for a suite of species becomes expensive and less cost effective.

Currently, the only focal species routinely monitored at the Detachment are all special status species: the Stephens' kangaroo rat, least Bell's vireo, California gnatcatcher, coastal cactus wren, and arroyo toad. Due to their legal and regulatory significance, special status species – specifically, federally listed threatened and endangered species – have generally been monitored with more regularity and relatively greater intensity. Table M-1 (Appendix M) contains a working list of additional potential focal species that may be of interest in the future. The list includes species identified by various organizations or studies as candidates, namely for their potential as indicator

or umbrella species. Nonetheless, they may or may not be suitable for the Detachment and must still be vetted.

Umbrella protection for non-listed, co-occurring species is perhaps one of the more valuable benefits provided by special status focal species at the Detachment. Together, the habitat of federally listed species represents several major community types across the installation (e.g., Stephens' kangaroo rats in grasslands, California gnatcatchers in coastal sage scrub, and least Bell's vireo in riparian habitat).

Unlike an ideal umbrella species, however, the requirements of federally listed species do not necessarily fully encapsulate the needs of other native species that share the same community. The Stephens' kangaroo rat, for example, is a grassland species associated with moderate amounts of bare-ground, high for cover, moderate slopes, and well-drained soils (USFWS 1997a), conditions that may not be as favorable for some other native grassland species, such as ground-nesting birds. Likewise, the California gnatcatcher tends to prefer open sage scrub with California sagebrush (*Artemisia californica*) as a dominant or co-dominant species and slopes less than 40 percent (Bontrager 1991, Ogden 1992). Many endemics associated with coastal sage scrub communities may not fall entirely within the habitat suitability parameters of the gnatcatcher (Fleury et al. 1998).

Special status species may also serve as indicators of ecosystem "health" due to their close habitat associations (Chase et al. 2000, Chase & Geupel 2005). For example, the continued and sustained presence and reproductive success of special status taxa can be considered a positive indicator for the health of the larger system. Conversely, a decline in special status taxa, and/or the presence of potential negative indicator species (such as a relatively high abundance of brown-headed cowbirds or bullfrogs), may provide an early warning that the system is experiencing degradation or has become susceptible to a threatening process (Landres et al. 1988, Hilty & Merenlender 2000).

While a special status species may provide a proxy for monitoring change in, or the "health" of, complex ecosystems, they may not always be effective indicators of species richness or biodiversity. The presence of California gnatcatchers, for example, does not necessarily indicate a more diverse ecological community within coastal sage scrub, especially with respect to other taxonomic groups such as mammals or invertebrates (Chase et al. 2000, Rubinoff 2001).

In general, the use of single species to infer species richness can be highly variable and unpredictable (Prendergast & Eversham1997, Chase et al. 2000). The focal species approach at the Detachment is intended to complement other survey and monitoring programs (e.g., habitat mapping, Long-Term Ecological Trend Monitoring, periodic richness/diversity surveys).

4.2.4 Long-Term Monitoring

To detect ecological responses and patterns on temporal scales appropriate for ecosystem management requires long-term monitoring. The primary purpose of long-term monitoring is to be able to identify changes and detect important trends, and possible causes of those trends, in natural systems. Long-term monitoring data can help inform land managers, facilitate adaptive management, and provide scientifically-based justifications for decision making.

Ideally, long-term monitoring provides a measure of baseline conditions from which to detect change and a means of assessing whether observed changes are within natural levels of variability or a potential result of anthropogenic influences. Understanding the status of species populations and their respective habitats at appropriate temporal and spatial scales not only provides insight into the overall "health" and resiliency of the system, but also helps assess the potential effects of land use activities and facilitates avoidance and minimization.

Fancy and Bennetts (2012) identified three critical elements for successful long-term monitoring: relevance (e.g., clearly defined goals and objectives, conceptual models), reliability (e.g., well-documented, peer-reviewed protocols), and commitment (e.g., institutional support, partnerships).

To varying degrees of success, the Environmental Office has endeavored to incorporate these elements in the long-term monitoring programs for natural resources management. Of particular interest in recent years has been the development of more explicit and rigorous survey protocols to maximize the efficacy of surveys and improve comparability of data through time. A future area of interest is the evaluation and input from peer review and subject matter specialist. See Section 4.1.2 for guiding principles that specifically refer to the development of survey methods and monitoring.

4.2.4.1 RESOURCE SPECIFIC AND BIODIVERSITY SURVEYS

Surveys and monitoring are fundamental tools for natural resources management. Biodiversity and the sustainability of sensitive species are important indicators of ecosystem health and ecological integrity. Most program elements within this chapter incorporate some aspect of resource-specific inventory surveys and long-term monitoring.

Many of the surveys conducted at the Detachment aim to serve a dual purpose of contributing to long-term monitoring (e.g., population trends) as well as providing short-term benefits (e.g., distribution data for avoidance and minimization measures). For surveys designed to provide long-term monitoring value, it is paramount that they follow repeatable protocols for comparability through time. To this end, the Detachment has developed, or is in the process of developing, installation-specific standardized protocols for several federally listed species, vegetation and habitat mapping, and grazing monitoring.

Many resources do not have installation-specific monitoring protocols per se, but periodic inventory surveys are conducted to provide a “snapshot” in time of species richness and diversity (e.g., bat surveys, herpetological surveys, vernal pool sampling) or land condition status (e.g., erosion inventory, fire mapping). In lieu of installation-specific protocols for these periodic inventory surveys, detailed documentation of the methodologies are expected to help enable repeatability for future endeavors.

The extent to which survey methodologies at Detachment Fallbrook are sufficient to meet the rigors of repeatability and comparability through time can vary depending on the subject. In general, all survey methods may benefit from a thorough evaluation of sample design, detectability of the resource, error rates, analytical methods, etc. However, even simple methodologies, if implemented consistently by qualified professionals, can yield valuable data so long as interpretations acknowledge assumptions, recognize limitations, and do not overreach.

4.2.4.2 LONG-TERM ECOLOGICAL TREND MONITORING (LTETM) PROGRAM

In 1995, a Long-Term Ecological Trend Monitoring (LTETM) program was initiated on the Detachment to document potential ecological trends with a focus on changes in plant community diversity, structure, and condition to better understand the potential effects of land use (SDSU 1996). The LTETM program is comprised of series of fixed monitoring plots that are re-sampled periodically, and sometimes at different intervals depending on the vegetation community represented by the plot and the management objective. In the years following the program commencement in 1995, the goals and objectives as well as the number of plots had evolved and expanded to an unsustainable level.

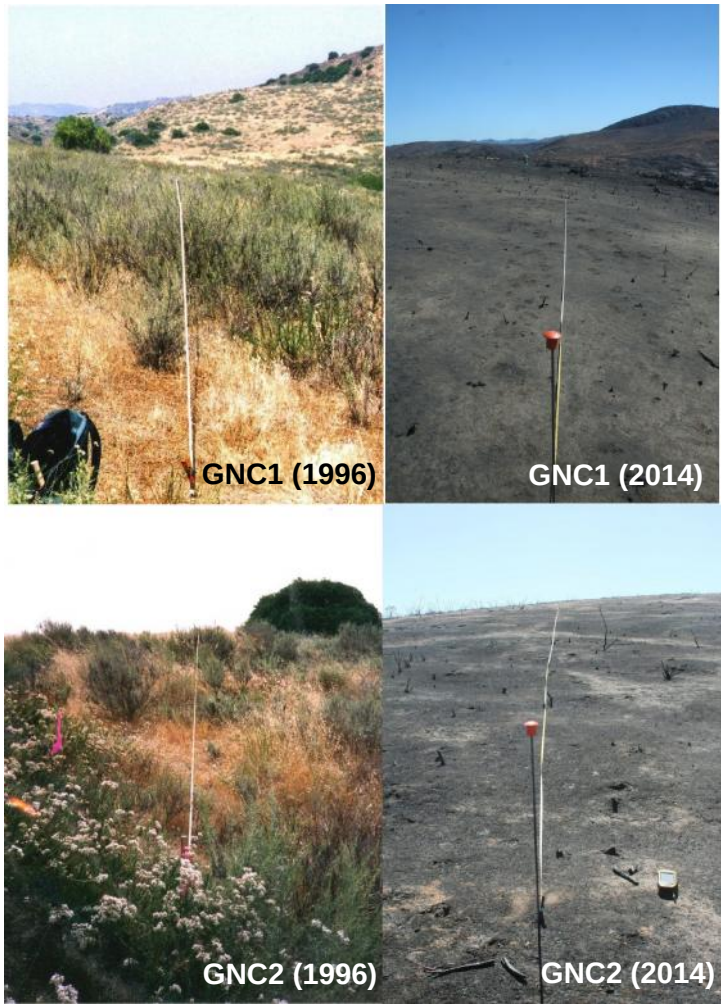

Photo 38. Long Term Ecological Trend Monitoring Plots help document environmental changes; shown here are plots GNC1 (top) and GNC2 (bottom) in 1996 and after the Tomahawk Fire in 2014.

In 2006-2007, the LTETM program was reviewed and the objectives were streamlined (TDI 2011b). To date, all or a subset of LTETM plots were sampled in 1995-2001, 2007-2008 and 2015. Following the 2014 Tomahawk Fire, all LTETM plots were sampled in 2015 to provide a baseline for post-fire recovery (Photo 38; TDI, in prep). Regardless of the frequency of LTETM plot monitoring, the data will remain relevant in perpetuity for future sampling comparisons.

4.2.4.3 WEATHER MONITORING PROGRAM

Weather monitoring is a critical component of land management and long-term trend analysis. Temperature, precipitation, drought, and relative humidity are examples of weather parameters that can have a profound effect on population dynamics and the ecology of a system. Weather data can help explain variation in survey results, anticipate the growing season for range conservation, and determine risks for fire management.

Within coastal southern California, an important climatic feature is the marine layer which is comprised of low clouds and fog. The coastal marine layer is a dynamic phenomenon reflecting ocean upwelling, ocean temperatures, and terrestrial surface topography which regulates its presence on land (Johnston et al. 2010). The marine layer is an important driver of species dynamics and ecosystem function in areas close to the coast (D'Antonio et al. 2002, Vasey et al. 2012). Many species are restricted to the fog belt where low coastal cloud cover has been documented to reduce drought stress on plants through shading and fog drip (Fischer et al. 2009). While it is known to moderate coastal climate by reducing temperatures and increasing humidity, we do not have spatial data on extent, duration, and intensity of the marine layer. More recently, advances in instrumentation have made relatively low cost monitoring approaches available and biologists are starting to study the influence of fog on CSS and chaparral communities in in the California floristic province (Vanderplank & Ezcurra 2015, Vasey et al. 2012). Fortunately, the water potential of the atmosphere, which can be calculated from air temperature and relative humidity, can be used as a proxy for fog (M.E. Loik, pers.com 1/8/2015, Vasey 2012).

Photo 39. Installation of RAWS weather monitoring tower. (Photo by MC1 Eli J. Medellin)

Weather is often very localized within southern California, with sometimes sizeable differences between coastal versus inland conditions or at different elevation gradients. Even the hills, valleys, and bodies of water at the Detachment create microclimates that influence the flora and fauna across the installation.

For this reason, it is important to gather data from weather monitoring stations that are as geographically close to the resources of interest as possible. Historically, there were at least two weather monitoring stations on the installation; however, they have not been functional for years and any data they generated do not appear to have been archived. Until 2015, weather data for the Detachment was typically taken from monitoring stations in the town of Fallbrook (further inland) or on neighboring MCB Camp Pendleton (more coastal). Although these data are useful for illustrating overall trends in the surrounding area (e.g., extended drought), it is difficult to know how accurate they are for the installation itself and it was not uncommon for there to be data gaps. Therefore, historical precipitation trends have necessitated patching together different sources of data or using more remotely located sources.

In 2014, six Remote Automated Weather Station (RAWS) towers were installed throughout MCB Camp Pendleton. A seventh RAWS tower was installed on the Detachment in late 2015 (Photo 39) which will generate a greater range of weather parameters and provide more accurate data for this locality. Although a greater number of sampling sites across the Detachment would provide a more complete picture of microclimate gradients, additional RAWS towers are not currently anticipated.

4.2.5 Watch Lists and Incidental Observations

A "watch list" species at the Detachment is one for which there is an interest in early detection, for which confirmation of their presence is needed (e.g., plant specimen or photo), or for which greater information is desired in general. Detachment Fallbrook watch list species are identified in Appendices J and K. Starting in 2015, the species watch list will be provided to the USFWS and

CDFW for review as part of the annual INRMP metrics. Maintenance of the watch list will provide an indication of potential future mission risk (e.g. a new SAR or invasive species that has the potential to occur on the Detachment), help prioritize management, and prepare the Environmental Office to respond to potential listings.

Species on the watch list may not be currently known to occur on the installation, but their potential presence and early detection is of interest for management implications. For example, a watch list provides extra vigilance for certain invasive and exotic species that may require time-sensitive treatment ("early detection, rapid response"). Similarly, detection of a new special status species would enable determination as to whether protection measures may be warranted. Watch list species known to be present in the vicinity of, and have the potential to occur on, the Detachment are provided with information about the nearest known location if those data are available.

Species that have been documented on the installation in the past may also be included on a watch list because recent observations are lacking, species verification is needed (e.g., photograph, voucher specimen), or other documentation is desired (e.g., specific location).

In conjunction with the Detachment's official species inventory, the watch list helps provide surveyors who may be unfamiliar with the Detachment with greater awareness of the potential significance of their observations, and offers an opportunity for timely confirmation. Occasionally in past survey reports, a new species for the Detachment's inventory would be included in a list of observed species, but no confirmatory documentation or locality information was provided because the surveyor was unaware of its significance at the time of the observation.

Formal surveys and monitoring efforts provide tremendous vigilance opportunities for watch list species. The subject matter expertise of surveyors (e.g., entomologists, ornithologists, botanists) can be leveraged to improve detection of certain taxonomic groups in the field.

A log of "incidental observations" provides a mechanism for documenting observations that may not have occurred during, or were not documented as part of, a formal survey effort. Some species occur with such rarity, or have such low detectability, that it is difficult to observe them during formal survey efforts (e.g., horned lizard, rosy boa, long nosed snake, badger, bald eagle). Anecdotal or incidental encounters have proven valuable for documenting the presence of such species. A formal process for inventorying such observations has been established (see Section 4.21, Documents and Records Management).

Although anecdotal or incidental observations do not convey much information about a species other than perhaps their continued presence, an accumulation of data over time can reflect known use areas and possibly provide hypotheses for larger trends (e.g., dramatic increases or decreases in incidental observations).

4.2.6 Pollinator Management

Pollination, or the transfer of pollen grains from one flower to another for plant reproduction, is often mediated by an animal pollinator, such as an insect or bird. Pollination is an ecosystem service and essential to human health, global food webs, and the protection of biodiversity.

Animal pollinators are responsible for pollinating 80 percent of the crops we consume as well as the majority of plants and fruits consumed by wildlife. Pollinators also help ensure that native landscapes do not become barren or overrun with invasive species. Examples of pollinators in the San Diego region include bees, butterflies, moths, beetles, flies, and birds.

The DOD Natural Resources Program advocates the conservation of pollinators on military lands and acknowledges that pollinators play a key role in helping keep landscapes healthy and resilient to impacts from military activities and other stressors such as fire, drought, and invasive species. For more information on the DOD program and work to support pollinators, visit www.DODnaturalresources.net and www.DODpollinators.org. A memorandum from the Office of the Under Secretary of Defense dated 5 September 2014 expands the DOD policy to use current best management practices, as appropriate, specifically to protect pollinators and their habitats, including the use of native landscaping and the minimization of the use of pesticides (USDOD 2014b).

Natural resources management at the Detachment that minimizes the use of pesticides, protects native habitats, and controls invasive species is expected to directly or indirectly benefit animal pollinators. Management for cattle grazing, which is perhaps the single greatest contemporary land use affecting the landscape, strives to maximize the benefits of grazing (e.g., fire management, control of exotic annuals) and minimize the impacts (e.g., avoid overgrazing, protect sensitive riparian areas, minimize erosion).

European honey bees occasionally present a health and safety risk when hives are established near buildings occupied by personnel. Where feasible and appropriate, avoidance and minimization measures are employed to protect honey bees (e.g., warning signage, possible hive relocation). Although not native, the honey bee is an important pollinator of agricultural crops. However, there is some controversy with respect to honey bees out-competing native bees (Kremen et al. 2002, Moisset & Buchmann 2011), which are also very important pollinators.

Although there is not extensive landscaping at the Detachment, the approved landscaping list (Appendix G) identifies pollinator-friendly species to encourage the selection of these plants where feasible. Periodic restoration efforts also provide opportunities to plant pollinator-friendly species (e.g., 2009 National Public Lands Day native planting event). Lastly, the ecological significance of pollinators and the importance of their conservation are standard topics covered in education and outreach initiatives.

To the extent feasible, opportunities for the protection and conservation of pollinators will continue to be a consideration during the development and implementation of natural resources management projects. Several pollinator species, or groups of species, may be suitable candidates for focal species monitoring in the future (see Section 4.2.3, Appendix M).

4.2.7 Climate Change Adaptation

Climate change is expected to drive changes in natural ecosystems affecting the suitability of habitat to support certain species, the timing of important events in the life cycles of plants and animals (phenology), and disturbance regimes such as fire and flooding that are key ecosystem drivers (Enquist et al. 2013a, Parmesan & Yohe 2003; Turner 2010). Effective management of natural resources will depend on the timely development and implementation of adaptation strategies to address these effects (Millar et al. 2007). In addition, conservation priorities are likely to change as a result of changes in species distributions, such as expansions, contractions, and shifts in species ranges (Pearson & Dawson 2003).

Although there is high uncertainty around the environmental effects of climate change, some management measures such as increased vigilance or stewardship that build baseline resiliency do not require firm predictions. Fundamentally, it is important to recognize that “no action” is also a management choice subject to uncertainty and risk.

Military installations are directed to address climate change adaptation in their INRMPs:

- DOD INRMP Implementation Manual (DODM 4715.03, 2013)
- DOD Natural Resources Conservation Program Instruction (DODINST 4715.03, 2011)
- Navy Environmental Readiness Program Manual (OPNAV M-5090.1)

Specifically, installations are directed to include historical regional trends and future projections of climate change in their INRMP updates (see Chapter 3 of this document) and use a vulnerability assessment approach to identify potential mission impacts and management (adaptation and/or mitigation) priorities. The DOD's 2014 Climate Change Adaptation Roadmap presents the required policy framework for climate change adaptation planning and DOD adaptation strategies.

Climate change vulnerability assessments (VAs) for natural resources management typically assess: (1) sensitivity of a species or system to changes in the climate, (2) level of exposure to change, and (3) adaptive capacity of species or systems (Glick et al. 2011).

The VA process helps reveal the potential for future change not only in species viability or ecosystem vulnerabilities, but also in the effectiveness of management actions. This information can underscore the importance of existing management, assist in prioritization (or re-prioritization) of actions, or identify potential new desired actions. In the face of high uncertainty, however, often the best that can be achieved in terms of planning and management support is the articulation of hypotheses of change that can be evaluated under an adaptive management or experimental framework.

Addressing climate change poses new challenges for managers who now need to anticipate future changes in ecosystem structure and function in addition to understanding those ecosystems as they function now and in the past (Millar et al. 2007, West et al. 2009). Vulnerability assessments provide a foundation for this effort.

In August 2013, Detachment Fallbrook hosted a two-day climate change adaptation planning workshop, "Facilitating Climate Change Adaptation in Naval Weapons Station Seal Beach Detachment Fallbrook's INRMP". For a list of organizers and participants, see Enquist et al. (2013b). Goals of the workshop were to:

(1) identify potential climate change effects and resource vulnerabilities, focusing on riparian and coastal sage scrub communities;

(2) use an adaptation planning framework to develop specific management and monitoring strategies;

(3) develop and test methods in the more simplified operational environment on the Detachment to support development of a strategic plan for incorporating climate change adaptation planning into MCB Camp Pendleton's INRMP; and

(4) develop a process to facilitate integration of climate change adaptation more generally into INRMPs within the context of the military mission and existing threats and management.

Following presentations on projected climate scenarios for the southern California region, workshop participants collectively generated a range of potential environmental effects for coastal sage scrub and riparian communities. Acknowledging the uncertainty associated with the climate change projections and potential ecological effects, the participants generated the following management strategies for the Detachment:

(1) stay current with climate change research and leverage knowledge gained by others by participating in regional VAs and collaborations;

(2) utilize Climate-Informed Monitoring (CIM) to detect potential climate-influenced environmental changes, and facilitate climate-informed decision making (Lawson et al. 2015 and Lawson et al. in prep); and

(3) protect, or improve, the resiliency of sensitive resources to adverse impacts in general, including the potential effects of climate change.

It is important to recognize that the fundamentals of these management strategies were already employed at the Detachment, since adaptive management necessitates the monitoring for change detection and ecosystem management requires collaboration beyond installation boundaries and seeking ecosystem resiliency to stressors in general. Thus, climate change adaptation represents an evolution of management strategies but is not a stark departure from on-going approaches. Nonetheless, evaluating program elements through the lens of climate change adaptation helped frame management questions and set priorities in context of projected scenarios and the potential direct and indirect effects of climate change. The workshop revealed, for example, that sometimes small adjustments could be made in project prioritizations and implementation schedules that, when implemented, should help buffer systems from the potential effects of climate change.

The workshop evaluated the following climate change adaptation strategies and projects:

- *Vulnerability assessments*. – A number of approaches exist to assess vulnerability that vary in cost and complexity (Glick et al. 2011). VAs can range from a rapid assessment of climate exposure (e.g., relative to measures of biological richness) to those that utilize ecological response models to evaluate sensitivity and adaptive capacity (Enquist & Gori 2008, Enquist et al. 2008, Robles & Enquist 2011). Ecological response models also vary from simple conceptual models to complex spatially explicit metapopulation models. Different conditions will drive different approaches to VAs for various conservation targets. Factors that may require a modified VA approach include limited time, increasing threats, state of ecological knowledge, and/or funding (cf. case studies, Glick et al. 2011).

  One initiative to improve our understanding of potential vulnerability to climate change is identifying where the installation occurs relative to the range extent of native plant species. For example, a species on the southernmost edge of its range, or that is isolated, may be more vulnerable to climate change.

  While a number of VAs were developed for use in the workshop, and conducting VAs are appropriate in certain contexts at the Detachment, the natural resources program can also benefit from collaborations and climate change VAs conducted by others within the coastal southern California region. Due to the high uncertainty around climate change projections and ecological effects, the periodic review and update of VAs and associated hypotheses of change will maximize their utility in supporting a cost effective management program.

- *Climate-informed monitoring (CIM)*. – Climate-informed monitoring is a process to evaluate and optimize existing monitoring efforts, in part, by identifying gaps and opportunities relative to climate-informed management goals and objectives.

  The goal of CIM is to reduce uncertainty associated with climate change-related management issues. A CIM program seeks to improve our understanding of climate-related vulnerabilities in the context of adaptive management, and ultimately build both ecological and institutional resilience to ongoing change. CIM involves evaluating and adjusting, where necessary and feasible, biological and climatic monitoring so that the results generate robust information for making climate-informed management decisions. CIM is critical to understanding: (1) whether the climate is changing as projected, (2) the response of species and ecosystems to climate change, and (3) the effectiveness of natural resources management tools and strategies. Where uncertainty is high, workshop participants concluded CIM in itself constitutes climate change adaptation.

The first step in implementing CIM began during the 2013 workshop with initial review of current monitoring initiatives and programs at the Detachment for which many were found to already provide the basis for CIM. Nonetheless, possible areas to further optimize monitoring were identified (e.g., more localized and consistent weather monitoring, adjustments to avian survey variables) with a more in-depth review of the monitoring program currently ongoing.

- *Promoting resiliency*. – Incorporating climate change adaptation into natural resources management is difficult with the uncertainty associated with climate change projections, VAs, and hypotheses of change. Nonetheless, natural resources are currently exposed to a range of anthropogenic and environmental stressors, and management strategies that seek to protect or improve the resiliency of sensitive resources to these adverse impacts will also help buffer ecosystems from the potential effects of climate change.

  A recommendation was made during the workshop to investigate projects that improve watershed resiliency through restoration of groundwater recharge and percolation. Erosional downcutting throughout the Detachment has created channelized streams supporting only narrow riparian systems which do not facilitate lateral water movement or groundwater recharge resulting in a lower water table.

  The purpose of these recommended projects would be maintenance of water availability as a tool to mitigate the negative effects of prolonged drought, increasing temperatures, decreased ground water availability, and wildland fire. Under future climate scenarios, increased watershed resiliency may also buffer against the effects of extreme precipitation events that could challenge culverts and overpasses.

  Similar projects previously identified in the Detachment's INRMP were primarily for habitat enhancement. However, the workshop's recommendation served to identify an added driver for those projects and to re-prioritize their potential importance. An initial phase could start in the next few years with an investigation to identify hydrologic "hot spots" not functioning at optimal levels and concurrently prioritize restoration efforts over the course of 15–20 years for improving hydrologic functioning.

- *Regional partnering*. – A common theme during the workshop was the value of regional collaborations. Although there are differences among localized vulnerabilities (e.g., coastal versus inland areas), the potential effects of global climate change have similar implications for the region. Participation in region-wide initiatives and taking advantage of these partnerships would greatly help Detachment Fallbrook identify vulnerabilities to climate change and opportunities for adaptation. As regional partnering was already a fundamental component of the Detachment's management strategy, incorporating climate change considerations is a relatively minor adjustment and logical extension.

- *Other projects.* – Other examples identified during the workshop of ongoing management activities that promote ecosystem resilience in the face of climate change. These include:
  - treatment of high priority exotic plant species;
  - identification and protection of California gnatcatcher habitat refugia from fire, including working with the Fire Department to develop pre-suppression and suppression actions tailored to these refugia; and
  - targeted grazing to reduce the biomass of annual exotics, e.g., decreasing thatch to reduce wildfire risks and improving habitat for the Stephens' kangaroo rat.

4.2.8 Regional Partnering and Involvement

Natural resources on military lands do not occur in isolation. Ecosystem management not only includes stewardship of installation resources, but also entails involvement beyond Detachment boundaries at both local and regional scales. The interdependence of military lands with surrounding communities is evident for both its positive and negative effects. Just as urban development and land uses in the region act as stressors on native habitats and biodiversity as a whole, parks, preserves, and other open space buffers help provide valuable wildlife corridors and connectivity. The need for collaborative planning between the military and neighboring jurisdictions throughout the southern California region is central to effective and lasting solutions.

Photo 40. USGS regional study investigating the use of canines to detect American badgers. (Photo by C.M. Wolf)

The natural resources management program has engaged in multiple cross-boundary partnering opportunities over the years, and contributed to local and regional conservation and research efforts. In addition to attending national and regional meetings (e.g., National Military Fish and Wildlife Association, San Diego Partners for Biodiversity, Riparian Birds Working Group, Gnatcatcher Regional Monitoring Meeting, and the San Diego Weed Management Area), natural resources program staff endeavor to remain current on developments within scientific, military, and conservation communities through data sharing, collaboration, presenting talks, and, occasionally, hosting training sessions and working groups.

The natural resources program strives to collect data of regional value within the parameters of existing projects. The Detachment contributes to regional conservation through the granting of access for surveys, research, and related initiatives to the extent they are compatible with the mission and consistent with resource management objectives. Such collaborations not only benefit conservation and research initiatives in the region, but often confer multiple advantages to the Navy, including cost savings, subject matter expertise, an overall better informed management program, and positive public relations. Of particular interest for research are studies that have practical applications for conservation and management.

Following are several examples of past and ongoing partnering initiatives:

- Cross-boundary weed control partnerships with MCB Camp Pendleton; County of San Diego Department of Agriculture, Weights, and Measures; Mission Resources Conservation District; Fallbrook Public Utilities; Color Spot Nursery; and private land owners. By working with neighboring land holders, Detachment Fallbrook has been able to reduce the off-site sources of exotic invasive seeds.
- Participation in a 2013-2014 DOD Legacy-funded California Invasive Plant Council study on regionally coordinated invasive plant management (see Section 4.15).
- Shared contracting with MCB Camp Pendleton since 2012 for exotic aquatic animal control along the shared boundary of the Santa Margarita River (e.g., ECORPS 2013).
- Partnerships with MCB Camp Pendleton Game Wardens have included periodic animal control services, data sharing, blood testing of vultures for lead poisoning, etc.
- Coastal cactus wren surveys: In support of the Conservation Biology Institute's efforts to better understand the status and distribution of the coastal cactus wren, Detachment Fallbrook expanded the parameters of the CAGN survey to include documentation of cactus wren locations.

- Participated in regional genetics studies on various SAR, including coastal cactus wrens and California gnatcatchers (U.S. Geological Survey [USGS] studies) and Stephens' kangaroo rats (San Diego Zoological Society study).
- Contributed samples to the DOD Partners in Amphibian and Reptile Conservation (PARC) study on the amphibian disease, Chytridiomycosis (*Batrachochytrium dendrobatidis*) (Lannoo et al. 2014).
- Participated in development of DOD PARC's strategic plan.
- Provision of access to USGS to collect band data from least Bell's vireo.
- Provision of access to Department of Food and Agriculture to trap for crop pests.
- Participation in USGS study investigating the efficacy of using canine detection for surveying badgers (Brehme et al. 2012; Photo 40).
- Contribute to regional population inventories, to include incorporation of regional protocols where available into Detachment-specific surveys, for California gnatcatcher, coastal cactus wren, least Bell's vireos.
- Hosted vegetation classification and mapping workshop in 2010 (see Section 4.6).
- Hosted two-day climate change adaptation planning workshop in 2013 (see Section 4.2.7).

4.2.9 Management Actions

Many management actions presented in other sections throughout this chapter directly or indirectly support the protection and conservation of ecosystems at the Detachment. Conversely, the ecosystem management measures presented below have broad applicability and are expected to benefit multiple species and resources.

- *Avoidance and minimization:* – See Section 4.2.2. Implement avoidance and minimization measures, as appropriate, that:
  - Take into account direct, indirect, cumulative, and long-term effects of actions.
  - Reduce or eliminate potential adverse effects on local environment as well as the ecosystem as a whole.
  - Reduce habitat fragmentation and maintain community connectivity, especially with respect to the provision of ecosystem services.
- *Surveys and monitoring:*
  - Monitor focal species at appropriate scale and frequency that informs management decisions, and consider inclusion of additional focal species that may benefit the natural resources management objectives of providing umbrella protection or serve as an indicator for ecosystem health. See Section 4.2.3.
  - Sample LTETM plots every 5 to 10 years or at a frequency that land use changes or environmental conditions warrant. See Section 4.2.4.
  - Standardize methodologies to collect repeatable and comparable data for long-term monitoring, and when feasible consider collection of variables to support climate informed monitoring. See Sections 4.2.4 and 4.2.7.
  - Collect and maintain weather monitoring data, ideally from the RAWS on Detachment Fallbrook, and archive for long-term trend analysis. See Section 4.2.4.3.

- Maintain a species "watch list" and formal log of incidental encounters. Starting in 2015, the watch list will be submitted to the U.S. Fish and Wildlife Service (USFWS) and California Department of Fish and Wildlife (CDFW) for review and discussion as part of the annual INRMP metrics. See Sections 4.2.5
- Evaluate existing surveys and monitoring programs for CIM opportunities, and make data collection improvements where necessary and feasible. See Section 4.2.7.

- *Conservation and research:* – To the extent feasible and compatible with the mission:
  - Assess the vulnerability of natural resources in response to anthropogenic and environmental stressors, including the potential effects of climate change. See Section 4.2.7.
  - Implement conservation recommendations in biological opinions issued pursuant to the ESA.
  - Facilitate the protection, maintenance, and, where necessary, restoration of ecosystem services. See Section 4.2.2
  - Enhance degraded habitats providing for optimal species richness and native biodiversity and fostering a healthy sustainable ecosystem that is more resilient to current and future stressors. See Section 4.2.7.
  - Use climate change projections, and the adaptive management cycle, to periodically (re)evaluate the prioritization of projects. See Section 4.2.7.
  - Seek opportunities for the protection and conservation of pollinators. See Section 4.2.6.
- *Adaptive management:*
  - Seek opportunities to test predictions and assumptions, and to inform management decisions, with the collection of quantitative data and hypothesis testing. Endeavor to improve the repeatability and management of data for long-term trends analysis and to help evaluate the effects of land use and the efficacy of management actions.
- *Regional partnering:*
  - Contribute to, or facilitate regional research, conservation, and monitoring efforts to the extent compatible with the mission and natural resources management goals. Use partnerships to leverage knowledge gained by others. See Sections 4.2.6 and 4.2.7.

4.3 WILDLAND FIRE MANAGEMENT

Wildland fire management is not only critical for mission support, but is also an obligation by DOD for the protection and sustainability of natural resources on military lands (Federal Fire Policy 2001, DODINST 4715.03, DODINST 6055.06, OPNAV M-5090.1). We must protect life, property, and natural ecosystem functions and diversity, while maximizing service to the Pacific Fleet and minimizing total cost.

Objective: Implement a comprehensive wildland fire management program to reduce fuel load; support fire management network; ensure effective suppression capabilities; and protect, maintain, and enhance ecosystem functions and diversity.
Key Considerations: • Protection of critical mission infrastructure from wildland fire risks. • Protection of sensitive resources from undesirable fire regimes. • Balancing the costs and benefits of fuels reduction (e.g., grazing, mowing, and disking can accelerate erosion, encourage exotics, and be expensive). • Potential changes in wildland fire regimes under future climate scenarios. • Compliance with the conservation measures and other non-discretionary terms and conditions of the Wildfire Management Plan Biological Opinion (WFMP BO).

Important fire management drivers include the safety requirements for ordnance operations (Naval Sea Systems Command Operational Procedures 5, Volume 1 "Ammunition and Explosives Ashore–Safety Regulations for Handling, Storing, Production, Renovation and Shipping") and security guidance regarding "clear zones" (OPNAVINST 5530.13B and 5530.14C). Broader regulatory drivers for wildland fire management within DOD include the 2001 Federal Wildland Fire Management Policy, which is the primary interagency wildland fire policy document in the U.S., and the "DOD Fire and Emergency Services (F&ES) Program" (DODINST 6055.06, 21 December 2006).

With respect to wildland fire and natural resources management integration, the DOD's "Natural Resources Conservation Program" (DODINST 4715.03, 18 March 2011) specifies:

> *"All DOD Components shall manage fuel loads, provide adequate planning for wildland fire management and implement prescribed burn programs where appropriate. Responses to wildfire shall be conducted in a manner that preserves health, safety, and air quality; protects facilities; and facilitates the health and maintenance of natural systems. This management shall reduce the potential for wildfires, function as an ecosystem-based management tool, integrate applicable State and local permit and reporting requirements, and be consistent with DODI 6055.06 and the current Environmental Protection Agency Memorandum…" (p. 23)*

Reiterating DOD policy, the Navy's "Environmental Readiness Program Manual" (OPNAV M-5090.1, 10 January 2014) further instructs: "INRMPs shall address the need for management of fuel loads, including the use of prescribed burns, for habitat enhancement purposes and to reduce the potential for wildfires. A wildland fire management plan shall be developed… per habitat management objectives" (p. 12-33).

Detachment Fallbrook's Wildland Fire Management Plan (USDON 2003a) and its associated Biological Opinion (USFWS 2003a) address installation-specific assets and risk considerations; establish resource management objectives including avoidance and minimization measures, and provides pre-suppression, suppression and post-suppression guidance. The overarching goal of the WFMP is to "Protect life, property, and natural ecosystem functions and diversity, while maximizing service to the Pacific Fleet and minimizing total cost" (p. 1-1, USDON 2003a).

The WFMP BO provides programmatic Endangered Species Act coverage, including discretionary and non-discretionary requirements, for the majority of activities associated with fire management at Detachment Fallbrook and is referenced often throughout this INRMP.

Principle activities of the fire management program include: (1) preventing ignitions; (2) maintenance of the firefighting network of roads and firebreaks; (3) fuel reduction via cattle

grazing, mowed clear zones (e.g., on top of magazines, around explosives operating buildings, along paved roads), and prescribed burning; and (3) maintenance of the Fire Atlas.

For ease of discussion for the program, this section is subdivided into pre-suppression, suppression, and post-suppression aspects of fire management. The core principles and management strategies of avoidance and minimization, surveys and monitoring, ecosystem sustainability, and adaptive management apply to all elements of wildland fire management, and are presented in greater detail in the WFMP and WFMP BO.

Chapter 3 of this document presents the fire ecology of the Mediterranean type ecosystem of southern California and its implication for natural resources management. Other sections throughout the INRMP discuss the both the positive and negative potential effects of wildland fire on sensitive resources and SAR. On both a species and community level, fire return intervals, seasonality, size, and intensity all matter to the resilience of natural resources. Each plant has fire or disturbance response capability based on its life history. Although many native plant species are adapted to fire, short fire return intervals (e.g., less than 10 years), as well as the loss of unburned refugia, can be detrimental to many wildlife species. Fires that burn too hot can also kill plant reproductive structures (e.g., soil seed bank) causing slow recovery. Large fires that leave too few or too small refugia slow recolonization by wildlife, and they tend to result in a homogeneous vegetation pattern of a uniform age class.

Reducing fuel loads that might otherwise contribute to fire hazard can serve the dual benefit of mission support as well as natural resources management objectives. Within annual exotic dominated grasslands and areas of occupied Stephens' kangaroo rats, however, higher fire frequencies are considered beneficial under the right conditions. Prescribed burns or wildland fires in these areas would also benefit the mission by reducing fuel loads.

Fundamentally, wildland fire management is inherently an adaptive process. Decision making and optimal solutions depend on the context of a changing environment (e.g., fuel loads, recent fires, habitat status, and weather parameters), new biological information, changes in risks and assets, and changes in Detachment policies and priorities. Future climate conditions are also likely to affect fire regimes, which may necessitate reassessment of strategies at some time in the future. Successful implementation of wildland fire management requires not only cross-boundary and inter-organizational collaboration (e.g., Environmental Office, Public Works Department - Facilities Management Division (PWD FMD or Facilities), Ordnance, Explosives Safety, Security, and Fire Department), it entails feedback monitoring and periodic (re)evaluation of strategies.

4.3.1 Pre-Suppression

Pre-suppression wildland fire support refers to all preparatory measures instituted before a wildland fire occurs. Pre-suppression includes fuels management, fuel/firebreak maintenance, personnel training, development of planning documents, fire prevention measures, etc. The Environmental Office, Facilities, Fire Department, and other stakeholders coordinate to ensure pre-suppression tactics are designed to protect sensitive species and their habitats and to manage fire for the enhancement of biodiversity to the greatest extent feasible. Below are pre-suppression measures supported by the natural resources program:

- *Wildland Fire Management Plan and Biological Opinion.* – The Environmental Office provides for oversight and implementation of the natural resources management aspects of the WFMP and its associated BO, and helps facilitate non-natural resources aspects of the plan. The current WFMP has a 2003 publication date, but it remains a relevant and useful guide. Although the natural resources landscape was dramatically impacted by the Tomahawk Fire, the WFMP was intended to be adaptive, and core principles and processes still apply.

Future updates to make the document current are expected regarding the resource conditions, current regulations, research findings, and new assets; however, the fundamental objectives, fire management approach, and pre-suppression, suppression, and post-suppression activities are unlikely to change significantly.

As the WFMP BO (USFWS 2003a) does not have an expiration date, the Navy and USFWS have addressed emerging requirements as amendments to the BO.

- *Fire Atlas*. – The natural resources program maintains and publishes the Fire Atlas to assist the Fire Department in determining relative values at risk on a site-specific basis and to facilitate optimal avoidance and minimization during suppression events. For more information, see Section 4.3.2 Suppression.
- *Fire management planning*. – Fire management planning is an ongoing process and ranges from informal field observations and inter-organizational discussions to formalized field assessments and planning meetings. Formalized annual pre-firebreak disking meetings facilitate coordination between the Navy and Marine Corps and other stakeholders. Prior to 2005, firebreak disking was performed by the agricultural lessee. Currently, MCB Camp Pendleton manages the contract to maintain all firebreaks on both installations. Following the 2014 Tomahawk Fire, an additional annual meeting was implemented, which includes a broad cross-section of stakeholders to more systematically review fire management priorities, assess current range conditions and risks, and evaluate level of annual program readiness.
- *Firebreak maintenance*. – Firebreaks help slow or minimize the spread of fire at key defensive locations and are maintained annually by disking of the installation interior or blading on the northern perimeter. In accordance with the WFMP BO, the natural resources program supports the annual maintenance of firebreaks by conducting pre-disking surveys along select firebreaks and flagging all possible locations of Stephens' kangaroo rat burrows. Results are submitted to the USFWS annually, and biomonitoring is provided during actual disking operations to ensure avoidance.
- *Cattle grazing*. – The cattle grazing, which is performed across large portions of the installation, is the primary management tool for reduction of fuel load. Grazing typically occurs on a seasonal basis and is managed by the natural resources program with range conservation and real estate agricultural lease support from Naval Facilities Engineering Command Southwest (NAVFAC SW). (See Section 4.4 for more information about the grazing program.)
- *Prescribed burns*. – Prescribed burning is a pre-suppression fire management tool to reduce fuel load in strategic locations. Although this measure has the potential secondary benefit of habitat enhancement in certain contexts, it has been administratively challenging supporting a prescribed burn on the Detachment. Nonetheless, the use of prescribed burns will continue to be a fire management tool for potential applications in the future.

  In recent years, however, three unplanned wildland fires (Gavilan in 2002, DeLuz in 2013, and Tomahawk in 2014, Map 3-4) burned substantial portions of the Detachment, obviating prescribed burns for several more years. Prescribed burning for a fuel treatment zone along the northern boundary is proposed for a 5- to 10-year rotation in the WFMP. Prescribed burning to enhance Stephens' kangaroo rat habitat could be appropriate on a more frequent basis.
- *Mowing*. – The WFMP BO provides Endangered Species Act (ESA) coverage for the mowing and control of vegetation on magazines, along roads, and surrounding buildings and structures. See Chapter 2 for a description of the clear zone requirements for safety and security measures.

- *Invasive plant control*. – The control of invasive plants supports both pre-suppression and post-suppression fire management. See also Section 4.15 for more about the invasive plant control program.

- *Fire prevention*. – The prevention of fire ignitions is an important pre-suppression fire measure. Several installation rules aid in fire prevention, e.g., smoking only allowed in a few designated areas, restricted off-road travel for vehicles, hot work permits required for any work in magazines having potential to cause an ignition, welding activities require the presence of at least two people and a fire extinguisher. Following the 2014 Tomahawk Fire, an aggressive, proactive approach to the protection of powerlines involved the removal of numerous trees. Although fire prevention measures are designed to minimize ignition rates originating from the installation, many historic fires on the installation originated from off-site sources.

- *Surveys, monitoring, and research*. – In accordance with the WFMP BO, each federally listed species is surveyed throughout the Detachment on a 5-year rotational basis (see Section 4.13 for further discussion). Other monitoring elements that greatly benefit fire management objectives include annual abbreviated surveys of listed species, periodic biodiversity surveys, and vegetation mapping.

  The monitoring of fuel moisture levels and weather variables (e.g., temperature, precipitation, relative humidity, fuel moisture levels) for the purpose of fire management is typically conducted by MCB Camp Pendleton; however, in 2015, the Navy supported the refurbishment and operation of a RAWS on the Detachment. Localized weather data from the new RAWS will not only benefit fire management, but also other natural resources management programs, e.g., grazing management, threatened and endangered species management, long-term ecological trend monitoring.

  An objective in the WFMP is to support research and monitoring that may improve the efficacy and cost-effective use of pre-suppression, fire suppression, and post-suppression tactics, especially for the purpose of minimizing losses from fire and maximizing ecological benefits for targeted resources.

- *Personnel training*. – Annual training of natural resources personnel is required to ensure personnel serving as a natural resource advisor (see 4.5.2 Suppression) on a wildland or prescribed fire are safe and duly integrated into the response team. Wildland fire training courses are standardized and include S130, Firefighter Training, and S190, Introduction to Wildland Fire Behavior. Abbreviated annual refresher courses (RT130 and RT190) are also available after completion of initial courses. Supplementary courses such as 1100 (Introduction to Incident Command System) are also highly recommended. The MCB Camp Pendleton Fire Department typically facilitates the training for Detachment Fallbrook staff.

- *Firefighter training*. – Occasionally the Environmental Office provides compliance and project support for firefighter training on the Detachment, e.g., chainsaw training in scrubland, structure training in the old housing area.

4.3.2 Suppression

Photo 41. Helicopter refilling at Depot Lake for water drops during fire suppression. (Photo by C.M. Wolf)

Fire suppression activities conducted by the Fire Department and/or mutual aid firefighters include but are not limited to fire line construction, firing out, direct suppression (e.g., aerial drops of water or retardant), equipment staging, and "mop up" (extinguishing of spot burns and smoldering areas remaining after a fire has passed through) (Photo 41). Where possible, fire vehicles use existing roads or firebreaks for ease of movement and safety reasons; however, suppression actions may include driving off road, including over recently burned areas. Past fire patterns (Map 3-4) indicate the location of the majority of fire suppression activities that have occurred on the installation.

- *Natural resources advisor*. –Natural resources personnel serve in an advisory capacity during fire suppression events, providing technical assistance and subject matter expertise designed to protect sensitive natural (and cultural) resources. In accordance with the WFMP and WFMP BO:

  "*During fire suppression, the Conservation Program Manager at the Detachment will be contacted and will coordinate with Fire Department Incident Commander to minimize impacts to listed species on the Detachment. Due to the unpredictability of wildfire behavior and the need to contain wildfires, it is probable that wildfire suppression will require some impacts to habitat (such as cutting, burning, or blading of vegetation) occupied by listed species. The Conservation Program Manager will make recommendations to the Incident Commander based on known locations of listed species such that maximal effort is made to avoid listed species when possible." (p. 7; USFWS 2003a)*

- *Fire Atlas*. –The Fire Atlas is designed to facilitate avoidance and minimization of impacts to natural and cultural resources during a fire suppression event. The Atlas includes maps with underlying aerial photos that depict infrastructure assets, and sensitive natural and cultural resources. The Atlas also contains simplified suppression guidelines to aid decision making during an emergency response.

  The Atlas partitions the installation into Land Management Units (LMUs) based, in part, on landscape features and natural locations for wildfire defense. The LMUs also allow viewing sections of the installation at more relevant scales for the assets and resources in the area, unimpeded by map page breaks. The original intent was updating the Fire Atlas on a two-year cycle, but a three- to five-year cycle is expected to be sufficient unless significant events dictate otherwise.

4.3.3 Post-Suppression

Post-suppression fire management includes but is not limited to: fire mapping, assessment and reporting of fire effects, erosion monitoring and control, exotics monitoring and control, and other

potential restoration measures. The range and extent of post-suppression actions varies greatly depending on the scale and impacts of the fire.

- *Fire mapping*. – It is important to document and maintain records of all fires of any significant size to assess potential effects, evaluate possible trends, and contribute to future resource and fire management planning. The perimeter and severity of all burns greater than five acres are mapped and incorporated into the GIS fire history geodatabase. Additional attributes and metadata associated with the GIS file includes cause (if known), origin, and date of the fire. Fires less than five acres may also be included, possibly only as a point feature in the GIS database, as a means of documenting frequency and origin of ignitions.
- *Post-fire monitoring and research*. – Post-fire monitoring and investigative studies provide insight into, among other things, the efficacy of pre-suppression and suppression measures, resource recovery rates, and long-term effects of wildland fires on resources. Wildland fires also provide opportunities to assess short-term responses of certain species to changes in the landscape. For example, the potential for greater upland movement by arroyo toads in the relatively unimpeded, although more exposed, denuded landscape of burned areas.
- *Assessment and reporting*. – After a wildland or prescribed fire, the natural resources program performs an assessment of the potential effects of the fire, to include potential take of federally listed and other sensitive species. In accordance with the WFMP BO, the Navy is responsible for reporting to the USFWS the take of federally listed species known (or suspected) to have occurred as a result of prescribed burns or other fire management activities.
- *Increased vigilance*. – In most cases after a wildfire has burned native vegetation, the Navy will not conduct active restoration, and the vegetation will be allowed to re-grow naturally without any rehabilitative actions such as seeding or planting. However, the natural resources program will maintain increased vigilance for potential emerging management concerns, such as significant threats from erosion, or invasive and exotic species, which may require restorative measures.
- *Invasive species control*. – Landscape disturbances such as a wildland fires can create ideal conditions for invasive plants. Increased vigilance and targeted weed treatments facilitate post-fire succession of native species.
- *Type Conversion-* Occasionally, native resprouting shrubs may become problematic after a fire and/or as a result of extreme drought and could be considered for targeted treatments, e.g., to prevent the conversion of coastal sage scrub to a landscape dominated by laurel sumac. See Section 3.6.3 regarding the ecological effects of fire.
- *Erosion control and rehabilitation*. – Natural re-establishment of vegetative cover after a fire is the most effective form of soil stabilization and habitat recovery. Generally, seeding of burned areas is not recommended due to the unfavorable cost-versus-benefit ratio and concerns about non-natives interfering with the establishment of the native plant species. After most fires, especially cooler fires where plenty of mulch is left over, there is typically more than adequate natural seed supply left in the ground. If a post-fire erosion problem emerges, possible abatement measures will be considered on a site-specific basis. Following fires with extreme fire severity, and extensive habitat loss, the Navy will evaluate the potential benefits of more proactive rehabilitation. For example, following the 2014 Tomahawk Fire where extensive stands of the relatively slow growing prickly pear and cholla cacti had burned, which had been occupied by coastal cactus wrens, the Detachment initiated a cactus translocation and replanting project.
- *Increased site protection*. – With the possible exception of cattle grazing, land use at Detachment Fallbrook is such that minimal post-fire site protection is necessary as a burn site recovers. Should cattle be on the installation after a fire has burned through an area, the

natural resources program will assess the need to mitigate with a possible pasture rotation, cattle removal altogether, or other avoidance and minimization measures.

4.3.4 Management Actions

Many actions in this section are also accomplished through other programs in this INRMP (e.g., cattle grazing, weed control, erosion control), but are included below because of their relevancy to fire management.

Several actions listed below provide for implementation of conservation measures and other non-discretionary terms and conditions of the WFMP BO. Other conservation measures, terms and conditions, and conservation recommendations are included in the relevant program areas elsewhere in this INRMP. For example, the periodic *Brodiaea filifolia* and other sensitive plant surveys are covered in Section 4.7, Rare and Sensitive Plants. However, refer to the WFMP and accompanying BO for a complete list.

- *Pre-suppression:*
  - Review and update the WFMP and Fire Atlas as necessary. The Fire Atlas is expected to require updates every two- to five- years.
  - Annually collaborate with Fire Department, Security, Emergency Management, Explosive Safety, Facilities, and other stakeholders as appropriate on pre-fire season preparations to include field assessment of the firefighting network, facilitation of clear zone mowing in accordance with the WFMP BO.
  - Participate in annual command-level review of WFMP and fire season preparedness implementation.
  - Annually conduct pre-disking Stephens' kangaroo rat surveys on select firebreaks, report findings to the USFWS, and provide biomonitoring during disking operations. Seek to improve firebreak maintenance in select locations (e.g., the north-south firebreak in the center of the South Magazine) such that it may simultaneously provide Stephens' kangaroo rat habitat enhancement and fulfil fire management objectives.
  - Continue to implement cattle grazing for the primary benefit of fuels reduction and in a manner that minimizes erosion, adverse effects on riparian areas, and other negative environmental effects.
  - To the extent feasible and appropriate, conduct prescribed burns in a manner consistent with fuel reduction and habitat enhancement objectives, avoidance and minimization measures, BMPs, and other stipulations in the WFMP and associated BO. Prescribed burning is not expected to be conducted before 2019 for the purpose of fuel treatment, due to the Tomahawk fire of 2014.
  - Provide for the control of certain high priority exotic invasive plants.
  - Support fire management related surveys, monitoring, and research. This includes maintaining compliance with the WFMP BO with the provision of stationwide surveys of arroyo toad, least Bell’s vireo, coastal California gnatcatcher, and Stephens' kangaroo rat on a 5-year rotational basis. (See Section 4.13, Federally Listed Species.)
  - Ensure appropriate wildland fire and emergency response training is current to be able to safely provide resource advisory services during a wildland or prescribed fire.

- *Suppression:*
  - Provide technical advisory support, and facilitate utilization of the Fire Atlas, for the avoidance and minimization of adverse effects to sensitive natural (and cultural) resources during wildland and prescribed fire events.
- *Post-suppression:*
  - Ensure the mapping and incorporation into the Detachment's GIS database of fire burn severity for all wildland and prescribed fires that were five acres and greater. To the extent feasible, also include fires less than five acres, minimally as a point feature, to document frequency and origin of ignitions.
  - Seek to implement post-fire monitoring and research, as appropriate and feasible, especially for significant fire events that may have long-term effects on the resources.
  - Assess potential impacts of a wildland fire event and report to USFWS the take of any federally listed species known or suspected to have occurred as a result of prescribed burns or any other fire management activities.
  - For fire events of significant size and severity, consider the provision of increased site protections and possible rehabilitation during the early stages of habitat recovery.
  - Provide for increased vigilance for, and the control of, certain high priority exotic invasive plants.
  - Provide for increased vigilance for erosion, and consider possible erosion abatement measures in high risk, site specific situations.

4.4 AGRICULTURAL OUTLEASING (LIVESTOCK GRAZING)

Under the authority provided by USC Title 10 Section 2667, and consistent with SECNAVINST 11011.47C and OPNAV M-5090.1, Detachment Fallbrook maintains a cattle grazing lease for the primary purpose of mitigating wildland fire risk by reducing fuel load severity (pre-suppression fire management). A secondary purpose of livestock grazing program is habitat enhancement for the endangered Stephens' kangaroo rat and other native flora and fauna to the extent feasible. The cattle grazing program is covered under, and must be compliant with, the WFMP BO. The Grazing Management Plan (USDON 2016) outlines in detail what the program entails.

Objective: Maintain a sustainable and effective livestock grazing program to reduce fuel load and maximize the beneficial use of grazing as a natural resources management tool.
Key Considerations: • Grazing influences the biological, physical, and chemical characteristics of ecosystems and may have beneficial and detrimental effects. • Compliance with the WFMP BO and avoiding and minimizing adverse effects to federally listed species. • Grazing practices and prescriptions can affect/influence the ecological risks of soil erosion, water quality degradation, and adverse impacts to sensitive habitat (e.g., spread of exotic, invasive plants). • Riparian systems may be especially vulnerable to the detrimental effects of cattle grazing require greater management oversight. • As a prescriptive tool, grazing can help contain or suppress invasive plant populations. • As a prescriptive tool, grazing can enhance habitat for Stephens' kangaroo rats and other native flora and fauna, especially in exotics dominated communities. • Prescriptive grazing has logistical and economic limitations; options will not always be available for ideal solutions. • An agricultural lease must be economically viable for a lessee for the mutual benefit of the Government and lessee to maintain program sustainability. • Prescribed grazing requires monitoring and management to achieve desired results. • Designing and implementing effective grazing prescriptions requires range management expertise and a solid understanding of plant ecology, animal behavior, and plant-animal interactions at a particular site.

A well-managed grazing program maximizes the benefits of cattle grazing, reduces potential costs, and takes into consideration the diversity and long-term sustainability of the ecosystem (Photo 42). As discussed in Sections 2.3 and 2.4 and Chapter 3, the landscape at Detachment Fallbrook is not pristine. The annual exotics dominated grasslands, erosion-rutted terrain, and channelized streambanks present today reflect a legacy of impacts, including decades of dryland farming as well as livestock grazing. Within this context, natural resources management will never be able to turn back the clock to pre-European conditions, but the grazing program can be managed to minimize negative impacts and can even be applied prescriptively as a restorative tool. The premise that grazing degrades the land is an oversimplification.

Prescriptive grazing involves the application of livestock grazing regimens (e.g., adjusting the timing, intensity, duration, and herbivore type) to accomplish specific vegetation management goals (Frost & Launchbaugh 2003). A fundamental difference between traditional (or non-prescriptive) grazing and prescribed conservation grazing is that the former manages the land to benefit livestock, whereas the latter manages livestock to benefit the land. In grasslands dominated by annual exotics, which is common in California and other western states, prescriptive grazing is being viewed more and more as a means of reducing exotic invasive species and creating or maintaining habitat for native flora and fauna (e.g., Germano et al. 2001, King 2011, Christensen 2011, Barry et al. 2011, Hayes & Holl 2003, Immel-Jeffery et al. 2013, Marty 2005).

To optimally integrate fire management and environmental stewardship, prescriptive grazing at Detachment Fallbrook incorporates conventional principles of range management with monitoring conservation indicators for habitat management objectives. Residual dry matter (RDM) standards, for example, are employed for assessing the fuel load reduction for fire benefits and ground cover adequacy for soil conservation, whereas indicators such as plant height, grass versus forb ratios, native versus non-native species, riparian understory, etc. are taken into consideration for determining habitat value.

Photo 42. A well-managed grazing program can have resource benefits in beyond fire management. (Photo by R.S. Lockwood)

Grazing pressure and range utilization is managed using a variety of tools, including, but not limited to, the number of head of cattle; seasonal timing of grazing (cattle arrival and departure dates); pasture rotation order and timing (see Map 2-3 for pasture delineations); exclusion fencing; and strategic placement of salt licks, feed supplements, and supplementary water troughs (see Avoidance and Minimization for additional discussion of each). The unit of measure for herd size is referred to as "animal units" (AU), which is equivalent to the forage consumed by a 1,000-pound animal, such as a cow with or without an unweaned calf or two 500-lb steers. The number of Animal Unit Months (AUM), which is calculated by multiplying the number of AU by the number of grazing months, provides a useful indicator of the forage consumption for a given grazing season. (A stocking rate takes into account the AUM per acre.)

The Grazing Management Plan (USDON 2016) provides greater detail on the background, goals, objectives, and implementation of the cattle grazing program. For the purpose of integrated natural resources management planning, presented below are examples of range condition and habitat quality considerations that guide management decisions:

- *RDM, soil conservation, and erosion control*. – Properly managed Residual Dry Matter can provide protection from soil erosion and nutrient loss. RDM refers to the dead herbaceous plant material left on the ground at the beginning of a new growing season; it is what is remaining from the previous season's forage production after consumption from grazing animals and natural breakdown over the summer. Measured in pounds per acre, RDM standards vary depending on vegetation community type, percentage of woody cover, slope, other site specific conditions. At Detachment Fallbrook, RDM minimums are used to help ensure soil and hydrologic protection within the pastures at Detachment Fallbrook.
- *Native versus exotic plants*. – Grazing has the potential to increase or decrease weedy and invasive species. Prescriptive grazing for invasive plant management endeavors to favor native plant species by manipulating grazing parameters (e.g., timing and rotation) such that target weeds are at a competitive disadvantage relative to other plants in the community. With so many introduced annual species, restoration of grasslands to a native dominated community is unrealistic and management is geared towards favoring native species richness and abundance in grasslands to the extent feasible. Not counting exotic annual grasses, pastures at Detachment Fallbrook remain relatively weed free (TDI 2003; Kellogg & Kellogg 1990). A well-managed grazing program will complement the weed management program (Section 4.15) and help reduce the application of herbicides.
- *Grassland versus coastal sage scrub*. – Grasslands provide a higher forage yield for cattle, a reduced fuel load for fire, and habitat for the Stephens' kangaroo rat. However, coastal sage is an important vegetation community for the threatened coastal California gnatcatcher as well as many other native and sensitive species. Management of the proportion of grassland

and coastal sage scrub vegetation must consider the competing habitat requirements of the Stephens' kangaroo rats and coastal California gnatcatchers. Prior to the DeLuz and Tomahawk Fires in FY14, for example, coastal sage scrub vegetation had been expanding and encroaching on grassland habitat (e.g., based on vegetation mapping [TDI 2011a], aerial photos, LTETM plots [TDI 2011b]), and the gnatcatcher population appeared to be relatively stable, whereas the Stephens' kangaroo rat population had been exhibiting severe declines (Appendix L). Under these circumstances, management trade-offs tended to favor grasslands in key locations. Following the FY14 wildland fires, however, the recovery of coastal sage scrub is a top priority. Site specific management decisions will still be made on a case-by-case basis and take into account conditions required for the recovery of both species.

- *Grassland habitat quality*. – Prescriptive grazing for grasslands at Detachment Fallbrook seeks a greater degree of heterogeneity in range utilization than conventional approaches that aim to achieve uniform utilization for optimal cattle production. Within priority management areas for the endangered Stephens' kangaroo rat, optimal range utilization leaves a greater relative forb cover and approximately 20% bare ground. Such conditions may benefit the Stephens' kangaroo rat, but can pose a risk to long-term soil stability if plant cover becomes less than about 65%. Outside of Stephens' kangaroo rat priority management areas, greater ground cover and plant height are desired for improved soil stabilization and for other native grassland species (e.g., ground nesting birds) that may require more habitat structure.

- *Riparian habitat quality*. – Protection of sensitive riparian habitat, in particular willow understory, from cattle grazing is a management priority for the least Bell's vireo and other riparian species. Many creeks and drainages on Detachment Fallbrook provide important water sources for cattle and are exposed to at least some level of grazing. While grazing may help reduce weedy species, the effect of cattle on riparian systems has long been an interest at Detachment Fallbrook. On the one hand, aerial photos from 1928 show that almost no riparian vegetation existed within the current boundaries of the Detachment (Photo 19; Kellogg & Kellogg 1990). Although the steep banks and incised channels within several places along Fallbrook Creek and other drainages limit the extent of riparian habitat possible, riparian vegetation has increased since the Navy has owned the property. On the other hand, impacts of cattle grazing on riparian habitat are still observable. In the 1980s, for example, Kus (1988) noted that cattle have "removed or substantially degraded shrubby vegetation at all but a few sites on Fallbrook Creek" (p. 29). More recently, the effects of cattle within riparian vegetation were noticeable following a five-year grazing hiatus, 2005-2010 (ICF 2016).

  Measures that help protect sensitive riparian habitat from cattle include a seasonal grazing prescription, in which cattle are removed during the hot, dry summer months when they are attracted to riparian habitat for potential surface water and shade. The addition of supplementary water troughs has also helped reduce cattle dependency on natural water sources. (None of the historical supplementary water troughs that used well water or diverted surface water are currently functional. Between 2010 and 2011, three water troughs, two in Pasture 2 and one in Pasture 3, were installed with connections to the existing potable water mains. Additional troughs are desired but water sources have limited options.) Exclusion fencing has also been effective at protecting riparian habitat in some areas. The Santa Margarita River and portions of Fallbrook Creek are excluded from the grazing pastures. Pasture 4, which encompasses Depot Lake and associated riparian habitat, is only allowed to be grazed for up to one month before the vireo breeding season in accordance with the WFMP BO. Additional exclusion fencing of willow riparian is a conservation recommendation within the WFMP BO (p. 47). Lower Lake was fenced in 2009 and cattle access was regulated between 2010-2014 because of the lake's status as a UXO site. (There was no grazing in 2015 following the Tomahawk Fire, and Lower Lake

was removed from the subsequent agricultural lease award.) Additional exclusion fencing was added in 2014 downstream of Lower Lake.

- *Coastal sage scrub habitat quality*. – Cattle grazing has been considered potentially detrimental to California gnatcatchers and/or coastal sage scrub (Callaway & Davis 1993, TDI 2002). Nonetheless, cattle grazing has occurred on Detachment Fallbrook lands, throughout the majority of the coastal sage scrub vegetation, since before the Navy owned the property and California gnatcatchers have continued to persist and appear to exhibit normal population fluctuations (Appendix L). In the five years of annual California concomitant gnatcatcher monitoring and cattle grazing (2010-2014), neither direct nor indirect adverse effects of cattle grazing on gnatcatchers have been observed (see Section 4.13.6, California Gnatcatcher). Although the effect of cattle grazing within coastal sage scrub is evident, with cattle trails and grazing between plants opening up shrub canopies, the Conservation Program Manager hypothesizes that this effect may actually provide a benefit to the California gnatcatcher and coastal cactus wren, two species that prefer more open scrubland habitat (e.g., Grishaver et al. 1998, USFWS 2007). This hypothesis is based in part on the relatively high occurrence of both the California gnatcatcher and coastal cactus wren, and the relatively open shrub canopies, within relatively old (> 40 years since last fire) coastal sage scrub stands on Detachment Fallbrook prior to the FY14 fires. Moreover, while cattle may affect the rate of coastal sage scrub expansion, the vegetation community had been progressively expanding prior to the FY14 fires. Post-fire recovering coastal sage scrub is likely to be more vulnerable to impacts from cattle, and it will be important to maintain vigilance and be prepared to make management adjustments as needed when cattle return.

For the grazing program at Detachment Fallbrook to be prescriptive, monitoring feedback and adaptive management are required. Even under the best of circumstances, grazing planning entails reliance on uncertain predictions, such as rainfall and forage production. Periodic monitoring and adjustments facilitate meeting seasonal objectives in the face of these uncertainties. Animal behavior, and the interaction of animal behavior and seasonal variations in plant communities, can also be unpredictable. Prescriptive grazing has other limitations, too. Ideal solutions may not be an option. For example, the breed, sex, and age class of cattle can affect forage utilization; however, such herd adjustments may not be an option for the lessee. Changes to herd size and grazing duration also can have logistical and economic constraints. Monitoring and adaptive management can provide a means of mitigating such limitations.

The agricultural lease agreement is awarded through and administered by the NAVFAC SW Real Estate office. The NAVFAC SW Agricultural Program supports lease management, in part by helping to ensure compliance with terms of the lease. Traditionally, a certified range conservationist from the NAVFAC SW Agricultural Program and the Detachment Conservation Program Manager collaborate on the implementation of the lease and range management decisions with the lessee. Due to staff turnover in the NAVFAC SW Agricultural Program, a certified range conservationist from SPAWAR will provide subject matter expertise starting in Fall 2015. Revenue from the agricultural lease supports management of the lease and the grazing program; however, the program has been augmented in recent years with natural resources management funding in an effort to better fulfil prescriptive grazing and stewardship objectives.

4.4.1 Avoidance and Minimization

Cattle grazing, an important fire management tool, is perhaps the most pervasive contemporary land use affecting natural resources at Detachment Fallbrook. Below are measures designed to help avoid and minimize adverse impacts to federally listed and other sensitive species and resources:

- *Lease restrictions*. – The agricultural lease agreement is required to have a conservation plan (OPNAV M-5090.1) containing best management practices and restrictions to protect

natural resources. Certain activities, such as the use of pesticides, supplemental feed, predator control, or projects that involve digging, soil disturbance, or the removal of plants, are explicitly restricted in the lease agreement and require written authorization by the Navy if implemented.

- *Programmatic avoidance*. – Some activities associated with lease management, such as the maintenance of fencing, water troughs, and other cattle infrastructure, are programmatically covered under the WFMP BO and amendments with conservation measures that are designed to avoid and minimize potential adverse effects (e.g., conducting the majority of fence repairs outside of the avian breeding season).

- *Overgrazing avoidance*. – Grazing management seeks to avoid conditions that would be conducive to overgrazing, or excessive grazing that does not allow sufficient plant recovery. Avoidance of overgrazing is primarily accomplished through adjustments to herd size, seasonal timing, pasture rotations, and residual dry matter (RDM) monitoring (see below). Some areas within pastures will always be grazed more heavily than other areas (e.g., because of proximity to a water source). These "hot spots" are to be expected and may require site-specific management. (In some instances, relatively higher grazing pressure may even be desirable, as in the case of Stephens' kangaroo rats.)

- *Seasonal grazing*. – Grazing is conducted seasonally to minimize adverse effects that can occur during the summer and fall (e.g., excessive dependence on, and utilization of, riparian areas during the hot, dry months). The timing of seasonal grazing can also serve as a prescriptive tool for giving native species a competitive advantage and reducing excessive growth of exotic invasive plants. Year-long grazing had been practiced at various times historically on Detachment Fallbrook (e.g., records indicate year-round grazing from the 1970s until 1986). More recently, during the first couple years of the 2010-2014 lease, a reduced number of cattle were allowed to graze year-round as there had been excessive fuel load build up following a five-year period of no grazing. However, seasonal grazing was resumed as soon as cumulative effects on riparian habitats became noticeable. Seasonal grazing from approximately 1 January to 31 May coincides with the period of higher forage production. This also supports the fire management objective of removing fine fuels before they have a chance to mature, dry out, and potentially ignite. Cattle are not allowed onto the Detachment until significant rainfall has occurred from several storm systems and an assessment of the season's potential can be more accurately made.

- *Animal Units*. – Adjustments to herd size or stocking rates provide a means of managing potential effects of grazing. Prior to the mid-1990s, stocking rates were generally higher and were reduced for environmental benefits. Herd size is initially estimated in advance of the grazing season and takes into consideration RDM levels and habitat conditions remaining from the prior grazing season, duration of the grazing season, as well as projected plant production following winter rains. In some years, forage and habitat conditions may be such that grazing does not occur at all (e.g., with extended drought conditions and following the Tomahawk Fire, grazing did not occur in 2015).

- *Rotational grazing*. – Grazing land at Detachment Fallbrook is subdivided into four pastures (see Map 2-3), allowing control over the timing, distribution, and duration of cattle across the installation. Pasture rotation enables managers to avoid and minimize sensitive areas during certain times and to manage for other objectives such as weed control. The riparian pasture located around the Depot Lake, for example, is limited to grazing one month per year between 1 January and 1 March, to avoid the least Bell's vireo breeding season. Pasture rotations can also help accommodate unforeseen events such as a wildland fire, where it may be desirable to prevent premature access to a burn site. Typically, a four- to six-week duration is targeted for each pasture; however, this is adjusted based on projected length of the grazing season, range conditions, or other land use or management requirements.

- *Exclusion fencing*. – Exclusion fencing is used to protect certain areas from cattle access on a temporary or permanent basis. Exclusion fencing has been especially useful at keeping cattle out of sensitive riparian habitat. Cattle grazing operations are excluded altogether from the Santa Margarita River. Exclusion fencing has also been employed to protect the barbed goatgrass eradication site from potential cattle dispersal of propagules of that invasive plant. Although exclusion fencing has generally not been used for the protection of individual nest sites, for example, the use of temporary (e.g., solar electric) fencing may be a viable option under certain circumstances in the future.
- *Strategic placement of attractants*. – Water troughs, mineral blocks (also called salt licks), and other feed supplements serve as an attractant to cattle. The strategic placement of such attractants can affect the degree of cattle utilization of an area (e.g., increase cattle trails, reduced RDM, higher percent bare ground). Avoiding placement of such attractants within or near sensitive resources helps reduce impacts to those sites. Conversely, strategically placing such attractants in areas where cattle are desired helps manage forage utilization and cattle distribution with pastures.
- *RDM standards*. – Soil erosion and water quality degradation are minimized, in part, through the tracking of RDM measurements (see above). As a conservation measure in the WFMP BO, the Navy will continue to practice grazing in a manner that minimizes erosion and other negative environmental effects, which includes maintaining minimum RDM levels for soil and water quality protection.
- *Federally listed species*. – The potential effects of cattle grazing and activities associated with grazing management on federally listed species are covered in the WFMP BO and its amendments. Conservation measures that help avoid and minimize potential effects to federally listed species are generally captured above, but the species specific monitoring programs also provides vigilance for potential emerging areas of concern.

4.4.2 Surveys and Monitoring

Monitoring at different temporal and spatial scales is important to the grazing program for providing real-time feedback for adaptive management, as well as to provide an indication of potential long-term trends.

- *AUM*. – The herd size, or stocking rate, is tracked on a monthly basis throughout the grazing season. Monthly reports from the lessee include cattle on/off dates (when cattle are added to or removed from pastures) and the number and type of animals (breed, age, sex). These data are translated to a standardized AUMs within a given pasture. In conjunction with production forecasts (e.g., based on rainfall) and periodic range assessments, monitoring AUM can help track grazing intensity and identify potential opportunities for adjustments. Documenting annual AUM per pasture, as well as actual production, over time also enables predictions for future projected stocking rates for the installation.
- *RDM*. – Residual Dry Matter measurements are typically collected at the end of the summer or beginning of the fall. RDM exclusion cages allow comparison of RDM within grazed and ungrazed locations in each pasture. (Ungrazed RDM measurements provide an indication of the production for the year, but include RDM from prior years; RDM cages are moved annually so that prior-year RDM contributions do not accumulate over multiple years.) RDM is a useful indicator of how well the grazing targets were met for the year, plus the remaining residual matter is factored into stocking rate considerations for the next season. Modifications to RDM monitoring have included increasing of sample size and distribution in recent years. The addition of RDM mapping has is also being considered for its potential value in documenting the heterogeneity of range utilization.

- *Weather*. – Weather, especially precipitation and temperature, directly influence the type and amount of growth that can be expected in a given year. Although long-term weather predictions are tentatively relied on for initial grazing season planning (stocking rates are determined before the first of the year), actual weather parameters are tracked to more accurately estimate annual production and to be able to make mid-season adjustments if necessary. The continuity and accuracy of localized weather monitoring is expected to be improved with the installation of a RAWS tower on the Detachment in fall 2015. Maintaining weather records will also help in analyses of long-term trends.
- *Periodic and annual range assessments*. – In order to be able to adaptively manage a prescriptive grazing program, it is important to have periodic within-season range assessments and an annual assessment beyond RDM measures. Of particular interest during the growing season are the quantity (estimated biomass) and the quality of production in terms of natural resources parameters (e.g., forb versus grass, exotics versus natives, percent bare ground, and plant height). Periodic range assessments also provide an opportunity to identify and address potential problem areas. (The lessee is responsible for monitoring grazing infrastructure, such as fencing and water troughs; however, periodic range assessments can catch potential problems in these areas, too.) In recent years, informal range assessments have been conducted periodically and opportunistically by the Navy; however, observations did not tend to be formally documented. Starting in 2016, a grazing log will be maintained to help document mid-season decisions and events (e.g., disturbances such as fire). At the end of the year, a brief summary of range conditions and annual events will be included with the annual RDM measures.
- *Federally listed species*. – See Section 4.13 (Federally Listed Threatened and Endangered Species) for a summary of the monitoring programs for individual listed species. Although the primary purpose of listed species monitoring is to track population abundance and distribution parameters, a secondary benefit is to be able to identify potential direct or indirect effects of cattle grazing. Potential effects can be negative or positive, immediate or long term. To date, for example, no known incidences of incidental take as a result of cattle grazing have been documented with listed bird species even with multiple years of nest monitoring. Post-fire recovery monitoring of federally listed species will likewise provide an opportunity to observe potential effects of grazing and whether cattle are having a significant effect on the recovery of coastal sage scrub, prickly pear, or other recovering resources.
- *LTETM*. – The Long-Term Ecological Trend Monitoring program (see Section 4.2) tracks changes in plant composition and qualitatively notes, through visual assessment, grazing impacts on the permanent plots. Because the majority of the installation is subject to cattle grazing, few LTETM plots were originally established in ungrazed habitats. In 2015, however, a few additional LTETM plots were established within areas that are not currently subject to grazing. This should yield additional data for potential differences in trends between grazed and ungrazed plots.
- *Performance standards and indicator monitoring*. – Ecosystem health and grazing management success can be assessed by using performance standards and indicator monitoring. Residual dry matter is the one ecological indicator that has been monitored fairly consistently over the years. (Other indicators, such as water quality, have been monitored, but with less consistently or little documentation.) For monitoring to provide sufficient feedback for adaptive management in both the short and long term, a set of criteria and indicators that relate to management objectives are necessary. One initiative currently underway is a closer evaluation of performance standards and indicator monitoring for improving implementation, documentation, and program efficacy (UDSON 2015). As important as making sure that performance standards and indicator monitoring are effective, monitoring and documentation must be simple enough to be readily feasible

and sustainable. A component of this initiative includes improved integration of data collected in other monitoring programs (e.g., percent bare ground is collected at annual Stephens' kangaroo rat monitoring plots but the data are rarely tied back to annual RDM or AUM measurements).

- *Photo monitoring*. – In the early 2000s, an effort was made to establish photo monitoring points along certain riparian corridors in support of the grazing program. This effort was not continued during the 2010-2014 lease, in part, because of the difficulty in finding or matching up some of the original monitoring points with the photos. There can be value in photo monitoring that is consistently and systematically implemented. One project is to re-evaluate the feasibility of the photo monitoring program, or an abbreviated form of the program, for potential incorporation with current grazing monitoring documentation.

4.4.3 Conservation and Research

The grazing management program is expected to benefit in the long term from habitat restoration measures, such as invasive plant treatments and erosion control.

- *Exotic plant control*. – The primary objective of the weed management program is to enhance native habitats, but exotic plant control has an added benefit of improving range conditions and forage quality especially for invasive species that are not palatable or may be toxic to livestock (e.g., barbed goatgrass, oleander). (See also Section 4.15)
- *Agricultural infrastructure improvements*. – Numerous infrastructure improvements have been recommended over the years to improve the agricultural lease, many of which would have direct or indirect benefits to natural resources. In a cattle water study by George (2006), for example, additional water development projects were recommended to improve cattle distribution as well as to reduce reliance of cattle on surface streams. Three new troughs were added following that study; however, more supplementary water sources are still recommended. Because of the limited distribution for potable water lines, implementing cost-effective and reliable alternate water sources is challenging and could entail installation of water wells (may not be reliable in the long term) or constructing several miles of water lines.

  Another example of an infrastructure improvement project involves the development of one or two holding paddocks that could accommodate the entire cattle herd for up to three days with supplemental water and (certified weed free) feed. This could serve multiple purposes, but would have a benefit of providing a "quarantine" pasture where all the new arrivals would empty their gut contents over the course of a few days within the same general area. This would not prevent the possible transmission of a new invasive weed on the installation, but it would greatly facilitate early detection and rapid response to eradicate new species introductions.

  Aging barbed wire fenceline presented a serious challenge during the 2010-2014 lease, with numerous cow breaches and grazing occurring in unwanted, and sometimes unsafe, locations. The old fencing was slowly being replaced in small segments, but the Tomahawk Fire greatly expedited the process with the replacement of nearly 7 miles of burned fence lines in post-fire recovery initiatives. There are still old fencelines in unburned areas that will need replacement, but the situation has improved tremendously. This will greatly assist cattle management and allow greater focus on evaluating the potential need for fence expansion to improve range management and the protection of sensitive resources. A conservation recommendation in the WFMP BO is to fence more areas to exclude cattle from willow riparian habitat (p. 47).
- *Stockpond dredging*. – Consider dredging some stockponds and lakes on a regular schedule (e.g., every 10-20 years) to counter sedimentation, improve water retention, maintain utility

as flood control, and support groundwater recharge. (This activity would require a Clean Water Act [CWA] permit and USFWS consultation.)

- *Investigative studies*. – There are numerous investigative studies that could potentially inform or benefit the grazing management program. Of particular interest are studies that can help identify the effects of grazing on sensitive resources (e.g., willows, oaks, and water quality) and the efficacy of avoidance, minimization, and other potential mitigating measures. Also of interest is research that would help identify the best use of grazing as a prescriptive tool for fire management and weed control.
- *Regional partnering*. – Periodically, there is regional interest in the grazing program on Detachment Fallbrook, especially as livestock grazing is increasingly looked at as a possible habitat restoration and/or fire management tool. To the extent feasible, the Navy will contribute to regional partnering efforts for research and education with respect to the grazing program at Detachment Fallbrook.

4.4.4 Management Actions

Actions presented below are intended to support a prescriptive grazing program that optimally integrates fire management and environmental stewardship objectives:

- *Grazing program administration:*
  - Annually establish in the Fall, in collaboration with the lessee, Conservation Program Manager, NAVFAC SW Agricultural Program representative, certified range conservationist (if different from the Agricultural Program representative), and other potential stakeholders, a planned prescriptive grazing regimen for the year. Collaborate as needed throughout the grazing season to determine if or when adjustments to plan may be necessary.
  - Review the Grazing Management Plan annually, and revise periodically as needed.
  - Maintain an annual log of grazing management decisions and key events in a grazing season. (Annual log should also contain survey and monitoring results, and any conservation or research initiatives implemented; see below.)
  - Maintain on staff, or regular access to, personnel with sufficient subject matter expertise to include range certification, knowledge of local plant ecology, understanding of animal behavior and plant-animal interactions, and familiarity with resources and site specific issues at Detachment Fallbrook.
- *Avoidance and minimization:*
  - Implement avoidance and minimization measures that reduce or mitigate potential adverse effects of grazing and maintain compliance with the WFMP BO. (See Sections 4.4.1 and 4.5.1)
- *Surveys and monitoring: (See Section 4.5.2)*
  - Continue to collect, and improve upon where feasible, grazing monitoring parameters (e.g., pasture on/off dates, AUM, RDM, rainfall, production, and other ecological indicators).
  - Evaluate the potential value, efficacy, and feasibility of including additional performance standards and indicator variables, reinstatement of photo monitoring, and integration of potential data from other monitoring programs.

- Improve upon the documentation of grazing monitoring, assessments, and other miscellaneous observations.

- *Conservation and research: (See Section 4.5.3)*
  - Implement exotic and invasive plant control, as feasible and secondary to habitat enhancement for native species, for improved range conditions (e.g., targeting certain invasive weeds that are unpalatable or toxic to livestock).
  - Continue to pursue infrastructure improvements, such as supplementary water sources, fencing replacements or expansions, quarantine pasture, etc., that facilitate the management of cattle for prescriptive grazing objectives.
  - Where appropriate and feasible, implement investigative studies designed to inform or benefit the grazing management program.

- *Regional partnering:*
  - Support mutually beneficial opportunities for partnering with resource agencies, research institutions, or individuals for studies pertaining to prescriptive grazing management.

4.5 SOIL RESOURCES

Soil is a vital resource that provides fundamental ecosystem services, such as water filtration, and serves as the foundation for all plant and animal life. Soil degradation (e.g., contamination, compaction) and/or loss through erosion are fundamental natural resources management concerns. The loss and destabilization of soil can have devastating and long-term effects on production capacity, wetland values, ecological processes, sensitive species, installation facilities, and even the military mission of the Detachment (Photo 43).

The loss of soil from wind and water erosion can be greatly exacerbated by land use and is a serious environmental and public health problem. We must ensure soil resources are protected and managed for long-term support of the ecosystem and the mission.

Objective: Conserve soil productivity, nutrient functioning, water quality, air quality, and wildlife habitat through effective implementation of BMPs to prevent and control soil erosion and contamination.
Key Considerations: • Potential for accelerated erosion from certain land use activities (e.g., grazing, mowing, disking) or events (e.g., fire, flood). • Ground disturbance caused by erosion, as well as erosion treatments, may affect sensitive natural and cultural resources. • Treatment prioritization should consider assets at risk, severity and rate of erosion, and preventative maintenance that may avert more costly future repairs. • Periodic monitoring, especially following significant rain events, for early detection of emerging erosion issues and to evaluate the efficacy of treatments and BMPs. • Given the damage that flooding events can cause, it is in the best interest of the Navy to follow prudent management techniques necessary to maintain the integrity of upland slopes and riparian areas. • Program nexus with Facilities (e.g., priority erosion sites often threaten infrastructure) necessitates the close collaboration.

Federal land owners are required to control and prevent erosion by conducting surveys and implementing conservation measures (Soil Conservation Act PL 74-46; 16 USC S.5901). DODINST 4715.03 and OPNAV M-5090.1 direct the conservation of soil, especially that which

may affect water quality as regulated under the CWA, through both point source (e.g., discharge originating from a single location such as a culvert) and nonpoint source (e.g., discharge originating from a dispersed area) erosion control.

As presented in Chapter 3, the Detachment reflects a legacy of elevated rates of erosion. A 1990 erosion inventory indicated many of the larger erosion sites were from historic land use practices, especially dry land farming, and had largely stabilized (Kellogg & Kellogg 1990). Nonetheless, while many sites show signs of equilibration, other sites show signs of active erosion. Current land use related to the military mission that can accelerate erosion include, but are not limited to cattle grazing, magazine mowing, road maintenance, firebreak disking, and wildland fires.

In 2012, a follow-up stationwide erosion inventory conducted by AMEC (2013) evaluated and provided a prioritization of over 250 erosion sites, of which 69 sites were given a severity ranking of extreme or high. Recommendations from the AMEC study have since helped prioritize treatments.

One site in particular, the Fallbrook Creek culvert south of the administrative area, labeled as #272 in AMEC (2013), was recommended for immediate treatment to protect infrastructure and water quality. This site had been treated in the past, which helped temporarily abate the erosion, but treatments have been ineffective in the long term. In 2014, the project was contracted out (funded jointly by Environmental and Facilities) and the treatment completed by the end of that year (ACCI 2015) following the appropriate permit approvals. The site will continue to be monitored, especially following high rain and flood events, to determine the long-term efficacy of the treatment.

A third stationwide erosion inventory was not expected for at least another fifteen to twenty years; however, the 2014 Tomahawk Fire may advance the timeline with accelerated rates of erosion. Increased vigilance and site-specific monitoring are anticipated in the interim.

Future erosion sites are expected to be mainly treated on an as-needed basis, with consideration of the severity and rate of erosion and the assets at risk. The priority rankings and recommendations of AMEC (2013) will be considered with a phased implementation of treatments to the extent feasible and appropriate. Opportunities for maintenance-level treatment will also be emphasized, especially where they may avoid more costly future repairs. The potential effects of untreated erosion, as well as the erosion treatments themselves, on sensitive resources such as Stephens' kangaroo rats, water quality, or cultural resources must always be taken into account when determining site specific prescriptions.

Soil contamination at the Detachment Fallbrook is greatly minimized with contemporary land use not generating much potential hazardous waste in the first place, and with strict controls on the transportation, storage, and disposal of hazardous waste that is generated. However, past land use has left a legacy of soil contamination. Discrete locations of known or suspected contaminated sites have been identified within the Installation Restoration Program for evaluation and potential clean up (see Section 2.4.4).

Lastly, storm water best management practices (BMPs) not only serve to protect water resources, but also provide the secondary benefit of minimizing soil erosion and contamination.

Photo 43. Soil erosion not only threatens infrastructure such as the roads shown here, but also natural resources. (Photos by AMEC 2013).

4.5.1 Avoidance and Minimization

A top priority in soil conservation is through the avoidance and minimization of soil contamination and erosion in the first place. Specific measures:

- *Installation procedures*. – Projects that involve soil disturbance require review and approval from the Environmental Office. Off road vehicle use is greatly restricted and is mainly only permitted in the line of duty in an emergency response by Security and Fire personnel, such as pursuit of trespassers or fire suppression.
- *Project review and approval*. – Soil conservation is considered in all site feasibility studies and during project planning, design, and construction. Conservation measures may include modification of project design or location, control of hazardous substances, and application of appropriate BMPs. The Storm Water Management Program also requires that certain projects develop and implement a Storm Water Pollution Prevention Plan (SWPPP).
- *Erosion control BMPs*. – For construction projects and other site specific situations where there may be a potential for runoff, siltation, and erosion, BMPs such as straw wattles, sterile seeding, silt fencing, etc. are implemented. Preventative BMPs, such as clearing out

silted in or overgrown culverts, can also avoid greater impacts and more costly repairs down the road.

- *Grazing program.* – The grazing program continually seeks ways to avoid and minimize impacts to soil resources through monitoring of RDM levels, seasonal grazing, exclusion fencing, strategic location of mineral supplements and water troughs, etc. (Minimization of erosion and other negative impacts from cattle grazing is a conservation measure of the WFMP BO.)
- *Road maintenance*. – Dirt roads are maintained in a manner intended to minimize erosion (e.g., installation of water bars) so that roads remain safely passable and long-term maintenance costs are reduced. Proper drainage and flow are also considered in the repair and maintenance of paved roads, in an effort to avoid unsafe ponding or damaging erosion.
- *Firebreaks*. – Although disking of firebreaks can and does create erosion, it is generally considered less erosive than blading of the breaks. Disking occurs within the Detachment's interior; however, blading is still considered necessary along the northern perimeter of the installation where terrain is too steep for disking to be done safely. Firebreaks generally terminate before reaching riparian habitat.
- *Post-fire*. – It is often not feasible to conduct large-scale erosion control measures after a fire; however, burned areas are monitored for recovery and to identify significant problem areas that may need to be addressed. Firelines or bladed areas that may have been disturbed by fire suppression activities are also evaluated for potential erosion control measures, such as ripping compacted swales, installing water bars, mulching, or other appropriate activity.

4.5.2 Surveys and Monitoring

To date, soil erosion monitoring has been conducted via a couple of stationwide assessments over 20 years apart, and on an ad hoc basis, typically when problems arise. The AMEC (2013) report provides a foundation for a simplified and systematic future erosion monitoring approach by providing metrics, prioritization ratings, photos, and quantification of the status quo. Specific measures:

- *Annual and periodic assessments*. – Certain priority erosion sites (e.g., road crossings over creeks) are recommended for annual monitoring, with spot checks as needed (e.g., after heavy rains, wildland fires). For areas that have been treated, follow up assessments will similarly be done after major rain events to evaluate the efficacy of treatment methods and determine if re-treatments are necessary. Vigilance for possible new sites is ongoing. (See also erosion monitoring in Section 4.4, Agricultural Outleasing.)
- *Long-term, stationwide surveys*. – Long-term monitoring of wide-spread, systemic erosion across the installation is accomplished by implementing a stationwide inventory at intervals of approximately every fifteen years. The cycle may be contracted or expanded depending on inferences from site specific annual surveys and factors such as extended drought conditions, high rainfall years, significant changes in land use, etc. The most recent stationwide erosion inventory was completed in 2012 (AMEC 2013).

4.5.3 Conservation and Research

Erosion abatement and control measures may be conducted either by the Facilities or the Environmental Office, depending on the cause, location, and potential impacts of the erosion site. The treatment prescription for an erosion site depends on site specific conditions.

Examples of rehabilitation projects include:

- *Erosion "hot spots".* – Localized, high priority erosion sites, or "hot spots", are treated as needed at the Detachment. Many erosion hot spots may be treated with simple solutions. Occasionally, more complex solutions may be necessary, to include planning, a formal engineering design, permitting, and contracting. The Fallbrook Creek culvert site south of the administrative area is an example of a more complex level of effort, but it was considered a high priority because the erosion around the culvert threatened a key access road and was causing excessive stream bank erosion and siltation.
- *Preventative maintenance.* – Preventative maintenance includes erosion treatment at locations that are at high risk for erosion or are already exhibiting signs of active erosion. A more proactive, preventative approach is generally the most cost effective and provides the best overall resource protection. Moreover, a proactive management strategy has been shown to be able to extend the life of aging infrastructure elements such as roads and drainages (AMEC 2013). Facilities is responsible for the majority of erosion repair work conducted for the benefit of facilities to include periodic erosion repair on top of magazines to maintain required soil depths.
- *Long-term streambed and floodplain restoration.* – Several of the streambeds are greatly channelized which, among other things, lowers the water table, reduces groundwater recharge, diminishes hydrologic buffering capability of the system, and decreases extent of associated wetland habitat. There is a need for a long-term, more holistic approach to reducing channelization, improving sediment deposition, and slowing peak flows. Streambed and floodplain restoration that improves wetland resiliency will not only improve ecosystem services and benefit sensitive species, but also help buffer against potential adverse effects of land use, extreme weather events, and possible future climatic shifts.

4.5.4 Management Actions

Soil conservation and erosion control is accomplished through day-to-day responsible land management practices covered throughout this chapter (e.g., well managed cattle grazing, reduced fire frequency, limited anthropogenic disturbances).

Actions planned or taken to benefit soil resources include:

- *Avoidance and minimization:*
  - Implement avoidance and minimization measures for soil conservation and erosion control. See Section 4.5.1.
- *Surveys and monitoring:*
  - Monitor priority erosion sites annually, maintain vigilance for potential new emerging problem areas, and track efficacy of treatments.
  - Re-survey the 2012 stationwide inventory in ten to fifteen years.
- *Conservation and research:*
  - Aim to treat erosion hot spots every three to five years, with preventative maintenance more frequently as needed.
  - Research potential methods and feasibility of a large-scale stream restoration project that reduces channelization, slows peak flows, improves flood protection, and contribute to

overall wetland resiliency. Follow with a phased implementation as feasible and appropriate.

4.6 VEGETATION COMMUNITIES, HABITATS, AND LAND COVER TYPES

Vegetation communities provide the foundation for sensitive species habitat and a healthy functioning ecosystem. Accurate and current mapping of vegetation, habitat, and other land cover features serves as the initial basis for mission planning and project support. (Land cover includes general vegetation types, but also bare ground, open water, development, etc.) The primary legal and regulatory drivers for vegetation and habitat management at Detachment Fallbrook include the ESA (habitat mapping is a requirement of the WFMP BO), Migratory Bird Treaty Act (MBTA) (habitat protection), CWA (wetlands protection), and OPNAV M-5090.1.

Objective: Maintain, monitor, and restore plant communities to support optimal species richness, biodiversity, ecosystem services, and habitat resiliency.
Key Considerations: • Maintenance of sufficient habitat quantity and quality to support sustainable populations of the coastal California gnatcatcher, least Bell's vireo, Stephens' kangaroo rat, and arroyo toad. • Habitat connectivity, reduced fragmentation, and a high native species to exotic species ratio promote community resiliency to stressors such as, impacts from land use, wildland fire, exotic species, and drought. • Wildland fire is a natural feature of the ecosystem, but fire intervals that are too short or fires that are excessively large have a higher ecological risk than excessively long fire intervals or small patch burns. • Channelized streambeds lower the water table, reduce groundwater recharge, diminish the hydrologic buffering capability of the system, and decrease the extent of associated wetland habitat. • "No net loss" is a U.S. policy goal aimed at preserving wetlands. Clean Water Act permitting is required for activities that discharge, dredge, or fill jurisdictional wetlands or waters of the U.S. • Grazing influences the biological, physical, and chemical characteristics of ecosystems and may have beneficial and detrimental effects. • Accurate vegetation, habitat, and land cover mapping facilitates land use planning and project support. • Vegetation and habitat mapping protocols help standardize surveys for repeatable and comparable data enabling long-term trend analysis. (Insufficient standards in vegetation classification and mapping have confounded collection of repeatable, comparable data in past mapping efforts on the Detachment.) • Consistency with state classification and mapping standards provides comparability with region. • Regional trends and the potential influence of wide-spread environmental stressors, including non-native invasive species, drought, climate change, etc. • Partnerships and collaborative opportunities that contribute a broader perspective and yield mutually beneficial results from shared research and management interests.

The management of vegetation communities concerns not only habitat quantity but habitat quality and the functional value of resources within the ecosystem. Common indicators of habitat quality include, but are not limited to: native species richness and diversity; reproductively sustaining populations; the prevalence, or lack, of exotic invasive species; and habitat patch size, connectivity, or fragmentation.

Optimal habitat conditions depend, in part, on community type and the land use and management objectives. For ease of discussion, vegetation communities at Detachment Fallbrook are grouped into six main categories: coastal sage scrub; grasslands; riparian woodland and scrub; wetlands, streams, and ponds; oak woodlands; and chaparral. (These categories generally correspond to national terrestrial "Ecological Systems" classifications in NatureServe, Table 3-6, that are scored

in the Navy's annual Natural Resources Conservation Metrics.) Below are management objectives and regulatory and ecological considerations specific to each community type:

- *Coastal sage scrub*. – A primary management interest for the coastal sage scrub community is the maintenance of a sufficient quantity and quality of habitat to support a sustainable population of the threatened coastal California gnatcatcher and compliance with the WFMP BO. Use of the gnatcatcher as an umbrella species for the protection of native and endemic flora and fauna associated with coastal sage scrub is a common management practice in the region. However, because the gnatcatcher tends to be associated with certain subtypes of coastal sage scrub, management at Detachment Fallbrook also endeavors to promote and protect a range of species assemblages (or associations) to support a wider diversity of native plants and animals.

  A conservation measure in the WFMP BO is the maintenance of "a minimum of 2,000 acres of [coastal sage scrub] in a state suitable for occupation by gnatcatchers" (p. 10, WFMP BO). Suitable habitat was defined as Types I, II, and III CSS with >20% shrub cover following Varanus (2002). In 2000, there were approximately 2,167 acres of "suitable habitat". In 2002, 609 acres of this suitable habitat burned in the Gavilan fire leaving 1,556 acres remaining for use by California gnatcatcher. Although changes to the vegetation classification and mapping system confounded direct comparisons, TDI (2011a) estimated there was approximately 4,000 (4,165) acres of coastal sage scrub in 2007/08 that could be classified as gnatcatcher habitat based on the Varanus (2002) definition of habitat suitability (see Chapter 3 and below for discussion of vegetation classification and mapping challenges). Although much of the increase between 2000/02 and 2007/08 can be attributed to differences in classification and mapping methods, coastal sage scrub vegetation, including suitable gnatcatcher habitat, likely increased in in the field based on other areas of evidence (e.g., LTETM plots). Rainfall, lack of grazing, and absence of fire would presumably be contributing factors to an increase in CSS.

  Following the FY14 DeLuz and Tomahawk fires, only an estimated 1,484 acres of gnatcatcher suitable coastal sage scrub remain (based on the 2007/08 vegetation map and the amount of unburned Types I, II, and III CSS). These acreage estimates are considered only loosely indicative of actual gnatcatcher habitat. A useful project in the future would be to analyze newer habitat mapping efforts with the increased amount of gnatcatcher data available to develop a revised habitat suitability model.

  Coastal sage scrub is fire adapted, but there is a potential threat of too short wildland fire return intervals, reducing habitat quality for the gnatcatcher (see Section 4.13.6). Also, contrary to the notion that fires are needed to "rejuvenate" shrublands, data suggest there is a higher risk from fire return intervals that are too short (e.g., immaturity risk or recruitment risk) versus the relatively low risk (e.g., senescence risk) of excessively long intervals of 100 years or more (Zedler 1995). Similarly, patch burning or creating a mosaic of age-classes of coastal sage scrub to reduce the risk of large fires is also an outdated concept that is not supported by data (Keeley & Zedler 2009).

- *Chaparral*. – As chaparral communities on Detachment Fallbrook are generally not associated with any federally listed species, management interests are primarily focused on maintaining optimal species richness and diversity. Similar to coastal sage scrub, chaparral is fire adapted and some species are even obligate seeders or fire followers (seeds germinate only after a fire). Although most shrubland species in southern California can tolerate a range of intervals for fire recurrence, there is a greater risk associated with too short of a fire return interval versus excessively long return intervals ("immaturity risk is far greater than senescence risk", p. 108, Zedler 1995). The senescence risk may not be significant for many species for up to and exceeding 100-200 years between fires (Zedler 1995). Conversely, unplanned wildland fires or prescribed burns conducted to reduce fuel load (proposed in the

WFMP, but not implemented to date) are unlikely to be biologically problematic for chaparral (e.g., causing localized extinctions) unless the fires occur on a large scale or high frequency. Because much of the chaparral along the northern boundary of Detachment Fallbrook has burned within the last 10-15 years, current fire suppression efforts are expected to benefit, or at least not adversely affect, the ecology of this community for several more decades.

- *Riparian woodland and scrub*. – A primary management interest for riparian areas is to encourage the maintenance and expansion of habitat suitable for the endangered least Bell's vireo (e.g., sycamore-willow and willow-dominated) and for numerous other migratory birds. Such efforts are expected to include promotion of corridor connectivity; control of invasive plants; and protection from fire and excessive or unwanted grazing impacts. Nonetheless, it is anticipated that livestock will continue to utilize and, in some areas, have a pronounced effect on riparian habitat within grazing pastures. However, management initiatives will continue to monitor and adaptively manage these areas as appropriate.

  The Santa Margarita River does not occur within grazing pastures and natural flood regimes (and occasionally fire) are the primary disturbance agents for maintaining younger age class riparian zones. The variation of annual and season precipitation create a fairly dynamic riverine system that ranges from shallow, narrow wetted channels dense with herbaceous growth to highly scouring flood events that clear out vegetation and inundate the channel. This is a natural process and is not generally managed. Occasionally management intervention has involved the removal of beavers and opening up dams these animals may have created. As the reach of the Santa Margarita River along the installation's boundary is co-owned with MCB Camp Pendleton, efforts are made to coordinate management and share costs between the installations. One area of interest is to continue to improve data sharing. Although data sharing has been fully incorporated in some program areas (e.g., aquatic exotics control), other program areas could benefit from greater data exchange and comparisons of findings.

- *Open water and other wetlands*. – In addition to the national "no net loss" policy goal and other regulatory drivers for preserving wetlands (e.g., Sikes Act, EO 11990 [Protection of Wetlands], OPNAV M-5090.1), activities that discharge into, dredge, or fill jurisdictional wetlands or waters of the U.S. require permitting under the CWA (namely, Section 401 certification from the State Water Quality Control Board and Section 404 permit from the United States Army Corps of Engineers). Of primary interest for the management of lakes, ponds, and other wetlands is to maintain regulatory compliance and to protect and enhance their ecological integrity and functional value (e.g., as wildlife habitat, as a water source for livestock and fire suppression, for flood control, and for groundwater recharge).

  Although the ponds and lakes on Detachment Fallbrook were originally manmade (primarily for cattle stockponds), many flora and fauna utilize these wetlands today, including native amphibians and reptiles, migratory birds, bats, and other sensitive species. Many non-native species (e.g., exotic fish, bullfrogs, crayfish) are also associated with these habitats. Because no federally listed species is specifically dependent upon the lakes and ponds, and because there is no recreational fishing, management to date has not focused on the control of exotic animals in these systems or maintaining appropriate water chemistry (e.g., dissolved oxygen) for sustaining fish populations. In fact, the majority of ponds are ephemeral, drying out completely in the summer; some years, even Depot and Lower Lakes dry out. This likely helps keep exotic aquatic animal species in check. Occasionally, certain exotic aquatic animals have been opportunistically controlled in the ponds and lakes (e.g., bullfrogs and red-eared sliders trapped during the pond turtle study were not released). Unless there are compelling reasons to initiate such a program in the future, aquatic exotic animal control is not a management priority within the interior of the installation.

Factors that reduce the hydrologic potential of ponds and streams include the siltation of ponds and streambank erosion and channel downcutting. The majority of the streambank erosion and channel downcutting present in certain reaches on the installation was most likely due to historic dryland farming. Downcutting of the stream channel is a recognized impact in the Santa Margarita River due to historic and current upstream land use. Certain of the reaches in the Fallbrook Creek or Pilgrim Creek drainages may have restoration potential.

The status of Depot and Lower Lakes as Munitions Response Program (MRP) sites severely restricts management options; however, the avoidance and minimization of grazing impacts and non-intrusive enhancement measures (e.g., certain weed control, provision of basking sites for pond turtles) are still feasible at those sites. As for several of the other ponds, dredging would help counter sedimentation and improve water retention. In addition to invasive plant control, stream restoration projects geared towards reducing channelization, improving sediment deposition, and slowing peak flows will not only benefit vegetation communities and habitats, but it will help improve ecosystem services and buffer against the potential adverse effects of land use, extreme weather events, and possible future climatic shifts.

As with the ponds and lakes, the majority of vernal pools on Detachment Fallbrook were of manmade origin. Although they provide habitat for many vernal pool species including a non-listed fairy shrimp (*Branchinecta lindahli*), vernal pools on Detachment Fallbrook have not been found to have any federally listed species. For this reason, and because vernal pools are generally not at risk of impacts from mission related activities, the primary management objective for these wetlands is to maintain optimal conditions for native species diversity and to periodically monitor (approximately once every 10 years) for potential colonization by a listed species and for potential effects from grazing or other land use. Currently, only one vernal pool has cattle exclusion fencing; however, some studies have indicated that grazing can actually benefit vernal pools through the reduction in annual exotic plants and RDM (e.g., Barry 1998, Marty 2005, Barry et al. 2011). The potential benefits of grazing on vernal pool species richness and diversity at Detachment Fallbrook would be a valuable study for determining future best management practices.

- <u>*Oak woodlands*.</u> – Oak communities on Detachment Fallbrook are not directly associated with any federally listed species, however, they are of management interest because they provide habitat for many other native flora and fauna, soil protection and erosion control, and shade for livestock. For example, Bloom (1996) noted that most of the raptor nests found on the installation were located in oak woodlands and riparian habitat. There are likely few land use stressors on oak trees at Detachment Fallbrook. Although there is undoubtedly some negative effects of grazing on individual oaks, the oak community does not appear to be adversely effected by grazing which is evidenced in part by the presence of multiple age classes, including seedlings and saplings (indicating recruitment) (e.g., TDI 2007). Oak trees are fairly resilient to fires. It has been suggested (e.g., McCreary 2004) that fire suppression practices in California during much of the 20th century have created increased fuel loads and conditions that make oak woodlands more susceptible to severe, crown-consuming fires. If there is validity in this position, it is possible that cattle grazing could confer an indirect benefit to oaks through the reduction of fuel loads.

  Currently, the primary management concern with respect to oak woodlands has to do with the goldspotted oak borer (GSOB) (see Section 4.15). This invasive pest has been spreading in San Diego County and was recently identified in Orange County. The management strategy for addressing this threat is focused on early detection and rapid response. Should trees become infested by the goldspotted oak borer on the Detachment, it will be important to implement an aggressive removal of infected trees (and possibly neighboring oaks) in an effort to halt the spread.

- *Grasslands.* – The primary management objective for grassland communities is the maintenance of a sufficient quantity and quality of habitat to support a sustainable population of the endangered Stephens' kangaroo rat and compliance with the WFMP BO. Maintenance of at least 380 acres of grassland habitat occupied by Stephens' kangaroo rat at low densities is a management objective presented in the WFMP (see Section 4.13.7 for more detail).

  In the absence of fire or other disturbance regime, many of the annual grasslands on the Detachment will undergo succession to shrublands. While this can potentially benefit the gnatcatcher, succession to shrubland could diminish habitat quality for Stephens' kangaroo rat over time. Cattle grazing can help abate this natural succession, however, grazing may not be sufficient to stop or reverse shrubland encroachment. The use of prescribed fire, mowing, or other management tools may be essential for maintaining grasslands in priority management areas. Mowing for mission maintenance (e.g., magazine and roadside clear zones) appears to have been instrumental in maintaining habitat that support Stephens' kangaroo rats in some areas (e.g., around Buildings 380, the former site of Building 366, and the former napalm sites). However, the proximity of Stephens' kangaroo rats with high value mission assets can also present management challenges. Moreover, mowing for mission maintenance has also tended to favor weediness of grasslands and has supported high populations of ground squirrels, which can become pests.

  For native perennial grasslands that are not prone to succession to coastal sage scrub and annual grasslands outside of Stephens' kangaroo rat and fire management priority areas, a management interest is to pursue practices (mainly grazing regimes) that favor native perennials over exotics and retain sufficient habitat structure to benefit a diversity of grassland animals (e.g., grasshopper sparrow).

- *Eucalyptus.* – Because Eucalyptus trees are exotic species, they are not protected and there is a management interest in removing trees where they present a fire hazard (e.g., grove by old housing area) or where they may be encroaching on native habitat. The primary management objective is to avoid and minimize adverse effects to native species that may be using Eucalyptus trees (e.g., nesting birds). Although Eucalyptus trees appear to be establishing in in some riparian drainages, they do not appear to be highly invasive and are subject to periodic control as part of the weed management program.

The classification and mapping of vegetation communities, species habitats, and land cover types are extremely valuable for land management and mission support. Applications include:

(1) Project review and site approval

(2) Long-term planning support

(3) Potential effects assessments

(4) Natural resources management prioritization

(5) Information documentation (e.g., historic land use, fire events)

(6) Environmental trend assessments and other analyses

However, vegetation and habitat mapping can be challenging in terms of accuracy and repeatability. Fundamentally, all maps are subject to certain distortions and inaccuracies depending on the type of projection (i.e., transformation of the 3-dimentional Earth to a flat, 2-dimentional map), scale (e.g., large scale maps cover a small area with a high amount of detail), and many other factors (e.g., method of data collection, date of map). The accuracy of a map will influence its utility; inaccurate maps are unreliable. As no map is perfect, ground-truthing, or field verification, is typically required for project site approvals and effects assessments.

For natural resources management, vegetation and habitat mapping has the potential to provide snapshots in time that can be analyzed for potential temporal changes and trends. Changes in vegetation communities (e.g., amount, composition, diversity) can be a reflection of land use, land management, larger regional trends, and/or natural processes such as succession. However, trend assessments require a level of repeatability and standardization in mapping methodology so data are comparable from one survey to the next.

Lack of continuity and standards in the past has produced several mapping products over the years that do not yield reliable trend data (see Chapter 3). It became evident that a vegetation classification and mapping protocol was necessary to help standardize data collection and processing. Although many of the differences between mapping products could be attributed to things like discrepancies in scale, subjectivity in mapping polygon delineations (e.g., lumping versus splitting of habitat patches), and subjectivity in determining which species are dominant in a patch, a considerable source of variation had to do with the effort to transition to State standards of vegetation classification, namely the Manual of California Vegetation (Sawyer et al. 2009).

The Manual of California Vegetation (MCV) contains taxonomic keys to vegetation types and is designed to be consistent with ongoing national vegetation classification efforts; however, MCV has been in various stages of development over the years (Sawyer et al. 2009) and only relatively recently have alliances and associations been described for the western San Diego County (Sproul et al. 2011, Dunn & Kentner 2015). Although the regional classifications are becoming more mature and less subject to change, the process is still dynamic and additional alliances and associations may be added as more vegetation data are collected.

In addition to the challenges associated with an evolving classification system, correctly implementing the MCV classification and mapping process requires specialized training beyond that of many field botanists. To help raise awareness of this issue and provide an orientation to the MCV methods, the Detachment's natural resources program hosted a 3-day course (27-29 April 2010) taught by a MCV co-author (Dr. Todd Keeler-Wolf) for the DOD community in the region and DOD vegetation contractors at the time.

In an effort to help standardize vegetation classification and mapping, AECOM was hired to develop a protocol for the Detachment (USDON, in prep). This protocol will provide a classification key that includes all the known alliances and associations on the installation, and will include a description of mapping methods specific to the installation to help alleviate some of the error sources and discrepancies between previous mapping efforts. A certain level of error is still expected even with a standardized protocol.

4.6.1 Avoidance and Minimization

Overarching factors such as low levels of development and low-impact operations (Section 4.2.2) are expected to minimize or avoid adverse effects to vegetation and habitat. Additional measures specific to the avoidance and minimization of impacts to vegetation communities and habitats include:

- *Umbrella protection.* – Measures implemented for the avoidance and minimization of federally listed species and their habitats are expected to provide umbrella protection to several vegetation communities. (Section 4.13)
- *Installation rules.* – The intentional disturbance of habitat is prohibited without prior authorization. (Section 4.1.2 and Chapter 5)
- *Project review and approval.* – Projects that involve soil or vegetation disturbance require review and approval. The review process allows for incorporation of BMPs, possible

footprint modifications or site relocations, etc. to prevent unnecessary damage to native plant communities. (Section 4.2.2 and Chapter 5)

- *Erosion control BMPs*. – Water bodies and wetland communities are expected to especially benefit from BMPs that help avoid and minimize soil runoff, siltation, or erosion. To the extent feasible soil conservation and erosion control BMPs are incorporated in all activities on the installation, from new project designs (e.g., vegetated buffers and sediment traps) and construction activities (straw waddles, silt fencing, etc.) to managing the cattle grazing program for minimum RDM levels. (Section 4.5, Soil Resources)
- *Grazing management*. – The grazing program continually seeks ways to avoid and minimize adverse effects to vegetation communities and sensitive habitats to include RDM management, seasonal grazing, exclusion fencing, strategic location of mineral supplements and water troughs, etc. Cattle grazing operations are excluded altogether from the Santa Margarita River. (Section 4.4, Agricultural Outleasing)
- *Wetland and floodplain protection*. – Due to the additional regulations associated with wetlands and floodplains, activities that have the potential to affect these areas tend to be avoided and minimized. Projects that have potential effects to wetlands are duly consulted on, permitted, and mitigated as necessary. (Section 4.2.2)
- *Fire suppression and management*. – Pre-suppression measures to help prevent fire ignitions and lengthen fire intervals, and reduce risks associated with fires that do occur, are expected to benefit virtually all vegetation communities on the installation, with the exception of grasslands that could benefit from a higher fire frequency. Habitats that may be more vulnerable to fire or fire suppression tactics (e.g., riparian areas, habitat occupied by listed species) are depicted graphically on the Fire Atlas and are color coded to receive Level 1 (no ground disturbance) or Level 2 (no ground disturbance, no burning) restrictions. Although avoidance may be impossible during an emergency event, the Fire Atlas can facilitate avoidance and minimization when there are decision-making opportunities during the extended attack phase of a wildland fire. (Section 4.3, Wildland Fire Management)
- *Education and outreach*. – With the dispersed pattern of development on the installation, many mission facilities and occupied buildings are adjacent to, or even surrounded by, native habitat. Education can greatly facilitate avoidance and minimization of adverse effects to vegetation communities and habitats.

4.6.2 Surveys and Monitoring

Survey and monitoring data from other program areas (e.g., RDM, weather, LTETM, weed mapping, rare plants) are expected to directly and indirectly benefit vegetation and habitat management. Survey and monitoring initiatives specific to vegetation communities and habitat management include:

- *Aerial photos*. – Take or obtain new, ortho-rectified aerial photographs at a sufficient scale and with appropriate standards (e.g., time of day, season, type of film and filter) for vegetation mapping at least once every five to ten years. Aerial photos provide the basis for vegetation and land use mapping and allow for more accurate estimates of area for the detection and quantification of actual changes through time.
- *Vegetation mapping*. – Vegetation classification and mapping should occur stationwide approximately every 5 years (more or less frequent intervals may be warranted depending on changes in land use or environmental conditions).
    - Prior to another stationwide mapping effort, the vegetation classification and mapping protocol for Detachment Fallbrook needs to be finalized. A protocol will help standardize data collection methodologies and improve repeatability and comparability

for long-term monitoring. Due to the extent of the FY14 fires and the inability to develop the requisite baseline vegetation map for future comparisons or create a "dictionary" of alliances and associations, finalization of the protocol may require another 5-7 years. Interim landscape conditions and habitat recovery will be monitored, but not in the form of stationwide mapping of all vegetation communities.

- The protocol should include collection of additional variables (GIS attributes) to support species specific habitat features (e.g., prickly pear stands). (See Sections 4.2.4 and 4.2.6.)
- Ensure field surveyors have appropriate training and experience in implementing the MCV standards upon which the Detachment's protocol is based.

- *Habitat suitability mapping*. – Habitat mapping is a requirement in the WFMP BO for several of the federally listed species on the installation and is to be conducted every five years (see Section 4.13). Habitat mapping often relies heavily on vegetation maps as a starting point for identifying potentially suitable habitat, but suitability mapping usually incorporates more habitat parameters than just vegetation (e.g., age class, height, structure, etc.). Habitat suitability mapping may be conducted for other focal species as well (e.g., pond turtle, cactus wren).
- *Wetland surveys and mapping*. – Update the Tierra Data, Inc. (TDI 1996) stationwide wetland delineation map with sufficient accuracy to protect them from potential unplanned impacts (OPNAV M-5090.1), and determine which wetlands fall under the most current ACOE definitions for jurisdictional. A stationwide wetland delineation is unlikely to be necessary more frequently than once every 20 years unless land use changes or environmental conditions warrant otherwise. However, periodic wetland mapping on a smaller scale in localized areas can provide greater precision to ensure CWA compliance and mission support. Vernal pools should be surveyed approximately once every 10 years for the potential occurrence of federally listed species and for potential effects from grazing and other land use. Site specific jurisdictional determination of wetlands or other waters of the US may still be required prior to construction or a military activity.
- *Fire mapping*. – Ensure the mapping and incorporation into the Detachment's Geographic Information System (GIS) database of fire burn severity for all wildland and prescribed fires greater than five acres. (Section 4.3)
- *LTETM*. – Sample LTETM plots every 5 to 10 years or at a frequency that land use changes or environmental conditions warrant. (See Section 4.2.4)
- *Plant list*. – Maintain installation plant species list in the INRMP. Collect voucher specimens to verify new or un-vouchered species for the Detachment's herbarium and San Diego Natural History Museum.

4.6.3 Conservation and Research

Conservation and research from other program areas (e.g., Sections 4.2, 4.4, 4.5, 4.13) are expected to directly and indirectly benefit vegetation and habitat management. Conservation and research initiatives specific to vegetation communities and habitat management include:

- *Weed control*. – The control of exotic and invasive plants is an important means of promoting healthy vegetation communities and resilient habitats. (Section 4.15)
- *Agricultural infrastructure improvements*. – Infrastructure improvements that facilitate the management of cattle for prescriptive grazing objectives are intended, by design, to benefit vegetation and habitat management. (see Section 4.4)

- *Long-term streambed restoration.* – A long-term, holistic approach to reducing channelization, improving sediment deposition, and slowing peak flows should be conducted in phases. An initial study will help evaluate existing conditions, prioritize sites, and plan possible treatment options. A phased implementation approach could keep projects economically feasible and any direct temporary adverse effects localized. (see Section 4.5)
- *Prescribed fire.* – As feasible and appropriate, use prescribed fire to reduce the succession of annual grasslands into coastal sage scrub in Stephens' kangaroo rat management priority areas. Prescribed fire can also improve the ratio of native perennials to non-native annual grasses where perennials exist. Prescribed burns have been logistically challenging to implement; however, they can be very effective and should remain a management option. Following the FY14 fires, and with an active grazing program, prescribed burns for habitat enhancement are not expected to be of management interest for several years.
- *Pond habitat enhancement*. – As no fishing or recreational usage of the lakes and ponds at Detachment Fallbrook is permissible, management of these resources is primarily for the benefit of the fire management and grazing programs, to provide wildlife habitat, and to support groundwater recharge. The status of Depot and Lower Lakes as MRP sites severely restricts management options; however, non-intrusive enhancement (e.g., certain weed control) is still feasible at those sites. As for several of the other ponds, dredging on a regular schedule (e.g., every 10-20 years) would help counter sedimentation and improve water retention.
- *Coastal sage scrub restoration*. – Although coastal sage scrub restoration has occasionally been conducted as compensatory mitigation for construction projects, this vegetation community had not been the focus of habitat enhancements (beyond weed control) for many years. This is owed to the fact that coastal sage scrub was not only expanding in recent years, but the populations for two scrubland focal species (California gnatcatcher and cactus wren) appeared to be doing reasonably well. Following the FY14 fires, however, more proactive measures have been pursued, namely to support the recovery of the slower growing prickly pear cacti. As post-fire recovery is monitored, other measures that help prevent conversion of coastal sage scrub to less suitable habitat types for the gnatcatcher, such as those dominated by laurel sumac, may be implemented.
- *Investigative studies*. – Land management can always benefit from an improved understanding of ecological trends and interactions, potential effects of anthropogenic and environmental stressors, the efficacy of conservation measures and management decisions, and survey and monitoring techniques. An investigative approach can be as simple as applying experimental replicates to management techniques (e.g., erosion or weed treatment test plots) or testing the feasibility of new tools (e.g., use of hyperspectral imagery for more accurate species and community mapping). Other studies may be more complex (e.g., interaction of land use, fire, and the ecology of shrubland associations; effects of grazing on species richness and diversity in riparian and other wetland habitats). It is not realistic to treat every management decision as a research project, but it is important to recognize that the majority of management decisions are based on working hypotheses. There will always be uncertainty in predicting future conditions, but improved monitoring, investigative studies, and adaptive management can reduce the risks inherent in decision making.

4.6.4 Management Actions

Actions are focused on vegetation communities, habitats, and land cover types include:

- *Avoidance and minimization*:
  - Implement avoidance and minimization measures that reduce or mitigate potential adverse impacts to vegetation communities and habitats. (See Sections 4.2.2 and 4.6.1)

- *Surveys and monitoring:*
  - Take or obtain new, ortho-rectified aerial photographs at least once every five years.
  - Implement stationwide mapping efforts approximately every five years following recovery from FY14 fires and completion of vegetation and habitat mapping protocols.
  - Continue habitat mapping for focal species in a manner and frequency appropriate and as required per species.
  - Conduct wetland mapping at select locations to support continued natural resources and mission compliance with CWA, and provide an updated stationwide wetland delineation map approximately every 20 years.
  - Map the burn severity for all wildland and prescribed fires greater than five acres.
  - Sample LTETM plots every 5 to 10 years or at a frequency that land use changes or environmental conditions warrant.
  - Maintain updated and well-documented (vouchered) plant species list in the INRMP.
- *Conservation and research:*
  - Continue to implement annual invasive plant control.
  - Where appropriate and feasible, implement proactive conservation and rehabilitation measures to facilitate recovery of impacted habitats, maintain optimal balance of grassland and coastal sage scrub coverage, and foster ecosystem resiliency (e.g., infrastructure improvements for prescriptive grazing objectives, prescribed fire, long-term streambed restoration).
  - Where appropriate and feasible, implement investigative studies designed to inform or benefit land management.
- *Regional partnering*:
  - Contribute to, or facilitate, regional research, conservation, and monitoring efforts to the extent compatible with the mission and natural resources management goals. Use partnerships to leverage knowledge gained by others. See Section 4.2.8.

4.7 RARE AND SENSITIVE PLANTS

Rare and sensitive plants are those plant species that are at risk of extirpation or extinction. If not already federally listed as a threatened or endangered species, rare plants could become candidates for listing in the future. We must ensure rare and sensitive plants are protected and managed for long-term support of the ecosystem and mission.

Objective: Conserve habitats that would support rich native plant diversity, including rare and sensitive species, to the extent feasible considering the legacy of land use impacts and balancing contemporary land use requirements.
Key Considerations: • California Native Plant Society (CNPS) and other associations or entities that provide focused resources for the research, conservation, and management of California native and rare plants. • How to optimally employ grazing as a prescriptive tool to favor native species. • Adverse effects of exotic and invasive species. • Potential adverse impacts from grazing. • Potential measures that preclude the need for the listing of SAR. • Regional rare plant trends and the potential influence of wide-spread environmental stressors, including non-native invasive species, drought, climate change, diseases, etc., beyond the boundaries of Detachment Fallbrook.

To date, there have been no observations of federally- or state-listed threatened or endangered plant species on the Detachment; however, species that are state-listed rare and on the CNPS Inventory of Rare and Endangered Plants (the Inventory) have been detected (Table 3-7, Appendix J). The California Native Plant Society (CNPS) Inventory is a widely-recognized resource that promotes research, conservation, and enforcement of laws pertaining to plant conservation. The CNPS Inventory categorizes and ranks species (California Rare Plan Rank [CRPR]) in terms of their rarity or degree of concern.

The land use history, notably dryland farming, likely explains the relative absence of rare plants on the installation today (TDI 2007). Decades of cattle grazing also undoubtedly had an effect on the composition of plants seen today. HilleRisLambers et al. (2010) demonstrated that the displacement of native annuals by Mediterranean annual grasses in California may have been driven, at least in part, by cattle grazing.

However, the role of livestock grazing today is more complex, especially in context of an annual exotic dominated landscape where grazing is considered a potential prescriptive tool for maintaining or enhancing native diversity in the western U.S. (e.g., Dermano et al. 2001, King 2011, Christensen 2011, Barry et al. 2011, Hayes & Holl 2003; see also Section 4.4). Indeed, some view the decline in coastal ranching operations as a threat to California's native prairies (e.g., Immel-Jeffery et al. 2013). Although restoring native habitats, especially grasslands, to conditions prior to the arrival of Europeans in the 1700s is unrealistic, a well-managed grazing program and other land management practices may encourage higher diversity of native plants at multiple scales.

Grazing or other potential land use impacts are generally considered low risk to the rare plants on the Detachment. The most common rare plant is the Engelmann oak (*Quercus engelmannii*), which appears to have healthy population recruitment based on the occurrence of multiple age classes ranging from seedlings to mature trees (TDI 2007). The Detachment will maintain vigilance on oak recruitment, and only if necessary will consider management actions to further protect oaks, e.g., protect seedlings from herbivory, and clear fuels from around their base to reduce effects of any wildland fire.

To help ascertain the presence or absence of rare plant species, rare plant surveys are conducted in accordance with a WFMP BO Conservation Recommendation, covering selected areas or "panels" of the installation approximately once every five years. Survey panels rotate over time such that entire coverage of the installation is expected every 10-15 years. These generalized rare plant surveys can confirm the presence of rare plants, but negative results do not guarantee the absence of rare plants. Only accumulated rare plant surveys over time will provide more compelling

evidence for absence. For this reason, project-level surveys for federally listed plants known to occur in the vicinity of Detachment Fallbrook may still be required under certain circumstances.

Rare plant surveys are conducted during the appropriate season for optimal detection of a suite of potential rare plants, including thread-leaved brodiaea (*Brodiaea filifolia*), a federally listed threatened species that occurs on neighboring MCB Camp Pendleton. As the generalized rare plant surveys are intended to cover relatively large panels, they do not follow a strict protocol on the distance between surveyors; however, global positioning system (GPS) track logs of surveyor routes document the coverage of surveys in a given year.

In addition to providing an opportunity for detecting the potential presence of rare plants or contributing to the evidence for their absence, rare plant surveys serve as an invaluable tool for early detection of potential non-native or invasive plant species of management concern. It was during the 2005-2006 rare plant survey (TDI 2007), for example, that the barbed goatgrass (*Aegilops triuncialis*) was first discovered. Barbed goatgrass is a noxious invasive that has since been the subject of an aggressive eradication program (see Section 4.15).

Lastly, the rare plant surveys also contribute to the installation's herbarium by providing voucher specimens for species on the Detachment's plant list, even if not rare, that have not previously been formally vouchered. In the future, one set of voucher specimens is to be stored in the on-site herbarium; another set is to be submitted to the San Diego Natural History Museum.

If a federally listed plant is discovered in the future, the Navy will confer with USFWS to determine if additional protective measures are warranted.

4.7.1 Avoidance and Minimization

Overarching factors such as low levels of development (See also Section 4.2.2) as well as the umbrella protection associated with listed species and sensitive habitat management (See also Sections 4.6.1 and 4.13) are expected to minimize or avoid adverse effects to rare plant species. Additional specific measures include:

- *Federally listed plants*. – Although no federally listed plants are currently known to occur on the Detachment, project level surveys may be required to ensure avoidance and minimization of potential project impacts in certain contexts. Should a listed plant species be discovered, then management considerations, to include avoidance and minimization measures, will be evaluated and implemented as warranted.
- *Umbrella protection*. – Measures implemented for the avoidance and minimization of federally listed species and their habitats are expected to provide umbrella protection to rare plants (See also Section 4.13).
- *Wetland protection*. – Measures to avoid and minimize ground-disturbing impacts and/or the discharge of pollutants, including dredged or fill material, to wetland habitats including lakes, ponds and streams are expected to benefit rare plants (See also Sections 4.2.2 and 4.6.1).
- *Fire Atlas and site approval*. – Rare plants are depicted graphically on the Fire Atlas and are color coded to receive Level 1 (no ground disturbance) or Level 2 (no ground disturbance, no burning) restrictions. Rare plants are also evaluated for avoidance during the NEPA-regulated project review process.

4.7.2 Surveys and Monitoring

Periodic rare plant surveys not only help assess the potential presence or absence of rare plants, but also provide an opportunity to validate un-vouchered species on the installation's plant list and provide increased vigilance for emerging weed species of potential management concern. Specific measures:

- *Periodic rare plant surveys.* – Rare plant surveys are generally scheduled to occur once every five years. Surveys are conducted during the appropriate seasons for optimal detection of potential rare plants including federally listed *Brodiaea filifolia*. Survey panels rotate over time such that entire coverage of the installation is expected every 10-15 years. These generalized rare plant surveys are not project level protocol surveys. For this reason, project-level surveys for federally listed plants known to occur in the vicinity of the Detachment may be required under certain circumstances. The installation plant list (Appendix J) will be updated after completion of each new rare plant survey.
- *Periodic vernal pool surveys.* – Vernal pools surveys are expected to occur approximately every 10 years or at a frequency warranted by changes in land use or environmental conditions. In addition to sampling for the presence of federally listed fairy shrimp, which is a Conservation Recommendation in the WFMP BO, vernal pool surveys will include surveys for rare and federally listed vernal pool plants.
- *Periodic Engelmann oak surveys.* – Engelmann oaks are recommended for periodic monitoring (approximately once every 10 years) to assess population recruitment and potential effects from fire, grazing, or other potential stressors. This monitoring can be accomplished concurrent with a rare plant survey.

4.7.3 Conservation and Research

Rare plants are expected to benefit in the long-term from habitat restoration measures, such as exotic invasive plant control and a well-managed grazing program. Specific measures:

- *Exotic plant control.* – The primary objective of the weed management program is to enhance native habitats, which is expected to benefit a variety of native flora and fauna, including rare and sensitive plants. (See also Section 4.15)
- *Exotic animal control.* – Currently there is no exotic animal control for the primary benefit of rare or sensitive plant species; however, the Detachment maintains vigilance, and may employ control measures in the future for potential pest species, such as the goldspotted oak borer (See also Section 4.14).
- *Investigative studies.* – Investigative studies pertaining purely to rare plants are uncommon, but studies that address potential effects of land use and land management, or test the efficacy of potential mitigation treatments, could benefit rare plants.

4.7.4 Management Actions

Actions presented within this section will directly or indirectly support the conservation and management of rare and sensitive plants. Actions planned or taken to benefit rare and sensitive plants include:

- *Avoidance and minimization:*
  - Implement avoidance/minimization measures outlined in Section 4.7.1.

- *Surveys and monitoring:*
  - Perform periodic surveys, estimated to occur once every five years, for rare and sensitive plants including Engelmann oaks. Periodic surveys for *Brodiaea filifolia* and other rare plants is a WFMP BO Conservation Recommendation. Maximize the value of rare plant surveys by providing vigilance for other plant species of potential management concern. Explicitly include surveys for potential listed plant species during vernal pool surveys.
- *Conservation and research:*
  - Implement conservation and research initiatives as outlined in Section 4.7.3.
- *Regional partnering:*
  - Contribute to regional partnering efforts for the conservation of rare and sensitive plants to the extent feasible and compatible with resource management goals.

4.8 INVERTEBRATES

The invertebrates, animals lacking backbones, are not only the largest and the least understood of the animal groups on the Detachment, but they are integral to, and may provide indicators of, functioning healthy ecosystems. For this reason, management efforts include a better understanding of the invertebrate diversity present, facilitating early detection of any potentially new sensitive species or exotic invasive pest species, and supporting applied research.

No federally- or state-listed invertebrate species and no state species of special concern are known to occur on the Detachment. Periodic surveys for the three federally listed endangered invertebrates in the region, the Quino checkerspot butterfly (*Euphydryas editha quino*), San Diego fairy shrimp (*Branchinecta sandiegonensis*), and Riverside fairy shrimp (*Streptocephalus woottoni*), will enable management adjustments if detected in the future.

Objective: Conserve viable habitat to support optimal native invertebrate diversity on the Detachment and support investigative research to improve our understanding of invertebrate ecology, their potential as bioindicators, and susceptibility to environmental stressors.
Key Considerations: • Baseline inventory at the Detachment. Sample identification time is a limitation. • Optimal native invertebrate species richness and diversity. • Ecological role of invertebrates (e.g., as seed dispersers, pollinators, food for other species) and their potential value as indicators of ecosystem health. • Whether benthic macroinvertebrates serve as useful indicators for monitoring water quality and stream degradation. • Regional trends and the potential influence of wide-spread environmental stressors, including drought, fires, climate change, etc. • Early detection and rapid response to control the spread of potential new exotic invasive invertebrates that may threaten local ecology. • The potential future occurrence of invertebrate SAR (e.g., listed fairy shrimp). • Partnerships and collaborative opportunities that contribute a broader perspective and yield mutually beneficial results from shared research and management interests.

In the absence of wildland fires, cattle grazing, both past and present, may be the single most influential land use affecting the richness and diversity of invertebrate communities at the Detachment. Although cattle grazing has often been found to adversely affect invertebrate diversity (e.g., Strand & Merritt 1999), certain grazing regimens and habitat conditions have been associated with an increased native invertebrate diversity (e.g., Marty 2005). To the extent natural resources management is able to reduce grazing impacts to streams and sustain resilient native vegetation communities, these efforts are expected to benefit invertebrate populations.

Invertebrates are often considered potentially good candidates as bioindicators of species richness, community composition, and environmental stress. They are more diverse and abundant than vertebrates; major invertebrate groups are present over a range of habitats; their small size, and in some cases relative immobility, makes them sensitive to local conditions; and their short generation times yield rapid numerical responses (van Straalen & Krivolutsky 1996, Gerlach et al. 2013).

Benthic macro-invertebrates have been widely used as bioindicators in aquatic systems for years, especially for water quality. However, there are also disadvantages to using invertebrates, especially terrestrial invertebrates, as bioindicators. Species level identification and taxonomy of some groups is not clear, and sample processing can be time consuming (van Straalen & Krivolutsky 1996, McGeoch 1998, Hodkinson & Jackson 2005, Gerlach et al. 2013).

Results of benthic macro-invertebrate sampling in 2013 and 2015 were informative in that they indicated land use at the Detachment does not appear to be adversely affecting the health of the benthic community any more so than upstream sources (Amec Foster Wheeler 2016, Photo 44). In general, the relatively poor biotic integrity and stream condition index ratings were not atypical for the region (Amec Foster Wheeler 2016). Although the extended drought that southern California has experienced over the past few years likely had an effect on the results, the FY14 fires did not appear to have had much effect on the benthic community and may have even had a slight benefit (Amec Foster Wheeler 2016).

Photo 44. John Rudolph sampling for aquatic invertebrate as indicators of water quality.(Photo by MC1 Eli J. Medellin)

Average or above average rain years may improve sampling results, however, one challenge with standardized sampling protocols for macro-invertebrates within the interior of the Detachment is that there is often not sufficient flowing water in the summer months when sampling is more likely to yield mature and easier to identify invertebrate specimens. It is possible that benthic macro-invertebrate sampling may not be a very informative management tool for stream ecology and water quality monitoring at the Detachment. However, we will continue to seek improvements in water quality conditions, and it is useful to have baseline sampling data from standardized protocols.

Terrestrial invertebrate communities may prove to be an untapped resource for bioindicator monitoring; however, the application of terrestrial invertebrates as bioindicators in southern California systems has not been well studied and is an area that would require additional research.

Exotic, invasive invertebrates on the Detachment include Argentine ant (*Linepithema humile)* and red swamp crayfish (*Procambarus clarkii*). Although Argentine ants are an exotic invasive invertebrate of ecological concern (see Chapter 3), they are so widespread that they are not currently targeted for control. The exotic crayfish is also widespread, but more restricted to

waterways, and this species is subject to some control during aquatic exotics removal efforts in the Santa Margarita River. See Section 4.15 for further discussion on the control of exotic, invasive species.

4.8.1 Avoidance and Minimization

Overarching factors, such as low levels of development and reduced artificial night lighting (Section 4.2.2), as well as the umbrella protection associated with listed species and sensitive habitat management (Section 4.13) are expected to minimize or avoid adverse effects to native invertebrates. Additional specific measures include:

- *Limited pesticide use*. – Insecticide application is uncommon and typically only within administrative/building areas. See Sections 4.2.2 and 4.14 (Pest Animals and Animal Control).
- *Soil erosion BMPs*. – Measures that improve water quality through the minimization of soil erosion, runoff, and siltation are expected to directly benefit aquatic invertebrates.
- *Federally listed invertebrates*. – Although no federally listed invertebrate is currently known to occur on the Detachment, project level surveys may be required by the USFWS for invertebrates (e.g., listed fairy shrimp species) in potentially suitable habitat. Should a listed or sensitive invertebrate species be discovered then management considerations, to include avoidance and minimization measures, will be evaluated and implemented as warranted.

4.8.2 Surveys and Monitoring

Currently there are no invertebrate focal species targeted for monitoring at the Detachment. Historic and current invertebrate surveys are summarized below:

- *Richness/diversity surveys*. – Given the vast array of species represented by invertebrates and the different expertise and sampling methodologies required (e.g., terrestrial versus aquatic, diurnal versus nocturnal), invertebrate surveys have historically focused on specific taxonomic groups, including ants, termites, Lepidoptera, and aquatic macroinvertebrates. Future invertebrate richness and diversity surveys should emphasize taxonomic groups that may indicate ecosystem trends, species that may be federally listed, and repeatability for possible trend monitoring.
- *Aquatic macroinvertebrate sampling*. – Aquatic benthic macroinvertebrate sampling has been conducted for the purpose of comparing a suite of indicator species with regionally appropriate indices of stream water quality, such as the California Stream Condition Index (Amec Foster Wheeler 2016). The use of aquatic benthic macroinvertebrates for stream condition monitoring in the future will depend, in part, on the findings of the current initiative (Amec Foster Wheeler 2016).
- *Listed fairy shrimp*. – No federally listed fairy shrimp were detected in the basewide wet season surveys (Cobb 2009). Re-sampling for the presence of federally listed fairy shrimp and other sensitive vernal pool species that have the potential to occur in appropriate ponding areas is a Conservation Recommendation in the WFMP BO, and expected to occur approximately every 10 years or at a frequency warranted by changes in land use or environmental conditions.
- *Watch list species*. – Vigilance for invertebrate watch list species, to include setting periodic traps for the exotic, invasive species not yet known to occur on the Detachment (e.g., goldspotted oak borer, ash borer), will allow for rapid response in the event the species is detected.

4.8.3 Conservation and Research

Invertebrate species are expected to benefit from habitat restoration measures, such as exotic invasive plant control. There is also an opportunity in using adaptive management to take advantage of the periodic surveys for listed and sensitive species, if future conditions warrant land management adjustments. Specific measures:

- *Exotic and invasive plant control.* – The primary objective of the weed management program is to enhance native habitats, which is expected to benefit a variety of native flora and fauna, including invertebrates such as many species of bees (*Bombus* sp.).
- *Investigative studies.* – Few if any investigative studies have been conducted on invertebrates and their role in the ecosystem at the Detachment. Future research may help inform natural resources management, e.g., the feasibility of invertebrate indicator species, potential control methods for exotic invasive species, response of invertebrate assemblages to disturbance across a land use gradient, relationship of insect communities to CAGN.

4.8.4 Management Actions

Actions presented within other sections of this chapter often directly or indirectly support the conservation and management of invertebrates. Below are management actions specifically applicable to invertebrates and their habitat:

- *Avoidance and minimization:*
  - Implement avoidance and minimization measures that help conserve and protect native invertebrates (e.g., control and minimize the use of pesticides, implement soil erosion BMPs). Should invertebrate Species at Risk (SAR) be identified in the future, implement measures as appropriate that avoid and minimize adverse effects to such species. (See Sections 4.2.2 and 4.8.1)
- *Surveys and monitoring:*
  - Conduct periodic reconnaissance surveys for invertebrate species richness and diversity, for water quality indicator species, for the potential occurrence of invertebrate SAR (e.g., listed fairy shrimp), and for the early detection of potential new exotic invasive invertebrate species. The WFMP BO contains a conservation recommendation to conduct periodic surveys for the San Diego fairy shrimp and other sensitive vernal pool species.
  - Maintain vigilance for watch list species, to include periodic monitoring for gold spotted oak borer and other exotic, invasive invertebrates, to allow for rapid response in the event the species is detected.
  - Maintain log of incidental encounters of watch list or other invertebrate species of potential management interest, especially if the observation is not already included in a survey report.
- *Conservation and research*
  - Implement exotic and invasive plant control for the enhancement of native habitats.
  - Incorporate, as appropriate and feasible, studies on the ecological role and potential management implications of invertebrates in the ecosystem. This is likely to be accomplished as part of a larger regional partnering effort.

- *Regional partnering:*
  - Support mutually beneficial opportunities for partnering with resource agencies, research institutions, or individuals to investigate invertebrate diversity and ecology, the potential use of invertebrates as bioindicators, methods of control for invasive exotic invertebrates, etc.

4.9 FISH

Natural resources management is not directly focused on the sustainability of fish populations within the interior of the Detachment for a number of reasons. The ponds and lakes on the Detachment were manmade, all of the fish species present are presumed non-native, and the dissolved oxygen levels are likely well below levels typically required for good fish populations. Moreover, recreational fishing is prohibited and the two largest lakes are MRP sites (see Chapter 2). Native fish species for this region are not usually associated with ponds or lakes with the exception of the threespine stickleback for which there was one an unsubstantiated record (See Section 3.9.1.2).

Nonetheless, freshwater fish populations would be expected to benefit from the management of pond, lake and stream habitat for other ecological benefits (e.g., habitat for pond turtles and water fowl) and hydrological values such as groundwater recharge and flood attenuation capacity (see Section 4.6).

Objective: Conserve habitat that support native fish diversity within the Santa Margarita River.
Key Considerations: • Adverse effects of exotic and invasive species. • Periodic reconnaissance for special status species. • Water quality and adequate riparian buffers for potential adverse impacts from grazing. • Partnerships and collaborative opportunities that contribute a broader perspective and yield mutually beneficial results from shared research and management interests.

Fish species within the Santa Margarita River are also dominated by exotic invasive species. However, two native fish species have been detected within the river upstream and/or downstream of the Detachment. Both are special status species: the arroyo chub (*Gila orcutti*), a California species of special concern, and the federally endangered southern California steelhead (*Oncoryhnchus mykiss*) (CNDDB 2014, USFWS 1998b, NMFS 2010, Warburton et al. 2000).

While there has been no contemporary observation of either species in the reach of the Santa Margarita River on the Detachment (see below for reconnaissance opportunities during exotic aquatics control efforts), the periodic or transient presence both species can be assumed at some level, especially for the steelhead, depending on the rain during the year.

Non-native aquatic fauna, including bullfrogs, crayfish, as well as many species of exotic fish, pose a threat to native fish species (e.g., through predation and competition). Historically, a few isolated aquatic exotics control measures had been conducted by the Navy.

Since 2012, Detachment Fallbrook has partnered with MCB Camp Pendleton to implement an annual program extending control efforts farther upstream, covering the length of the Santa Margarita River within the DOD enclave (Photo 45). Control measures upstream of the DOD enclave would facilitate an even more effective watershed approach.

In addition to removing exotic aquatic wildlife species from the Santa Margarita River, the surveyors identify all fish species caught in the seine nets and other fish traps. In this manner, the aquatic exotics control program provides an opportunity for reconnaissance for native fish. Aquatic exotics control has been ongoing within the Santa Margarita on Camp Pendleton, off and on, for over twenty years. To facilitate river access and the extension of the exotic aquatic control efforts further upstream along the boundary of Detachment Fallbrook, the Navy and Marine Corps have collaborated annually since 2012. Each year, the program removes thousands of exotic fish from the Santa Margarita River, hundreds of which are removed from the reach along Detachment Fallbrook's boundary. No native fish have been caught to date along the reach bordering the Detachment.

It is worth noting that although the exotic aquatic species removal program provides an excellent opportunity for detecting fish species, the program is not conducted during high water flood events when river conditions would be dangerous for personnel. However, it is during such flood events that river conditions are more optimal for steelhead migration within the river corridor along Detachment Fallbrook's boundary.

Photo 45. Removal of detrimental aquatic exotic animals from the Santa Margarita River. (Photo by ECORPS 2013)

4.9.1 Avoidance and Minimization

Overarching factors such as low levels of development, low-impact mission, and protection of wetlands (Section 4.2.2) are expected to avoid and minimize adverse effects to aquatic life in general. Additional specific measures include:

- *Limited pesticide use.* – Avoidance and minimization of potential impacts from pesticides on bodies of water and associated wetlands at the Detachment are expected to benefit fish and other aquatic life (Sections 4.2.2, 4.14, 4.15). Nonetheless, since the Detachment occurs farther downstream of the relatively large Santa Margarita River watershed, pesticides are expected to enter waterways on the installation via urban and agricultural runoff farther upstream (see Section 3.4.5).

- *Soil erosion BMPs*. – Measures to improve water quality through minimization of soil erosion, runoff, and siltation are expected to directly benefit fish and other aquatic life.
- *Wetland protection*. – Measures to avoid and minimize ground-disturbing impacts and/or the discharge of pollutants, including dredged or fill material, to wetland habitats, which include lakes, ponds, and streams, are expected to benefit fish and other aquatic life (Sections 4.2.2 and 4.6.1).
- *Land use in the Santa Margarita River*. – The Navy currently, and for the foreseeable future, has virtually no mission related activities within the Santa Margarita River, which is expected to benefit fish and other aquatic life (Sections 4.2.2).
- *Installation rules*. – Due primarily to the safety and security restrictions associated with the mission, fishing is not permitted. Although historically conducted within Depot and Lower Lakes, fishing is no longer permitted for the additional reason that those lakes are now classified as MRP sites. The intentional disturbance of wildlife and habitat is prohibited without prior authorization.
- *Federally listed species*. – Measures implemented for the avoidance and minimization of federally listed species (e.g., arroyo toad, least Bell's vireo) are expected to provide umbrella protection to steelhead, and other fish SAR and their habitat, within the reach of the Santa Margarita River along the Detachment.

4.9.2 Surveys and Monitoring

Currently there are no fish focal species targeted for monitoring. Historic and current fish surveys are summarized below:

- *Richness/diversity surveys*. – Periodic sampling surveys within the water bodies of the Detachment interior as well as along the Santa Margarita River have almost exclusively yielded non-native fish species in the past. Future richness/diversity surveys are not expressly planned for fish species; however, future opportunities (e.g., regional studies) for assessing fish populations would be consistent with natural resources inventory objectives.
- *Watch list species*. – During exotics aquatics control efforts in the Santa Margarita River, the species, number, locations, and other pertinent information (e.g., age class, as applicable) of both non-native species controlled and any native fish species observed are documented. This provides an opportunity for reconnaissance for a potentially newly documented non-native fish species as well as vigilance for native fish species thought to occur only periodically and/or at trace levels.

4.9.3 Conservation and Research

Fish species on the Detachment are expected to benefit in the long term from habitat restoration measures, such as exotic invasive plant and animal control. Specific measures:

- *Exotic plant control*. – The primary objective of the weed management program is to enhance native habitats, which is expected to benefit a variety of native flora and fauna, including native fish to the extent they may occur on or transit through the installation.
- *Exotic animal control*. – The control of aquatic exotic animals (e.g., exotic fish, crayfish, bullfrogs) in the Santa Margarita River has a direct potential benefit for native fish species should they be present.

4.9.4 Management Actions

Actions presented within other sections of this chapter often directly or indirectly support the conservation and management of native fish to the extent they may occur on or transit through the installation. Specific actions applicable to native fish and their habitat:

- *Avoidance and minimization:*
  - Implement avoidance and minimization measures that benefit native fish and SAR (e.g., control and minimize the use of pesticides and their potential impacts on water quality; implement soil erosion BMPs). (See Sections 4.2.2 and 4.9.1)
- *Surveys and monitoring*
  - Conduct, or partner with regional collaborators to conduct, periodic reconnaissance surveys for the potential presence of SAR fish species.
  - Maintain a log of incidental encounters of watch list or other fish species of potential management interest, especially if the observation is not already included in a survey report.
- *Conservation and research*
  - Implement exotic and invasive plant control for the enhancement of native habitats, coordinating with adjacent property owners and regional efforts as applicable and to the greatest extent feasible.
  - To the extent feasible, implement non-native invasive animal control that may benefit endemic fish species (e.g., aquatic exotics control), coordinating with adjacent property owners and regional efforts as applicable and to the greatest extent feasible. Consider extending control efforts into the interior of the installation only if future conditions present an overwhelming natural resources concern if left unchecked.
- *Regional partnering*:
  - Support mutually beneficial opportunities for partnering with resource agencies, research institutions, or individuals for studies pertaining to fish diversity, ecology, and native species conservation.

4.10 AMPHIBIANS AND REPTILES

Many amphibians and reptiles, collectively referred to as herpetofauna, are considered species at risk. DOD policy recognizes that "protecting (SAR) is critical" and that "to the extent practicable, (installations) shall establish policy and procedures for the management of (SAR) to prioritize proactive management of those species that, if listed, could adversely impact military readiness. Program objectives shall focus on efforts that have the greatest potential to preclude the listing of SAR (e.g., habitat conservation, planning level surveys, monitoring)" (DODINST 4715.03, p. 18).

There are currently no federally listed reptiles, and only one federally listed amphibian on the Detachment, the endangered arroyo toad, which is afforded legal protections under ESA and is addressed in greater detail in Section 3.10.2, 4.13.2, and in Appendix L. There are no state listed threatened or endangered herpetofauna; however, nearly a third of the amphibians and reptiles are designated as California Species of Special Concern (Appendix K).

Objective: Conserve viable habitat to support optimal native amphibian and reptile diversity.
Key Considerations: • Regional herpetofauna trends and the potential influence of wide-spread environmental stressors, including non-native invasive species, drought, climate change, diseases, etc., beyond the boundaries of the Detachment. • Partnerships and collaborative opportunities that contribute a broader perspective and yield mutually beneficial results from shared research and management interests. • DOD Partners in Amphibian and Reptile Conservation's (PARC), National Military Fish and Wildlife Association (NMFWA) Herp Working Group, and other associations or entities that provide focused resources for the research, conservation, and management of amphibians and reptiles. • Effective monitoring to determine the status, health, and habitat use of amphibians and reptiles, including potential application of focal species to facilitate informed management decisions. • Inventory and determine the health and trend of amphibian and reptile populations, emphasizing those that may indicate ecosystem trends or may become federally listed, and control exotics that threaten ecosystem health. • Potential measures that preclude the need for the listing of SAR. • Non-native invasive species (plant and animal) that may detrimentally affect native amphibians and reptiles.

Amphibians and reptiles are experiencing alarming declines globally, with habitat degradation, loss, and fragmentation among the leading threats. Pressure from non-native invasive species and infectious diseases, such as chytridiomycosis (*Batrachochytrium dendrobatidis*; "Bd"), have exacerbated impacts on herpetofauna. Alterations in temperature and precipitation patterns as anticipated with climate change are also expected to have enormous adverse effects on amphibians and reptiles. For example, sexual differentiation of gonads has been shown to be temperature sensitive in many amphibians and reptiles.

One resource for helping achieve DOD and Navy policies for the conservation of herpetofaunal SAR is offered through Partners in Amphibian and Reptile Conservation (PARC) and DOD PARC (www.dodnaturalresources.net/DOD-PARC.html; see Section 1.5.1). DOD PARC focuses on habitat and species management; inventory, research, and monitoring; and education, outreach, and training. The Detachment has directly contributed to and participated in DOD PARC initiatives (e.g., reviewing early drafts of the strategic plan, participating in a chytrid fungus study, attending annual Herp Working Group meetings at the National Military Fish and Wildlife Association). As appropriate and applicable, we will evaluate and incorporate the information provided in the PARC Habitat Management Guidelines for the southwest once it is published.

As with any conservation program, the local context, the species biology, and habitat requirements inform management priorities. Because amphibians and reptiles frequently require both aquatic and terrestrial habitats for their annual cycle, management must reflect a landscape perspective that includes complementary habitats for movement between wetlands and uplands for reproduction, foraging, and hibernation/aestivation. For example, maintaining a narrow habitat buffer around wetlands, a common management practice that helps contribute to water quality improvements, may not meet the terrestrial habitat needs of associated herpetofauna.

Species longevity and reproductive productivity also affect the conservation and survival of a species. Long-lived species with delayed onset of sexual maturity (first age of reproduction), as is the case with several reptiles and some amphibians, translates to lower reproductive rates and greater vulnerability to localized extirpations. The native western pond turtle, for example, may live up to 40-50 years in the wild and lay numerous eggs; however, it does not reach sexual maturity until approximately 8 years of age and only a small percentage of the hatchlings survive to adulthood (Morey 2000).

The cattle grazing at the Detachment is likely to be the most influential contemporary land use affecting the richness and diversity of herpetofauna. However, the exact nature of the effect is difficult to characterize. Poorly managed cattle grazing can have severe negative impacts on an ecosystem. However, well managed grazing within landscapes, otherwise dominated by exotic annual grasses, has been used as a conservation tool and has been associated with an increase in native herpetofaunal diversity. Examples include the red-legged frog and tiger salamander (Ford et al. 2013). A component of the grazing management objective is to maximize the beneficial use of grazing as a natural resources management tool, which will hopefully yield a net benefit to herpetofauna on the installation (see also Section 4.4).

In addition to the degradation of habitat by non-native annual grasses, other threats to amphibians and reptiles from non-native invasive species come in the form of animals, such as the Argentine ant, exotic fish, crayfish, and bullfrogs. These species either prey upon native species or out-compete native species for resources required for survival (Morey 2000, Lovich 2015).

Although little can likely be done to control for the Argentine ant in the foreseeable future, Detachment Fallbrook has partnered with MCB Camp Pendleton since 2012 on the control of aquatic exotic species within the Santa Margarita River (see Section 4.14). Second to the bullfrog, the most common exotic herpetofauna is the red-eared slider which is thought to directly compete with and possibly prey on native southwestern pond turtles (Hollingsworth & Stepek 2015). Periodically other non-native herpetofauna such as the green iguana and gopher tortoise have been found on the installation, but these are thought to have been released pets and are unlikely to have established breeding populations. Exotic invasive species are discussed in more detail in Sections 4.14 and 4.15.

An increase of chemicals in the environment, such as herbicides and pesticides, has also been attributed to herpetofauna declines (Davidson et al. 2002). Pesticides are used infrequently and sparingly at the Detachment. Herbicides are also rarely used in landscaping contracts; however, they are employed as part of the weed management program in wildland areas. The weed management program strives to minimize the use of herbicides with most applications entailing spot treatment by hand and applications in aquatic environments are avoided (see Section 4.15).

Lastly, amphibians and reptiles can also be vulnerable to mortalities on roads and trails as they move between habitats or bask on the pavement. With the exception of Ammunition Road, most of the roads do not experience a high degree of traffic and vehicle speeds tend to be reduced.

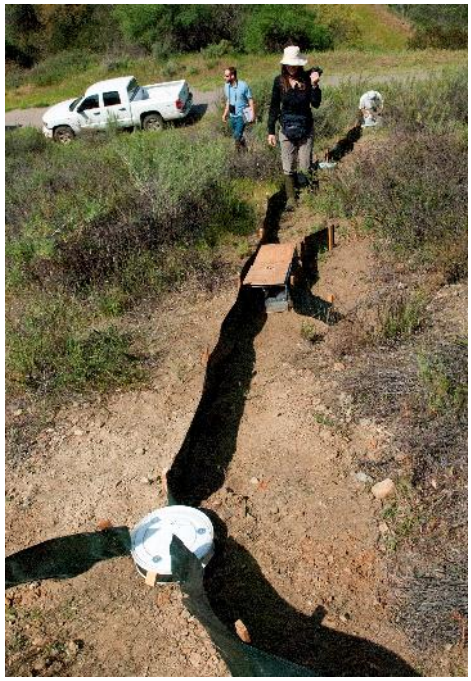

Photo 46. Pitfall array traps for herpetological surveys. (Photo by MC1 Eli J. Medellin)

Many overarching wildlife and land management objectives (e.g., maintaining contiguous habitats, the control of non-native invasive species, and minimizing adverse effects of grazing) are expected to benefit the amphibian and reptile community at the Detachment. Periodic herpetofaunal surveys will help identify trends, measure success, and enable management adjustments (Photo 46). Amphibians in particular are considered sensitive environmental indicators given their permeable skin, and aquatic eggs and larvae make them more susceptible to environmental contaminants. Due to its listed status, the arroyo toad already serves as a focal species which provides a level of umbrella protection along the Santa Margarita River and its

associated upland habitat, but may not serve as a reliable indicator given its low densities and low detectability within the uplands. Within the interior of the installation, other amphibian species with relatively high reproductive rates may be candidates for serving as a useful indicator in the future.

Occasionally, venomous rattlesnakes pose a health and safety risk when they occur in locations where personnel are working (e.g., within or around buildings and parking lots). Rattlesnakes are native to the ecosystem and considered ecologically important for helping to keep small mammal prey populations in check. Nonetheless, rattlesnakes in close proximity to humans may be relocated for safety reasons to more remote locations on the installation (Photo 47).

Photo 47. Red-diamond rattlesnake, a California Species of Special Concern, being relocated by Christy Wolf and Ryan Lockwood away from an occupied building.

4.10.1 Avoidance and Minimization

Overarching factors such as the relatively low-impact mission at the Detachment and protection of wetlands (Section 4.2.2) are expected to help avoid and minimize potential adverse effects to amphibians and reptiles. Additional specific measures contributing to the protection and conservation of herpetofauna include:

- *Limited pesticide use*. – The limited use of pesticides, and the avoidance and minimization of potential impacts from pesticides on bodies of water and associated wetlands, are expected to benefit herpetofauna (Sections 4.2.2, 4.14, 4.15).
- *Wetland protection*. – Measures to avoid and minimize ground-disturbing impacts and/or the discharge of pollutants, including dredged or fill material, to wetland habitats are expected to benefit herpetofauna that depend on these resources for at least a portion of their life cycle (Sections 4.2.2 and 4.6.1).

- *Land use in the Santa Margarita River*. – The Navy currently, and for the foreseeable future, has virtually no mission related activities within or adjacent to the Santa Margarita River. This is expected to benefit reptiles and amphibians, especially those species, such as the endangered arroyo toad, that rely on the river for completing a portion of their life cycle (Sections 4.2.2 and 4.13.2).
- *Federally listed species*. – The presence of the endangered arroyo toad within the Santa Margarita River and its associated upland habitat helps provides umbrella protection for herpetofauna within that portion of the installation. Amphibians and reptiles are also expected to benefit from avoidance and minimization measures for other federally listed species, such as the California gnatcatcher and least Bell's vireo, within the interior of the Detachment. (See Section 4.13)
- *Installation rules*. – The intentional disturbance of wildlife and habitat is prohibited without prior authorization. The harm, harassment, collection, possession, and/or trade of wildlife and plants may be regulated under one or more state or federal laws.
- *Education and outreach*. – Education can greatly facilitate avoidance and minimization of adverse effects to some reptiles, especially snakes. With rampant misconceptions and fear that people often have regarding snakes, especially venomous species, education helps raise awareness of, and fosters a stewardship ethic towards, these animals that are so important to the ecosystem.

4.10.2 Surveys and Monitoring

To the extent feasible and applicable, regional and other standardized protocols are taken into consideration when designing amphibian and reptile monitoring. Historic and current herpetofauna surveys at the Detachment:

- *Focal species monitoring*. – Only one amphibian focal species, the endangered arroyo toad, has been the subject of long-term monitoring (see Section 4.13 and Appendix L for more detail on monitoring goals and protocols).
- *Richness/diversity surveys*. – The herpetofauna surveys of 2013-2014 (Hollingsworth & Stepek 2015) provide a protocol for sampling species richness throughout the interior of the Detachment. Species composition and richness were compared to historical surveys; however, historical survey methods had not been standardized. The level of detail provided in Hollingsworth & Stepeck (2015) provides a baseline for repeatable data collection in the future and possible trend assessment for many species. However, several amphibian and reptile species are very difficult to capture in standard trap techniques. The herpetofaunal community composition and richness will always rely, at least partially, on documentation of incidental encounters.
- *Watch list species/incidental observations*. – A number of amphibian and reptile observations made by Hollingsworth & Stepek (2015) were from incidental encounters. In fact, five species were documented only via incidental encounters. Anecdotal or incidental observations of sensitive species or species of potential management concern are documented during herpetofauna surveys and occasionally during surveys of other taxonomic groups.
- *Short-term monitoring*. – Aside from the arroyo toad (see Section 4.13), few short-term monitoring surveys have been conducted for reptiles and amphibians. Historically, short-term surveys were conducted for the orange-throated whiptail (Brattstrom 1990; McGurty 1981) and San Diego horned lizard (Brattstrom 1990, 1992, 1993).

4.10.3 Conservation and Research

Amphibians and reptiles are expected to benefit from general habitat restoration measures, such as exotic invasive plant and animal control. Specific measures include:

- *Exotic plant control*. – The primary objective of the weed management program is to enhance native habitats, which is expected to benefit a variety of native flora and fauna, including herpetofauna. (See Section 4.15)
- *Exotic animal control*. – Although the primary driver for the control of exotic aquatic animals (e.g., non-native fish, crayfish, bullfrogs) within the Santa Margarita River is to support the recovery of listed species (e.g., arroyo toad, steelhead), any reduction in predation or competition pressure from exotic invasive species is expected to benefit all native amphibians and reptiles that use the river. (See Section 4.14)
- *Investigative studies*. – There are numerous investigative studies that could potentially inform or benefit the management of native herpetofauna and SAR. In the past, most studies have focused on the endangered arroyo toad; however, in 2013, the Detachment participated in a DOD Legacy funded study investigating the chytrid fungus, *Batrachochytrium dendrobatidis* (*Bd*), in amphibian species across the U.S. (Lannoo et al. 2014)[1]. One conclusion of that study is that *Bd* does not appear to be having a negative impact on amphibian species in much of North America, and the fungus can be considered endemic today, likely having spread throughout the continent decades ago. However, other studies implicate this disease in causing the extinction of more than 100 amphibian species worldwide and still consider it a serious threat to some amphibians, including the mountain yellow-legged frog in North America (Wake & Vredenburg 2008).

4.10.4 Management Actions

Actions presented within other sections of this chapter often directly or indirectly support the conservation and management of herpetofauna. Specific actions applicable to the conservation and management of amphibians and reptiles:

- *Avoidance and minimization:*
  - Implement avoidance and minimization measures that protect native herpetofauna and SAR (e.g., minimize erosion and other potential impacts to water quality). (See Sections 4.2.2 and 4.10.1)
- *Surveys and monitoring:*
  - Continue arroyo toad focal species monitoring. (See Section 4.13.2)
  - Conduct surveys for herpetofauna species richness/diversity at Detachment Fallbrook approximately once every five years or at a frequency warranted by changes in land use or environmental conditions. Surveys shall provide reconnaissance for the potential presence of amphibian and reptile SAR.

[1] Samples submitted from Detachment Fallbrook unfortunately did not make the study deadline and were not included in the final report by Lannoo et al. (2014); however, the principle investigator, M.J. Lannoo, forwarded (23 April 2014, email) the lab results for the 14 amphibians tested at Detachment Fallbrook: 2 animals tested positive for *Bd* (a tree frog and a bullfrog), 1 bullfrog had equivocal results, and 11 animals tested negative.

  - Maintain log of incidental encounters of watch list or other herpetofauna species of potential management interest, especially if the observation is not already included in a survey report.

- *Conservation and research:*
  - Continue to implement non-native invasive species control (e.g., weed management and aquatic exotics control), coordinating with adjacent property owners and regional efforts as applicable and to the greatest extent feasible.
  - Consider options to retain native herpetofauna species and restore their role in the ecosystem. Seek a consistent strategy with that of DOD PARC, as applicable, including recommendations for the management and conservation of reptiles and amphibians.
- *Regional partnering*:
  - Support mutually beneficial opportunities for partnering with resource agencies, research institutions, or individuals for surveys and studies pertaining to herpetofauna diversity, ecology, and native species conservation.

4.11 BIRDS

Virtually all birds on the Detachment, both migratory and resident species, are protected by one of the oldest U.S. environmental laws, the Migratory Bird Treaty Act (MBTA) of 1918. The MBTA, and subsequent amendments, is a domestic law protecting migratory birds that implements obligations of the U.S. under several international treaties and conventions.

Per MBTA, the 2007 Final Rule on Take of Migratory Birds by the Armed Forces (aka "Migratory Bird Rule"; 50 CFR Part 21), Executive Order 13186 (Responsibilities of Federal Agencies to Protect Migratory Birds), and a Memorandum of Understanding between the DOD and USFWS (September 2014) that further promotes the conservation of migratory birds, installation personnel must evaluate and manage the effects of both military readiness and non-readiness activities on migratory birds and their habitats. Added legal protections are afforded bird species listed under ESA and the Bald and Golden Eagle Protection Act. For additional discussion of the Migratory Bird Rule, protections afforded by MBTA, and integration of avian regulations with mission activities, see Section 5.5.2.

Objective: Conserve viable habitat to support optimal native avian diversity within coastal sage scrub, riparian, grassland, chaparral, and oak woodland communities.
Key Considerations: • Compliance with MBTA and other regulations protecting birds. • Regional avian trends and the potential influence of wide-spread environmental stressors, including drought, fires, climate change, habitat loss at wintering grounds, etc., beyond the boundaries of Detachment Fallbrook. • Partnerships and collaborative opportunities that contribute a broader perspective and yield mutually beneficial results from shared research and management interests. • Partners in Flight, Riparian Birds Working Group, and other associations or entities that provide avian-focused resources for research, conservation, and management insight. • Effective monitoring to determine the status, health, and habitat use of raptors and other avian focal species to facilitate informed management decisions. • Potential measures that preclude the need for the listing of SAR. • Non-native invasive species (plant and animal) that may detrimentally affect native birds. • Balancing requirements of some avian species (e.g., California gnatcatcher in coastal sage scrub and grasshopper sparrow in grassland) with habitat requirements of the Stephens' kangaroo rat.

The majority of birds on the Detachment are protected under MBTA, but numerous avian species are also listed as California Species of Special Concern and/or SAR (Table 3-14). SAR includes species maintained by USFWS and/or CDFW as threatened or endangered, or candidates (or proposed) for such lists (DODINST 4715.03). DOD policy recognizes that "protecting (SAR) is critical" and that installations "shall seek to minimize impacts on migratory birds and address effects of activities on migratory birds in INRMPs" (DODINST 4715.03, p. 18). The policy instruction further states that, "Program objectives shall focus on efforts that have the greatest potential to prevent the listing of SAR (e.g., habitat conservation, planning level surveys, monitoring)…" (DODINST 4715.03, p. 18).

To help guide prioritization for management, where necessary, Appendix K inventories of all avian species that have been documented on the installation and identifies which species have special status rankings, to include not only the California Species of Special Concern and SAR, but also species that have been identified as priority focal species by DOD Partners in Flight (see below), Species of Greatest Conservation Need by CDFW, and species that are covered by the regional North County Multiple Species Conservation Plan.

Partners in Flight (PIF) and DOD PIF (www.dodpif.org; see Section 1.5.1) offer a variety of resources to help natural resources managers better comply with relevant laws and policies, and incorporate migratory bird information into INRMPs. Detachment Fallbrook is in PIF Physiographic Region 90, Central and Southern California Coast and Valleys. A California Partners in Flight (CPIF) Plan contains relevant habitat subplans with recommendations and population targets for focus species of coastal sage scrub, chaparral, riparian, and oak woodland. Discussion of these species occurrence on the Detachment can be found in Appendix K. In 2014, the DOD also issued a Strategic Plan for Bird Conservation and Management on Department of Defense Lands (USDOD 2014a). Such conservation guideline and policy sources continue to help shape the avian management approach on the Detachment.

In addition to habitat loss and degradation, there are many threats to birds in the contemporary landscape (Photo 48), including artificial nighttime lighting (see 4.2), pesticides (see 4.2), domestic cats and other invasive species (see 4.14 and 4.15), bird/animal aircraft strikes (see 4.18), glass collisions, wind energy, power lines, and open pipes. Some of these threats are discussed in other program elements (see section references); the latter two threats are discussed in greater detail below.

Photo 48. Barn owl chicks in a storage structure. (Photo by K. Fischer)

One avian conservation issue that has been the subject of interest at the Detachment is the protection of raptors from electrocution from power poles/lines. At the Detachment, TDI (2012) found that were seven documented cases of avian electrocutions from Navy-owned poles based on personal communication with John Gettle, the former Facilities electrical planner who worked at the installation for 25 years. Mr. Gettle was able to provide the avian species (4 red-tailed hawks, 1 barn owl, 1 common raven, and 1 golden eagle) and pole locations, but unfortunately he was unable to provide the dates of the electrocutions (TDI 2012). The year of the golden eagle electrocution, 1993, is known from the USFWS permit (# PRT-784660) for exhibiting the mounted specimen for educational display purposes at Building 1 on the installation.

Raptor perches were installed on top of many Navy-owned poles in 1999 (n= 63) and again in 2002 (n=58) (TDI 2012). Since then, research has shown that these perches are less effective in minimizing electrocutions (Harness 2000). In 2010-2011, all Navy-owned power poles were individually mapped in GIS and prioritized for avian protection based on potential electrocution risk (TDI 2012). Following the Tomahawk Fire in 2014, 40 burned Navy-owned poles were replaced with more state-of-the-art raptor-friendly and fire resistant steel poles. San Diego Gas & Electric (SDG&E) had 25 wood-to-steel pole replacements after the fire as well – all with raptor-sensitive configurations. Of the remaining 226 unburned Navy-owned poles, efforts are underway to retrofit insulators or install other avian protection devices on all "high" and "very high" priority poles based on their potential electrocution risk (see TDI 2012 for pole ranking criteria and scores; GIS power pole data are updated when protection devices are added or poles are replaced).

The hazards of open pipes and other unintended pitfall traps are an area of avian conservation concern that has garnered greater attention in recent years. It is estimated that millions of birds and other wildlife have been killed in open pipes or other inescapable open containers (Rowe 2011, Burns 2014). A single 6-inch diameter irrigation standpipe in California, for example, was found to have seven vertical feet of dead animals comprised of 231 individuals (Burns 2014). Another example from Nevada found that 854 4-inch PVC mining claim posts contained the remains of 879 birds, 113 reptiles, and 20 mammals (Burns 2014).

Any open pipe, or similar open structure, of varying sizes (e.g., uncapped top of a chain link fence post, magazine vents, or monitoring wells) can become a death trap as animals fall in and are unable to escape. It is difficult to assess the extent to which open pipes and unintended pitfall traps have claimed wildlife at the Detachment; however, such structures do exist on the landscape and, to the extent feasible, efforts are made to remove, cap, or screen open pipes and potential pitfall traps.

4.11.1 Avoidance and Minimization

Overarching factors such as the relatively low-impact mission at the Detachment and the review and approval of projects (Section 4.2.2) are expected to avoid and minimize adverse effects to migratory and resident birds. Additional specific measures for protection or conservation of birds include:

- *Installation rules*. – Hunting is not authorized on the Detachment. Moreover, the intentional disturbance of any nesting bird and/or its habitat is prohibited without prior authorization (e.g., for species not protected under MBTA or incidental take authorized by the USFWS). Personnel who encounter potential conflicts with nesting birds in the work place or within a project area are referred to the Environmental Office for guidance. See Section 4.2.2, Appendix E.
- *Seasonal restrictions*. – To the greatest extent practicable, projects and activities that may occur within avian nesting habitat (to include non-vegetative features such as building eaves) are prohibited during the avian breeding season. Depending on the habitat and nature of the project, the seasonal restriction dates may be adjusted slightly. Avian seasonal

restrictions typically begin 15 March, but may be as early as 15 February (e.g., California gnatcatchers are non-migratory and can begin breeding sooner), and run through the end of summer, 31 August.

- *Nest avoidance*. – During the breeding season, or for species that breed year round, additional measures may be implemented to avoid and minimize potential adverse effects to nesting birds. For example, it may be beneficial to clear vegetation outside of the breeding season, reducing the likelihood that nesting can occur within the project footprint. Other methods, such as surveys for and the buffering of active nests may also be required. Such measures are determined on a project specific basis.
- *Weed treatment avoidance*. – The phenology of plants and optimal timing for the treatment of non-native invasive plants often requires weed control during the avian breeding season. In addition to providing the weed contractor historical locations of federally listed birds (as predictor of possible future nesting), spot (hand) treatments enable greater visibility of potential nesting birds and field applicators are trained to avoid treating plants in the vicinity of nests.
- *Fire management*. – During a suppression event, the Fire Atlas supports on-scene avoidance and minimization of known locations of federally listed birds, as well as the coastal cactus wren, a state species of special concern, and associated occupied habitat.
- *Power pole protection*. – Installation of newer, avian friendly power poles following the 2014 Tomahawk Fire and the retrofitting of older, existing poles with insulators will help avoid and minimize the mortality of birds from electrocutions.
- *Pitfall death pipes/traps*. – To the greatest extent feasible, efforts are made to avoid the creation of bird death traps with open pipes and other structures that birds may fall in and not be able to get out of.

4.11.2 Surveys and Monitoring

Birds are a commonly surveyed taxonomic group for documenting trends in species richness, species diversity, community composition, and focal species populations that may inform management. To the extent feasible and applicable, regional and other standardized protocols are taken into consideration when designing bird monitoring protocols. Sources such as "Coordinated Bird Monitoring: Technical Recommendations for Military Lands" (CBM Technical Recommendations; Bart et al. 2012) provide sample monitoring programs and guidelines for the design of bird monitoring surveys on DOD lands (when, where, and how to monitor).

Because it is cost prohibitive and inefficient to attempt to monitor demographics of all avian populations, surveys are largely based on focal species monitoring (Appendix H), habitat (vegetation and suitability) mapping, and periodic diversity surveys. Programmatic monitoring and mapping surveys have mostly been focused on federally listed species and their habitats to date, however, much information about the avifauna at the Detachment has been accumulated during these surveys and from other incidental observations, e.g., during site specific or project-level surveys, miscellaneous partnering opportunities (e.g., USGS California gnatcatcher and coastal cactus wren DNA studies, CDFW coastal cactus wren surveys, raptor banding), and a sundry of short-term studies (e.g., Monitoring Avian Productivity and Survivorship (MAPS) Program, least Bell's vireo dispersal).

The avian focal species are currently comprised of federally listed species (California gnatcatcher, least Bell's vireo) and a state listed species of conservation concern (coastal cactus wren). Augmenting formal surveys and monitoring efforts is the documentation of significant incidental observations (e.g., watch list species, vagrants). Historic and current avian monitoring programs and surveys summary:

- *Long-term focal species monitoring.* – In recent years, systematic avian monitoring has largely focused on the breeding populations of two federally listed species, California gnatcatcher and least Bell's vireo, with coastal cactus wren and southwestern willow flycatcher concurrently documented during these survey efforts (see Section 4.13 and Appendix L for more detail on monitoring goals and protocols). As California gnatcatcher and least Bell's vireo occur in coastal sage scrub and riparian habitats, respectively, large portions of the installation are covered during these two focal species surveys. Tracking breeding population dynamics (e.g., number of pairs, territories, nest success) of these sensitive endemics provides an indication of population and habitat viability, which can yield umbrella management protection for other native avifauna associated with these communities.

- *Richness/diversity surveys*. – Currently there is no single program to monitor, or systematically inventory on some recurring schedule, avian richness/diversity. Nonetheless, all avian species observed during annual focal species monitoring have provided an indirect measure of species richness (presence/absence). Two past survey initiatives described below (MAPS and the least Bell's vireo monitoring points, which recorded all species detected) may provide potential baseline data for comparisons with comparably collected data; however, neither of those past surveys were designed to sample avian richness or diversity throughout the installation.

- *MAPS*. – The five-year Monitoring Avian Productivity and Survivorship (MAPS) study conducted by San Diego Natural History Museum and Jones & Stokes (Jones & Stokes 2008) was a short-term monitoring program conducted from 2001 to 2005. The 2001-2005 MAPS program consisted of ten mist-net lanes, each sampled ten times during the breeding season, within a reach of Fallbrook Creek upstream of Lower Lake that was subject to cattle grazing. In addition to contributing to a continent-wide program intended to track large-scale avian population trends, the MAPS study provided quantitative data on avian population demographics (adult productivity, adult survivorship, fledgling survivorship, and recruitment). Such baseline data may improve the ability to discern between land use effects, e.g., from the agricultural program, wildland fires, etc., versus annual variations in factors such as precipitation. There are, however, limitations to mist-netting and banding studies for baseline diversity, population size, or community density data in that some species are not effectively surveyed by mist-netting and the sample locations are often limited because of the labor intensive sampling technique.

- *Historic LBVI Monitoring Points*. – Between 1993 and 2002 Detachment Fallbrook documented least Bell's vireo presence at 31 fixed riparian point count stations. Point count stations were visited eight times during the breeding season. All avian species detected were recorded during the point counts.

- *Raptors: banding and nest site geodatabase*. – Since the early 1990s, Dr. Peter Bloom and his associates have mapped and banded raptors on the Detachment. Information on the dispersal, nesting success, and life expectancy of hawks has been generated through these data. Observation data and nest locations are maintained in a raptor geodatabase that facilitates avoidance and minimization of potential impacts during project reviews.

- *Short-term monitoring.* – Short-term avian monitoring is perhaps most frequently employed to support project specific avoidance and minimization of potential effects to nesting birds. These types of surveys are not generally useful for population monitoring purposes; however, they may on occasion identify a new location for species distribution maps.

- *Watch list species/incidental observations.* – Anecdotal or incidental observations of sensitive species or species of potential management concern are documented during the systematic California gnatcatcher and least Bell's vireo surveys and other miscellaneous short-term surveys and studies. Surveyors are provided a copy of the installation's bird list

and watch list species to facilitate recognition of potentially significant observations in the field.

To the greatest extent feasible, surveyors are encouraged to document via GPS location (including date, observer, and other metadata) all observations of focal species that are also species of special concern. Should surveyors observe a species not on Detachment Fallbrook's official inventory, or a rare species that has sparse or outdated documentation, the surveyors are encouraged to photo-document the observation and report the finding as soon as possible to the Conservation Program Manager for possible follow-up verification.

- *Habitat mapping.* – Mapping potentially suitable habitat is not an exact science; however, habitat suitability mapping for the least Bell's vireo and California gnatcatcher have contributed to a greater understanding of the actual and potential use areas for these sensitive species and to potential large-scale habitat changes over time.

4.11.3 Conservation and Research

An objective in the DOD PIF Strategic Plan is to "encourage proactive management to avoid and prevent bird species from becoming listed" (p. 15 in USDOD 2014a). Conservation and rehabilitation to foster avian species and habitat resiliency can come in many forms, depending upon the urgency of a situation, the type of environmental stressors, the degree or scale of habitat loss or degradation, etc.

Evaluation and prioritization of habitat-targeted measures for avifauna conservation, or for the management of potential future avian focal species (see Section 4.2.3) that may be appropriate for providing umbrella conservation benefits, are expected to be the subject of collaborations with the USFWS and CDFW during the annual INRMP metrics or other mid-year meeting.

In rare instances, conservation measures may be labor-intensive and relatively invasive, such as captive breeding and release programs. Other measures may be relatively simple, such as providing nesting boxes or conducting weed control. Included below are research projects that proactively seek to understand conservation and other investigative questions, such as efficacy of habitat treatments, limiting habitat features, DNA studies, and occurrences of lead poisoning. Many of research projects can also be classified as short-term surveys (see previous section).

Examples of avian conservation and rehabilitation programs that have been conducted, in progress, or proposed:

- *Exotic plant control*. – The control of exotic invasive plants (weed management) is the most prevalent form of habitat conservation and rehabilitation for avian species. The primary objective of the weed management program is to enhance native habitats, which is expected to benefit a variety of native fauna, including birds (Lawson et al. 2005, Zavaleta et al. 2001). For example, giant reed (*Arundo donax*) has been virtually eradicated and areas once dominated by the exotic reed (e.g., upstream portions of Fallbrook Creek) now provide willow habitat for species such as the least Bell's vireo.
- *Exotic or problem animal control*. – If it is determined that a non-native or problem animal species is having a direct effect on a sensitive native species (e.g., brown-headed cowbirds parasitizing least Bell's vireo, feral domestic cat predation of birds), then appropriate control actions will be implemented as feasible. The rate of brown-headed cowbird parasitism is tracked as directed in the WFMP BO. The brown-headed cowbird, a nest parasite of local native avifauna, is currently controlled through targeted measures. For example, when cowbird eggs or chicks are encountered during least Bell's vireo nest surveys they are removed from the nest by permitted biologists. Higher incidences of cowbird parasitism reported in specific locations (e.g., along parts of the Santa Margarita

River) may warrant consideration of increased control measures for this species; however, the potential negative effects on non-target species captured needs to be taken into consideration before this is implemented. To date, parasitism has not been shown to be a significant problem.

- *Long-term streambed restoration.* – Several of the streambeds are greatly channelized which, among other things, lowers the water table, reduces groundwater recharge, diminishes the hydrologic buffering capability of the system, and decreases the extent of associated wetland habitat that many bird species depend upon for survival. A long-term, holistic and systematic approach to reducing channelization, improving sediment deposition, and slowing peak flows is proposed for evaluation and phased implementation. Stream restoration that improves wetland resiliency will not only improve ecosystem services and benefit sensitive species (e.g., by widening riparian zones and creating more habitat for foraging and breeding), but will help buffer against the potential adverse effects of land use, extreme weather events, and possible future climatic shifts. See Section 4.6.
- *Avian genetic studies.* – Detachment Fallbrook has participated in regional genetics studies conducted by USGS on the coastal cactus wren in 2011 (Barr et al. 2012, 2013, 2015) and the California gnatcatcher in 2012 (Vandergast et al. 2014). In addition to contributing to the regional conservation initiatives for these species, the results have yielded insights into relationship of the Detachment's populations to the region.
- *Power pole/raptor protection study.* – This 2010-2011 study by Tierra Data, Inc. (2012) inventoried and assessed all Navy-owned power poles on Detachment Fallbrook for avian electrocution potential. All poles were ranked in terms of priority for raptor protection. Many poles were coincidentally replaced with new steel poles that have raptor-friendly configurations after the Tomahawk Fire. Subsequently, Facilities installed insulator covers on remaining "High" and "Very High" electrocution-risk poles.
- *Turkey vulture lead sampling.* – In collaboration with the Game Wardens Office on MCB Camp Pendleton, the Detachment collected blood samples from turkey vultures in 2013 for an investigation on lead toxicity levels due to possible consumption of carcasses with lead shot pellets or fishing weights. Lab results were negative for lead poisoning (CAHFS 2013).
- *Nest boxes.* – This has not been a widely deployed conservation measure for bird species though it may be considered in certain situations in the future. Past recommendations for deployment of nest boxes to encourage breeding pair establishment by burrowing owls have generally not come to fruition due to the co-occurrence of the owl sightings with Stephens' kangaroo rat habitat and the conflict of potential effects on the endangered rodent.
- *Post-fire habitat enhancement.* – To facilitate more rapid recovery of some select burn areas after the May 2014 Tomahawk Fires, the propagation and transplanting of prickly pear and cholla cacti are proposed to hasten the recovery of this slow growing habitat feature required by coastal cactus wren. Increased exotic invasive plant control is also anticipated to help with recovery of native vegetation communities.

4.11.4 Management Actions

Actions presented within other sections of this chapter often directly or indirectly support the conservation and management of birds. Specific actions applicable to management of birds:

- *Avoidance and minimization:*
  - Implement avoidance and minimization measures that protect migratory birds and other sensitive avifauna. (See Sections 4.2.2 and 4.11.1)

- *Surveys and monitoring:*
  - Continue focal species monitoring and habitat mapping (see Section 4.13).
  - As appropriate and feasible, develop and implement more systematic and strategic monitoring and documentation protocols for bird species not specifically addressed in current monitoring programs. Potential new avian focal species or suite of species will be discussed in collaboration with USFWS and CDFW during annual INRMP metrics.
  - Conduct reconnaissance of regional avian monitoring programs, especially those that target avifauna richness and diversity that may be applicable to Detachment Fallbrook and provide data for comparative studies or trend analysis.
  - Periodically survey for and maintain database of raptors and their nest sites.
  - Implement short term monitoring as appropriate and feasible for avoidance/minimization of project impacts and to address specific management or research questions (e.g., post-fire response, dispersal, effect of cattle).
  - Have ornithological surveyor's document observations of special status birds and other watch list species, and maintain an inventory of all avian species observed, during annual monitoring surveys.
  - Conservation and research. Continue to implement invasive species control (e.g., weed management and incidental cowbird control), coordinating with adjacent property owners and regional efforts as applicable and to the greatest extent feasible.
  - Where appropriate and feasible, implement proactive conservation and rehabilitation measures to facilitate recovery of impacted habitats, e.g., post-fire enhanced weed control, revegetation, exclusion fencing. Seek a consistent strategy with that of DOD PIF or CPIF, as applicable and appropriate, including the PIF Bird Conservation Plan covering the Detachment.
- *Regional partnering:*
  - Contribute to regional partnering efforts in avian research, conservation, and monitoring to the extent compatible with resource management goals (e.g., periodic banding of raptors, genetics studies).
- *Education and outreach*:
  - Raise awareness of the importance of migratory birds and stewardship strategies.

4.12 MAMMALS

Although natural resources management includes stewardship of large mammals, such as coyotes and deer, it is the smaller species (e.g., bats, the endangered Stephens' kangaroo rat, and rodent pests in buildings) that often gain a greater profile in the context of the mission. Hunting of game animals is not permissible due to security restrictions, and therefore California hunting regulations have not been a significant factor in management. The Detachment is too far inland to have species subject to the Marine Mammal Protection Act.

Currently, the Stephens' kangaroo rat is the only federally listed endangered mammal on the installation (see Section 4.13), which is why most mammalian surveys and management have focused on small burrowing mammals. Several state listed species of special concern, including bats and the American badger (*Taxidea taxus*) have been the focus of short-term surveys.

Objective: Conserve viable habitat to support optimal native mammalian diversity, including bats and carnivores.
Key Considerations: • Maintenance of movement corridors with relatively unimpeded continuity (e.g., fencing that is penetrable by mammals) within the Detachment and with neighboring open space on MCB Camp Pendleton. • Regional trends and the potential influence of wide-spread environmental stressors, including non-native invasive species, drought, climate change, pesticides, diseases, etc., beyond the boundaries of the Detachment. • Partnerships and collaborative opportunities that contribute a broader perspective and yield mutually beneficial results from shared research and management interests. • Effective monitoring to determine the population status, health, and habitat use of mammals, emphasizing those that may indicate ecosystem trends or may become federally listed. • Potential measures that preclude the need for the listing of SAR. • Non-native invasive species (plant and animal, including other mammals) that may detrimentally affect native mammals and ecosystem health in general. • Long-term conservation of bats and minimization of conflicts with humans.

Land management that avoids and minimizes habitat fragmentation and degradation in general is expected to benefit native mammals at the Detachment. Larger animals, especially carnivores, tend to require more space. The diverse array of mammalian species, including mule deer (*Odocoileus hemionus*), coyotes (*Canis latrans*), bobcats (*Lynx rufus*), mountain lions (*Puma concolor*), American badgers, and San Diego black-tailed jackrabbits (*Lepus californicus bennettii*), are expected to benefit from the open space and contiguous habitat immediately adjacent to the installation as well as from connectivity to open space within the larger surrounding area (see Section 3.11).

Cattle grazing is likely the most influential contemporary land use at the Detachment affecting native mammals. As with other wildlife, the effect of grazing is expected to vary depending on the mammalian species and extent of grazing. Grazing has had demonstrated beneficial effects on habitat for Stephens' kangaroo rats (see Sections 4.4, Agricultural Outleasing, and 4.13, Federally Listed Species). Other studies investigating the effect of livestock grazing on wildlife have often focused on competition with economically valuable game species, such as mule deer, with results ranging from detrimental to neutral to beneficial effects (e.g., Chaikina & Ruckstuhl 2006, Holechek 1982, Sommer et al. 2007). The nature and extent of the effect of livestock grazing on deer and other mammalian wildlife appears to depend mainly on the intensity of grazing, with detrimental effects arising or becoming more prominent when sites are heavily grazed over long periods of time (e.g., Gallizioli 1979, Krausman et al. 2009).

Another potential wildlife/grazing conflict has to do with potential predation of livestock (e.g., by mountain lion on young or weak cows). Local carnivores have not presented a significant problem with cattle grazing historically. In accordance with the terms of the agricultural lease, the lessee must have Navy approval prior to implementing legal means of predator control. Such a request has not been made in recent years, nor do there appear to be historical records of predator control having been requested by, or granted to, an agricultural lessee on the installation. Top predators, in decline globally, play an integral role in maintaining ecological integrity (Beschta & Ripple 2009, Ripple et al. 2014). Natural resources management seeks to maintain the protection and conservation of native carnivores to the greatest extent feasible.

Bats present an interesting management challenge. As discussed in Chapter 3, bats provide important ecosystem services (Section 3.9.1.5). Although several species known to occur on the installation are California species of special concern (Appendix K), bats can become a nuisance with the accumulation of their guano and the potential for health risks in several magazines and,

historically at least, in some occupied buildings. Three species of bats (Yuma myotis, Mexican free-tailed bat, and big brown bat) were confirmed roosting within buildings and magazines in 2013 and 2014 (Stokes 2015). Bats generally prefer roosting spaces with precise conditions (e.g., temperature, humidity, space configuration). With the loss of natural habitat and increased urbanization, manmade structures often provide suitable environmental conditions, have sufficient room for bats to move to different locations in order to thermoregulate, and accommodate larger colonies than natural roost sites (Brown 1995). Unfortunately, roosting in manmade structures can put bats in direct conflict with humans.

Bats are very important to the ecosystem (Section 3.9.1.5) and are vulnerable to impacts to their population. As relatively long-lived species for their small size (some have been known to live up to 40 years), bats have a low reproductive rate with individuals of many species not reaching sexual maturity for two to three years and producing only one to two young per year.

More information on efforts to control bats in manmade structures, to include provisioning of artificial bat houses to provide alternate roosting sites, and on the management of other small mammal pests (e.g., mice and rats) is provided in Section 4.15.

4.12.1 Avoidance and Minimization

Overarching factors such as low levels of development, low-impact mission, and the umbrella benefit from listed species protections (see Section 4.2) are expected to minimize and avoid adverse effects to native mammals on the Detachment. Additional specific measures contributing to the protection of native mammals include:

- *Limited pesticide use*. – Rodenticide application is uncommon on the Detachment. See Sections 4.14.
- *Installation rules*. – Due primarily to the safety and security restrictions associated with the mission, recreational or sport hunting is not authorized on the Detachment. The intentional disturbance of wildlife and habitat is prohibited without prior authorization.
- *Limited native predator control*. – The control of native predators is extremely uncommon. Although federally listed species are presumed to be occasionally depredated by native predators, there is no evidence of disproportionate predation pressures and the natural process of predation is considered part of a healthy functioning ecosystem.
- *Wildlife-friendly fencing*. – Although certain fencing standards are required in some areas for mission security reasons (e.g., chainlink perimeter fencing), to the greatest extent feasible, potential wildlife movement corridors are considered during fencing installation or maintenance projects. Most wildlife appear to be able to penetrate the barbed wire cattle fencing within the installation based on the general absence of tangled carcasses and anecdotal observations of coyotes and deer crossing through or over the fencing. However, aging barbed wire fencing was also not proving effective at containing cattle during the 2010-2014 lease. After the 2014 Tomahawk Fire, much of the old 3-strand barbed wire was replaced with 5-strand barbed wire with spacers in between the t-posts. To mitigate the increased cattle-tight strength of the fencing for wildlife, the bottom strand of the 5-strand fencing is a smooth (un-barbed) wire that is generally set higher off the ground (around 18”).
- *Bat exclusions*. – When situations dictate the exclusion of bats from magazines, buildings, or other manmade structures, every effort is made to conduct the operation in a humane manner (e.g., provide alternate roosting sites, conduct exclusion measures after bats have migrated out for the winter). See Section 4.14.3 for more information.

- *Installation rules*. – Hunting is not permitted on the Detachment. The intentional disturbance of wildlife and habitat is prohibited without prior authorization. The harm, harassment, collection, possession, and/or trade of wildlife and plants are regulated under one or more state or federal laws.
- *Education and outreach*. – Education is especially important for avoiding and minimizing adverse effects to some mammalian species. With rampant misconceptions and fear that people often have about some mammals, such as bats, coyotes, bobcats, and mountain lions, education can be vital for raising awareness and helping foster a stewardship ethic for these animals that are so important to the ecosystem.

4.12.2 Surveys and Monitoring

Determine the status, health, and habitat use of mammals, emphasizing on certain target or indicator species not currently considered sensitive. Specific measures:

- *Richness/diversity surveys*. – No systematic survey for general mammalian species richness/diversity has been conducted on the Detachment. Nonetheless, certain mammalian groups, such as rodents and bats, have been surveyed with some regularity. Future richness and diversity surveys should emphasize mammalian groups that may be of management interest, e.g., carnivores as potential indicators of ecosystem health. Species richness/diversity surveys should emphasize repeatable methodology for possible trend detection over time.
- *Long-term focal species monitoring*. – Systematic, long-term mammalian monitoring has largely focused on the federally endangered Stephens' kangaroo rat (see Section 4.13 and Appendix K). With a limited distribution in grassland habitats and often occurring at trace levels on the Detachment, the Stephens' kangaroo rat is unlikely to serve as a good indicator species for grassland biodiversity. Nonetheless, the Stephens' kangaroo rat likely provides at least partial umbrella protection for species with which it co-occurs.

  Evaluation and prioritization of another potential future mammalian focal species (see Section 4.2.3) that may be appropriate for providing umbrella conservation benefits is expected to be the subject of collaborations with the USFWS and CDFW. The annual INRMP metrics provides a venue for the initial discussion of such topics.
- *Short-term monitoring*. – Numerous short-term surveys have been conducted to assess potential project effects on the endangered Stephens' kangaroo rat. Other short-term mammalian surveys have involved bats (e.g., assessing bat usage of buildings, magazines, or artificial bat houses). Such short-term studies are expected to continue to support the management of those species as needed. Future short-term monitoring surveys might prove valuable for investigating the status of mammalian species on the installation for which little is currently known, such as the San Diego black-tailed jackrabbit, San Diego desert woodrat (*Neotoma lepida intermedia*), gray fox (*Urocyon cinereoargenteus*), long-tailed weasel (*Mustela frenata*), etc.
- *Watch list species/incidental observations*. – Anecdotal or incidental observations of mammalian species, especially shy or nocturnal ones, have helped contribute to the official inventory of mammals on the installation. Some mammals, however, have not been well documented and require confirmation (Appendix K). The watch list is also useful for mammalian species (e.g., the feral pig) not currently on the Detachment, but have the potential to occur in the future.

4.12.3 Conservation and Research

Mammalian species on the Detachment are expected to benefit directly or indirectly from the conservation and rehabilitation measures identified below.

- *Exotic and invasive plant control.* – The primary objective of the weed management program is to enhance native habitats, which is expected to benefit a variety of native flora and fauna, including mammals. Successful eradications of non-native species often leads to recovery of native species and ecosystem functions (Zavaleta et al. 2001).
- *Stephens' kangaroo rat habitat enhancement.* – A well-managed cattle grazing program is expected to provide habitat enhancement for the Stephens' kangaroo rat. Other forms of habitat enhancement, such as mechanical means of vegetation modification, have been conducted for this species (see Section 4.13).
- *Bat habitat enhancement.* – Provision of artificial, supplemental roosting sites for bats has been shown to be a successful alternative to occupying buildings and magazines in certain circumstances. For the conservation of these important, sensitive species, it is essential the Navy maintains a long-term commitment to the maintenance (and where feasible, enhancement) of artificial roosting structures, especially ones that have successfully attracted sizeable bat colonies.
- *Research.* – Aside from the Stephen's kangaroo rat or bats, only a limited number of investigative studies have been conducted on mammals. In 2011, the Detachment participated in a short-term study by the USGS that evaluated the efficacy of using canine detection methods for surveying for the American badger (Brehme et al. 2012). Future research may help inform natural resources management on the installation, especially with respect to the potential use of indicator species, potential control methods for exotic invasive species, efficacy of different artificial bat house locations and configurations, etc. The Detachment has also benefited from the CDFW studies on mountain lions that use telemetry to track mountain lion movements and distributions, which have indicated the use of the installation by radio-collared animals.

4.12.4 Management Actions

Actions presented within other sections of this chapter often directly or indirectly support the conservation and management of mammals. Specific actions applicable to the conservation and management of mammals:

- *Avoidance and minimization:*
  - Implement avoidance and minimization measures that protect native mammals and SAR. (See Sections 4.2.2 and 4.12.1)
- *Surveys and monitoring:*
  - Conduct, or partner with regional collaborators to conduct, periodic reconnaissance surveys for the potential presence of mammalian SAR.
  - Approximately once every 5-10 years, depending on environmental conditions, conduct a species richness/diversity survey for key mammalian taxa (e.g., bats). Prior to implementation, protocol should have sufficient rigor to establish baseline conditions (if not already available) from which to detect change.
  - Continue focal species monitoring for Stephens' kangaroo rat (see Section 4.13.7), and evaluate and prioritize the potential benefit of additional mammalian focal species for possible monitoring (see Section 4.2.3).

- Maintain log of incidental encounters of watch list or other mammalian species of potential management interest, especially if the observation is not already included in a survey report.

- *Conservation and research:*
  - Continue to implement non-native invasive species control (e.g., weed management, aquatic exotics), coordinating with adjacent property owners and regional efforts as applicable and to the greatest extent feasible. Should a non-native, invasive mammal, such as the wild pig, become a problem in the future, their eradication will be a priority for management and likely require regional coordination.
  - Investigate and implement as feasible opportunities to retain healthy native mammalian species and restore their role in the ecosystem (e.g., seek humane and effective solutions for pest management that eliminate the use of chemical rodenticides that may directly or indirectly affect non-target species).
  - Investigate the efficacy of bat exclusion/conservation initiatives.
  - Continue to seek effective and permanent alternative (artificial) bat roost locations that help draw bats away from areas that conflict with human activity and provide for the long-term conservation of the bat colonies.

- *Regional partnering:*
  - Support mutually beneficial opportunities for partnering with resource agencies, research institutions, or individuals for surveys and studies pertaining to mammalian diversity, ecology, and native species conservation.

4.13 FEDERALLY LISTED SPECIES (INCLUDING DISCUSSION OF BENEFITS TO SPECIES)

Species that are federally listed as threatened or endangered under the federal Endangered Species Act (federally listed species) present a special concern for natural resources management and mission support. The federal ESA of 1973 describes two categories of imperiled plants and animals needing protection under the Act: (1) “endangered species”, which are at the brink of extinction, and (2) “threatened species”, which are likely to become endangered in the foreseeable future. This federal legislation is intended to provide a means whereby the ecosystems upon which endangered and threatened species depend may be conserved, and provide programs for the conservation of those species, thus preventing extinction of native plants and animals.

The USFWS and National Marine Fisheries Service (NMFS) administer the ESA and may designate specific geographic areas as “critical habitat” if the areas are deemed essential to the species’ conservation and require special management and protection. Under Section 4(b)(2) of the ESA, critical habitat shall not be designated on lands owned or controlled by DOD that are subject to an INRMP, if the INRMP in question provides a benefit to such species.

Currently, there is no designated critical habitat at Detachment Fallbrook. This section presents management measures that specifically support the protection and conservation of federally listed species and their habitats. To the extent compatible with the mission, Detachment Fallbrook further supports measures that may aid in the recovery of federally listed species.

4.13.1 Southern California Coast Steelhead

The Southern California Coast (SCC) steelhead (steelhead), which was recently observed in the Santa Margarita River upstream of the base (NMFS 2010), is expected to capitalize on available migration opportunities through elevated flows during storm events (e.g., abundant rainfall). Habitat within the reach of the Santa Margarita River along the Detachment likely serves as a migratory corridor both for adult steelhead transiting to/from the ocean to spawn in streams further upstream and provides rearing habitat for their offspring returning to the ocean to forage until maturity. Unlike most salmonids that die after spawning, adult steelhead may return to the ocean and make one or more repeat spawning migrations (NMFS 2005).

As the Navy conducts few and largely benign activities within or near the Santa Margarita River, and as steelhead presence is largely determined by sufficient quantity and quality of river discharge, management for the species is primarily covered under avoidance and minimization and possibly through habitat enhancement for other SAR that co-occur within the river (e.g., least Bell's vireo, arroyo toad). Descriptions of management applications that may benefit steelhead are presented below.

One contemporary project, at this time, that affects steelhead is the Santa Margarita River Conjunctive Use Project (CUP) (NMFS 2015), of which Detachment Fallbrook is a participating agency (Section 3.4.4). The SMR CUP is currently under consultation with both USFWS and NMFS.

Objective: Implement management strategies that maintain a healthy and diverse riverine and riparian community to benefit steelhead and other SAR and native sympatric species.
Key Considerations: • ESA, CWA, and other regulations protecting native fish, SAR, and their habitat. • Invasive species (plant and animal) that may detrimentally affect native fish and steelhead in particular, including upstream sources that are difficult to manage. • Potential influence of wide-spread environmental stressors, including factors that affect river hydrology (e.g., drought, water consumption), climate change, diseases, etc., beyond the boundaries of Detachment Fallbrook. • Partnership opportunities with Camp Pendleton for the shared management of the Santa Margarita River. • As provided for under the ESA Section 7(a)(1) with respect to species conservation, consider implementation of recovery actions described in the Southern California Steelhead Recovery Plan (NMFS 2012).

4.13.1.1 AVOIDANCE AND MINIMIZATION

Overarching factors such as low levels of development, low-impact mission, and protection of wetlands (Section 4.2.2) are expected to minimize or avoid adverse effects to steelhead. Below are additional avoidance and minimization measures that may support steelhead conservation and recovery:

- *Legal status.* – Because steelhead is a federally listed endangered species, any future project or activity that may affect steelhead or its habitat requires an ESA section 7 consultation with NMFS.
- *Limited pesticide use.* – Avoidance and minimization of potential impacts from pesticides on bodies of water and associated wetlands at Detachment Fallbrook are expected to reduce effects to fish and other aquatic life (Sections 4.2.2, 4.14, 4.15). Nonetheless, as the Detachment occurs relatively far downstream within the larger Santa Margarita River

watershed, pesticides are expected to enter waterways on the installation via urban and agricultural runoff further upstream.

- *Soil erosion BMPs*. – Measures that improve water quality through the minimization of soil erosion, runoff, and siltation are expected to reduce effects to steelhead.
- *Wetland protection*. – Measures to avoid and minimize ground-disturbing impacts and/or the discharge of pollutants, including dredged or fill material, to wetland habitats, which include lakes, ponds, and streams, are expected to minimize adverse effects to steelhead (Sections 4.2.2 and 4.6.1).
- *Land use in the Santa Margarita River*. – The Navy currently, and for the foreseeable future, has virtually no mission related activities within or near the Santa Margarita River, which is expected to minimize adverse effects to steelhead (Sections 4.2.2). Detachment Fallbrook does not have any dams or manmade barriers to salmonid migration on the river.
- *Umbrella protection*. – Measures that were implemented for the avoidance and minimization of other federally listed species within the Santa Margarita River (e.g., arroyo toad, least Bell's vireo) are expected to avoid adverse effects to steelhead (e.g., avoidance of impacts to vireo habitat helps maintain riparian understory vegetation that provides shade, which in turn helps keep water temperatures from spiking during summer months).

4.13.1.2 SURVEYS AND MONITORING

The portion of the Santa Margarita River along Detachment Fallbrook is expected to provide habitat as a migratory corridor for steelhead. As such, steelhead presence is largely dependent on sufficient quantity and quality of river discharge. Detecting steelhead presence inside or outside of the migratory and rearing season requires, in part, a systematic survey approach; as such, there is no specific monitoring program at Detachment Fallbrook for the species tailored to detect the species at different life stages (e.g., fry, parr, smolts, adults). Nonetheless, the aquatic exotics control program provides an excellent opportunity to detect steelhead in low to moderate flow conditions. However, during high flow events, when the probability of steelhead presence is expected to be greater, aquatic exotics control is more limited. Should steelhead be detected incidentally or during other surveys or programs, additional monitoring may be considered.

- *Watch list species*. – Vigilance for steelhead is maintained during aquatic exotic species control efforts in the Santa Margarita River both on Detachment Fallbrook and downstream on neighboring MCB Camp Pendleton.

4.13.1.3 CONSERVATION AND RESEARCH

Steelhead are expected to benefit from the following habitat conservation/restoration measures in the Santa Margarita River:

- *Exotics control*. – An abundance of non-native invasive species within the Santa Margarita River can significantly alter steelhead habitat. Animals such as bullfrogs, non-native fish, and crayfish can contribute substantial predation pressure on native species, such as young steelhead. Prior to 2012, the Navy periodically conducted exotics aquatic control in the Santa Margarita River. Since 2012, the Navy has partnered with MCB Camp Pendleton on an annual aquatic exotics removal program, enabling an expansion of the treatment further upstream and benefiting the shared reach of the river along Detachment Fallbrook. This supports the invasive animal and plant species control recovery action identified within the Southern California Steelhead Recovery Plan (NMFS 2012).

4.13.1.4 MANAGEMENT ACTIONS

Actions presented within other sections of this chapter may directly or indirectly support the conservation and management of steelhead. Specific actions applicable to the species:

- *Avoidance and minimization.* – Implement avoidance and minimization measures that protect steelhead and steelhead habitat within the Santa Margarita River. (See Sections 4.2.2 and 4.13.1.1)
- *Surveys and monitoring.* – Maintain vigilance for steelhead as a watch list species, especially during aquatic exotics control efforts and other surveys that may involve surveyors with relevant subject matter expertise.
- *Conservation and research.* – Provide for the rehabilitation of habitat for steelhead and other listed species and SAR through the control of invasive species to the greatest extent feasible. This supports the Southern California Steelhead Recovery Plan (NMFS 2012).

4.13.2 Arroyo Toad

The arroyo toad is only known to occur within the Santa Margarita River floodplain and its associated upland habitat. Very few mission-related activities occur within this reach of the Santa Margarita River, and those activities are fairly benign (e.g., biological surveys, exotics control, helicopter flyovers).

The Detachment's northern perimeter fence restricts cattle from grazing within the drainage itself, with the closest point between the pastures and the river being at a low spot along River Road in the northeast area of the installation. Firebreak maintenance, which occurs once annually, is the most intrusive activity in the area. Potential effects to arroyo toads from firebreak maintenance are considered relatively low and are addressed within the WFMP BO. One conservation measure is to stop firebreaks before reaching the river's floodplain. To date, no arroyo toads have been observed within firebreaks on the Detachment. The only other contemporary project with potential to affect arroyo toads is the SMR CUP, of which the Navy is a participating agency (Section 3.4). The SMR CUP is currently under consultation with the USFWS and NMFWS.

Aquatic exotics control conducted within the Santa Margarita River is for the benefit of the arroyo toad and other native species. The multitude of exotic fish, crayfish, and bullfrogs are known predators of arroyo toads, their eggs, and larvae. Adult arroyo toads have been documented in the stomach contents of bullfrogs on more than one occasion. Aquatic exotics control at the Detachment is conducted in collaboration with MCB Camp Pendleton to provide a more effective watershed approach. Ideally, and possibly in the future, more systematic aquatic exotics control could be continued further upstream through collaborations with San Diego County Parks and Recreation and the community of Fallbrook.

Although exotic aquatic species also occur within the interior of the Detachment, especially in years when surface water in Fallbrook Creek and the larger ponds persists through the summer, many of the drainages within the interior are ephemeral and less likely to provide as significant a source of exotics in the river as compared with the contiguous upstream flows (e.g., Riley et al. 2005).

As an amphibian, the arroyo toad annually cycles between aquatic and terrestrial (upland) habitat. Of particular interest for the management of arroyo toads is gaining of a better understanding of the non-breeding upland component its life cycle. Outside of the breeding season, arroyo toads burrow into the friable soils of upland terraces and are also known to seek temporary shelter under other debris or in mammal burrows (Griffin et al. 1999, Ramirez 2000).

Arroyo toads can be active at all times of year, but may enter into a state of dormancy in their burrows during the non-breeding season, starting in the late summer from about August and extending to about January (Cadre 2002, 2003, 2007). Dormancy in arroyo toads is often referred to as aestivation, which is similar to hibernation to prevent dehydration during hot or dry times of the year. Arroyo toads may also exhibit brumation, which is a type of dormancy in reptiles and amphibians in response to colder temperatures and the decrease in daylight hours in the late fall; brumation differs from aestivation in the metabolic processes involved. For management purposes, it is important to understand the extent to which arroyo toads may disperse into the upland habitat at the Detachment and under what conditions.

In an effort to identify potential arroyo toad upland utilization, a spatially explicit model of upland habitat suitability was developed by Varanus (2004b), which subsequently underwent several revisions (see ICF & BEC [2013] for a discussion of early versions of the model). The basic premise of the model was to map the potential arroyo toad distribution within upland habitat based on three parameters: (1) topographic slope (slopes > 30%, as determined by GIS topographic layers, were considered barriers to movement), (2) potential travel corridors between the floodplain and upland habitat (which included vegetation density in earlier model versions, but was mostly based on contiguous lower grade slopes from the river into upland habitats in later versions), and (3) distance from the river.

Dense vegetation, when present, may be a barrier to upland toad dispersal. When vegetation was removed after wildland fires, more arroyo toads were found above the floodplain (e.g., after the 2002 Gavilan Fire (Varanus 2006a) and 2014 DeLuz fire (Hollingsworth & Stepek 2015)). At least part of the increase in arroyo toad observations could have been due to an increased detectability by surveyors; however, pitfall captures also increased slightly after the fire (Hollingsworth & Stepek 2015).

Testing and validating the upland model has been difficult due to the rarity of observing arroyo toads beyond the floodplain at the Detachment (Bloom et al. 2010, ICF & BEC 2013, Hollingsworth & Stepek 2015). Not only do arroyo toads already occur at low densities, but this is a species subject to dramatic natural fluctuations in all life-stages and whose activity can be highly variable depending on environmental conditions (e.g., rainfall, temperature) and may not be active at all for long periods. It is also possible that the arroyo toad may not be present within many areas of the upland habitat along the northern perimeter of the installation, especially where the terrain is steep. But absence is difficult to establish, especially for a species with low detectability. Over time, the cumulative findings of several years, under different environmental conditions (e.g., post-fire, rainy years), will eventually yield a more robust picture of potential arroyo toad distribution within upland habitat.

Objective: Implement management strategies that maintain a healthy and biodiverse riverine and riparian community to benefit the arroyo toad and other SAR and native sympatric species.
Key Considerations: • ESA and implementing agreements with USFWS, including WFMP BO. • Invasive species (plant and animal) that may detrimentally affect arroyo toads, including upstream sources that are difficult to manage. • Upland habitat suitability and use; refinement of spatially explicit distribution model. • Status of the arroyo toad on the Detachment as compared to a larger regional context and trends. • Partnership opportunities with Camp Pendleton for shared management of the River. • Potential influence of wide-spread environmental stressors, including factors that affect river hydrology (e.g., drought, water consumption), climate change, diseases, etc. • As provided for under the ESA Section 7(a)(1) with respect to species conservation, consider implementation of recovery actions described in the arroyo toad recovery plan (USFWS 1999).

4.13.2.1 AVOIDANCE AND MINIMIZATION

Overarching factors such as low levels of development and a low-impact mission (Section 4.2.2) are expected to minimize and avoid adverse effects to the arroyo toad. Additional specific measures that may support arroyo toad conservation and recovery:

- *Legal status.* – Because the arroyo toad is a federally listed endangered species, any future project or activity that may affect the toad or its habitat requires an ESA section 7 consultation with the USFWS.
- *Limited pesticide use.* – Avoidance and minimization of potential impacts from pesticides on bodies of water and associated wetlands at Detachment Fallbrook are expected to benefit the arroyo toad (Sections 4.2.2, 4.14, 4.15). Nonetheless, as the Detachment occurs relatively far downstream within the larger Santa Margarita River watershed, pesticides are expected to enter waterways on the installation via upstream, off-base urban and agricultural runoff.
- *Soil erosion BMPs.* – Measures that improve water quality through the minimization of soil erosion, runoff, and siltation are expected to benefit the arroyo toad.
- *Wetland protection.* – Measures to avoid and minimize ground-disturbing impacts and/or the discharge of pollutants, including dredged or fill material, to wetland habitats, notably within the Santa Margarita River, are expected to benefit the arroyo toad (Sections 4.2.2 and 4.6.1).
- *Land use in the Santa Margarita River.* – The Navy currently, and for the foreseeable future, has virtually no mission related activities within or near the Santa Margarita River, which is expected to benefit the arroyo toad (Sections 4.2.2).
- *Seasonal avoidance*. – Although few activities beyond biological surveys occur within the Santa Margarita riverbed itself, projects such as giant reed removal are to avoid the arroyo toad breeding season (February 15–July 15) when toad egg masses and larvae are especially vulnerable. Firebreak maintenance typically occurs in May (after the growing season and before the fire season really starts up), but firebreaks stop well before reaching the riverbed or immediate floodplain. Timing of firebreak maintenance also avoids the peak periods of adult toad dispersal (November – February) and during neonate/juvenile dispersal when individuals present are at maximum seasonal numbers (June – October). Should a prescribed burn occur on Detachment Fallbrook, the timing and location of a scheduled burn would also avoid and minimize impacts to arroyo toads.

4.13.2.2 SURVEYS AND MONITORING

Accurate estimations of the arroyo toad population in a given survey effort is confounded by the difficulty in detecting the species even under optimal environmental conditions. Tracking population trends is similarly challenged by highly variable annual fluctuations. At Detachment Fallbrook, the primary monitoring interest is to maintain long-term vigilance of the arroyo toad population within its riverine habitat and to better understand habitat utilization within the uplands. See Appendix L for additional details on the monitoring program for the arroyo toad.

- *Five-year stationwide surveys.* – The entire length of the Santa Margarita River along the boundary of Detachment Fallbrook is surveyed for arroyo toads and mapped for habitat suitability every five years in accordance with the WFMP BO. The five-year survey focuses on when and where the species is most conspicuous, during the breeding season, ideally during above-average rainfall years, and within the river. The observed presence of all life stages and breeding locations are documented as well as the hydrology, vegetation, and other factors related to the ecology, potential movement, and conservation of the arroyo toad (e.g., dense understory vegetation, recent fire, presence of exotics). As the

Detachment's reach of the Santa Margarita is shared with MCB Camp Pendleton, the Navy also benefits from the Marine Corps' annual arroyo toad monitoring program. When possible, the five-year arroyo toad survey results will be analyzed in context of the MCB Camp Pendleton monitoring data.

- *Upland surveys*. – To improve the characterization of potential upland toad distribution on Detachment Fallbrook, periodic surveys are conducted to test and refine aspects of the upland habitat model. Because of the low detectability of the species within upland habitat and annual variations, repeated survey efforts, under varying conditions are necessary to document the full extent of potential arroyo toad upland habitat utilization at Detachment Fallbrook. Upland survey localities and methods (e.g., nocturnal searches on foot, pitfall trapping, radio telemetry) have varied over the years (Varanus 2004b, 2006b; Bloom et al. 2010; ICF & BEC 2013; Hollingsworth & Stepek 2015).
- *Short-term surveys*. – Short-term surveys for the arroyo toad at Detachment Fallbrook have focused on upland surveys and investigations (above). With no major construction or mission-related projects planned in the northern perimeter of the installation in recent years, there have been no project-level (USFWS protocol) surveys in support of an ESA section 7 consultation.

4.13.2.3 CONSERVATION AND RESEARCH

Arroyo toads are expected to benefit from the following habitat conservation/restoration measures in the Santa Margarita River:

- *Exotics control*. – An abundance of non-native invasive species within the Santa Margarita River can significantly alter arroyo toad habitat. Animals such as bullfrogs, non-native fish, and crayfish can contribute substantial predation pressure on all stages of arroyo toad development. Prior to 2012, the Navy periodically conducted exotics aquatic animal control in the Santa Margarita River. Since 2012, the Navy has partnered with MCB Camp Pendleton on an annual aquatic exotics removal program, enabling the Marine Corps' to expand their treatment further upstream and benefiting the shared reach of the river along Detachment Fallbrook. Minimal exotic plant control is performed in the reach of the Santa Margarita River along Detachment Fallbrook. Large stands of giant reed are less common in this channelized segment of the river (it has been treated for several years by MCB Camp Pendleton), and the scouring flow regimens can be fairly dynamic in average and above-average rainfall years dramatically altering vegetation cover.
- *Investigative studies*. – Investigative studies are not necessarily mutually exclusive from surveys (above) if the studies simultaneously provide population abundance and/or distribution data. To date, arroyo toad studies at Detachment Fallbrook have mainly focused on questions of upland habitat preferences and movement corridors, including post-fire effects; these studies have simultaneously provided information about the species distribution within upland habitat (Varanus 2006a, Bloom et al. 2010, Hollingsworth & Stepek 2015). Such investigative lines of inquiry are expected to continue for the foreseeable future. However, additional research, such as regional investigations on arroyo toad genetics, might also benefit Detachment Fallbrook.

4.13.2.4 MANAGEMENT ACTIONS

Actions presented within other sections of this chapter may directly or indirectly support the conservation and management of arroyo toads. Specific actions applicable to the species and its habitat:

- *Avoidance and minimization:*
  - Implement avoidance and minimization measures that protect arroyo toads and their habitat within the Santa Margarita River and the associated upland habitat. (See Sections 4.2.2 and 4.13.2.1)
- *Surveys and monitoring:*
  - Comprehensively survey for the arroyo toad and the suitability of its habitat within the Santa Margarita River at least once every five years in accordance with the WFMP BO. A conservation recommendation in the WFMP BO is to coordinate with MCB Camp Pendleton regarding federally listed species surveys along the mutual boundary of the Santa Margarita River to avoid redundant efforts.
  - Continue to investigate upland habitat utilization by arroyo toads on the Detachment, and use results to validate and adjust the arroyo toad habitat suitability model.
  - Collaborate with MCB Camp Pendleton on arroyo toad surveys and monitoring results, to the extent feasible and applicable, to gain a more complete understanding of the species population dynamics within the Santa Margarita River and elsewhere.
- *Conservation and restoration:*
  - Provide for the rehabilitation of habitat through the control of exotic invasive, and other potential pest species, to the greatest extent feasible.
  - Partner with other stakeholders for conservation and research initiatives to the extent feasible and compatible with the mission.

4.13.3 California Least Tern

The migratory California least tern is only an occasional visitor to the Detachment from the coast where it locally breeds in the spring and summer. Typically hunting small fish and invertebrates in the shallow estuaries and lagoons of the coast, or beyond the breakers in the ocean, this species is occasionally spotted foraging in Depot and Lower Lakes on the Detachment.

As the Detachment does not generally harbor typical constituent elements of California least tern habitat and the species is only rarely seen and not expected to ever breed on the installation, management for the species is the same as for other migratory birds, which predominantly entails avoidance and minimization and general habitat protection.

Objective: Implement management strategies that maintain a healthy and diverse riparian community to benefit federally listed, sensitive, and other sympatric species.
Key Considerations: • ESA, MBTA, and other regulations protecting birds. • Invasive species (plant and animal) that may detrimentally affect native birds. • Potential influence of wide-spread environmental stressors, including drought, climate change, diseases, etc., beyond the boundaries of the Detachment.

4.13.3.1 AVOIDANCE AND MINIMIZATION

Overarching factors such as low levels of development, low-impact mission, and protection of wetlands (Section 4.2.2) as well as measures for the protection of birds in general (Section 4.11.1) are expected to avoid and minimize adverse effects to the California least tern. Additional specific measures that may support tern conservation and recovery include:

- *Legal status*. – Because the California least tern is a federally listed endangered species, any future project or activity that may affect the tern or its habitat requires an ESA section 7 consultation with USFWS.
- *Umbrella protection*. – As a migratory bird, the California least tern benefits from the seasonal avoidance and protection of all migratory birds as specified during NEPA and other project reviews. This INRMP assumes that the California least tern, which is only expected to occasionally forage at the lakes, receives additional umbrella protection from the added measures to avoid and minimize impacts to riparian and wetland communities.

4.13.3.2 SURVEYS AND MONITORING

As an occasional visitor, there is no monitoring program that specifically targets the California least tern. In the highly unlikely event the species establishes a breeding site, additional monitoring may be considered in the future.

- *Watch list species*. – As a federally listed species, the California least tern is considered a watch list species. Periodic detection is expected during other bird monitoring surveys, such as those for least Bell's vireo or California gnatcatcher.

4.13.3.3 CONSERVATION AND RESEARCH

As the least tern only occasionally visits the Detachment to forage, conservation and rehabilitation measures that would improve the foraging quality of the ponds would potentially benefit this species. However, as the two largest bodies of water, Depot and Lower Lakes, are part of the Munitions Response Program (MRP) (Section 2.4.4), more intrusive (soil disturbing) lake management measures (e.g., dredging, seining) are currently, and for the foreseeable future, prohibitive. Nonetheless, some less-intrusive management measures that may benefit the California least tern include general habitat enhancement for riparian areas on the Detachment:

- *Exotics control*. – Non-native invasive plant control is conducted within the riparian areas surrounding Depot and Lower Lakes, which may have a marginal indirect benefit to California least terns to the extent that it could potentially enhance the quantity or quality of foraging habitat. To date, exotic animal control is not generally conducted within the interior of the Detachment. (See Section 4.15)

4.13.3.4 MANAGEMENT ACTIONS

Actions presented within other sections of this chapter may directly or indirectly support the conservation and management of the California least tern to the extent that the species utilizes habitat on the installation. Specific actions applicable to the California least tern:

- *Avoidance and minimization:*
  - Implement avoidance and minimization measures that protect California least terns where they may occur on the Detachment. See (Sections 4.2.2 and 4.13.3.1).
- *Surveys and monitoring:*
  - Optimize vigilance through documentation of all avian species observed; especially watch list species during single-species avian surveys.
- *Conservation and research:*
  - Provide for the rehabilitation of habitat through the control of exotic invasive, and other potential pest species, to the greatest extent feasible.

4.13.4 Southwestern Willow Flycatcher

For reasons not well understood, populations of southwestern willow flycatchers are at critically low numbers throughout their distribution and current locations probably do not represent the full range of habitats in which the species could successfully breed (USFWS 2014b).

Although the southwestern willow flycatcher is not known to currently breed on the Detachment, riparian drainages on the installation (especially within the Santa Margarita River) provide dispersal and migratory habitat for the species. Non-breeding willow flycatchers (not identified to subspecies) have been detected in this habitat. Due to the Detachment's location next to MCB Camp Pendleton (which supports a population of breeding southwestern willow flycatchers), the Detachment has a high potential to support breeding flycatchers in the future.

Management of the southwestern willow flycatcher is primarily focused on avoidance and minimization of impacts to potential habitat, and continued vigilance for the species during least Bell's vireo monitoring. Constituent elements of southwestern willow flycatcher habitat are less well understood. However, conservation and rehabilitation measures conducted to improve riparian habitat in general (e.g., exotics control) are expected to benefit the flycatcher.

Objective: Implement management strategies that maintain a healthy and diverse riparian community to benefit federally listed, sensitive, and other sympatric species.
Key Considerations: • ESA, MBTA, and other regulations protecting birds, including WFMP BO. • Invasive species (plant and animal) that may detrimentally affect native birds, including upstream sources that are difficult to manage. • Habitat suitability and connectivity for southwestern willow flycatchers. • Status of the southwestern willow flycatcher on Detachment Fallbrook as compared to the larger regional context. • Potential influence of wide-spread environmental stressors, including drought, climate change, diseases, etc., beyond the boundaries of the Detachment. • As provided for under the ESA Section 7(a)(1) with respect to species conservation, consider implementation of recovery actions described in the Southwestern Willow Flycatcher Recovery Plan (USFWS 2002a).

4.13.4.1 AVOIDANCE AND MINIMIZATION

Overarching factors such as low levels of development, low-impact mission, and protection of wetlands (Section 4.2.2) as well as measures for the protection of birds in general (Section 4.11.1) are expected to minimize or avoid adverse effects to the southwestern willow flycatcher. Additional specific measures that may support flycatcher conservation and recovery include:

- *Legal status.* – Because the southwestern willow flycatcher is a federally listed endangered species, any future project or activity that may affect the flycatcher or its habitat requires an ESA section 7 consultation with USFWS.
- *Umbrella protection.* – As a migratory bird, the southwestern willow flycatcher benefits from the seasonal avoidance and protection of all migratory birds as specified during NEPA and other project reviews. This INRMP assumes that protecting the southwestern willow flycatcher, which occupies a narrower habitat niche within the same riparian habitat occupied by the least Bell's vireo , will also be accomplished through protection of least Bell's vireo as described in the WFMP BO (e.g., no cattle grazing in the Santa Margarita River and certain interior drainages).

4.13.4.2 SURVEYS AND MONITORING

Due to a lack of breeding flycatchers on the Detachment, there is currently no requirement to monitor southwestern willow flycatchers. Annual and 5-year vireo surveys conducted by the Navy, in combination with annual flycatcher surveys conducted by the Marine Corps on the Santa Margarita River, are expected to be sufficient to detect potentially breeding flycatchers. If the flycatchers establish breeding sites, the survey protocol will be reviewed and may be modified in coordination with the USFWS to accommodate any necessary changes.

- *Watch list species*. – As a federally listed species, the southwestern willow flycatcher is a watch list species and included in the annual and 5-year survey protocol for the least Bell's vireo. Flycatchers detected during these surveys (Section 4.13.5.2) are subsequently surveyed to determine whether they are territorial and breeding.

4.13.4.3 CONSERVATION AND RESEARCH

Willow flycatchers are only occasional visitors to the Detachment; nonetheless the following general habitat enhancement measure would be expected to benefit the southwestern willow flycatcher:

- *Exotics control*. – Non-native invasive species control, especially non-native plant control in riparian systems, is expected to enhance habitat for southwestern willow flycatchers. Within the Santa Margarita River, where the southwestern willow flycatcher is more likely to breed than the interior of the Detachment, large stands of giant reed were removed in the 1990s and early 2000s (largely conducted by MCB Camp Pendleton) and the area sustains sufficient stands of native riparian scrub for vireos, but flycatchers are still not breeding in this area. Today, weed control in the Santa Margarita River mostly involves re-treatments that are maintained by MCB Camp Pendleton. In this channelized reach of the river, exotic invasive plants are also naturally controlled with scouring flow regimens in average and above-average rainfall years. Although the Navy does not currently conduct cowbird trapping on Detachment Fallbrook, and instead monitors the occurrence of cowbirds, the installation is expected to benefit from cowbird trapping that occurs on neighboring MCB Camp Pendleton. Cowbird trapping may be considered in the future if deemed warranted in collaboration with the USFWS.

4.13.4.4 MANAGEMENT ACTIONS

Actions presented within other sections of this chapter may directly or indirectly support the conservation and management of the southwestern willow flycatcher to the extent that the species utilizes habitat on the installation. Specific actions applicable to the species:

- *Avoidance and minimization:*
  - Implement avoidance and minimization measures that protect southwestern willow flycatchers where they may occur on Detachment Fallbrook. (See Sections 4.2.2 and 4.13.4.1)
- *Surveys and monitoring:*
  - Maintain vigilance for the southwestern willow flycatcher during least Bell's vireo monitoring and in accordance with the WFMP BO. A conservation recommendation in the WFMP BO is to coordinate with MCB Camp Pendleton regarding federally listed species surveys along the mutual boundary of the Santa Margarita River to avoid redundant efforts.

- *Conservation and research:*
  - Provide for the rehabilitation of habitat through the control of exotic invasive, and other potential pest species, to the greatest extent feasible.
  - Partner with other stakeholders for conservation and research initiatives to the extent feasible and compatible with the mission. This is unlikely to be feasible in the foreseeable future due to such a low frequency of species occurrence.

4.13.5 Least Bell's Vireo

The main threat to the least Bell's vireo's continued existence is the loss or degradation of its breeding habitat in southern California combined with cowbird parasitism (USFWS 1998a). In the 1990s through the mid-2000s, the San Diego County least Bell's vireo population increased more than other populations within this species range, which is attributed largely to brown-headed cowbird control efforts and riparian habitat conservation (USFWS 2006b, Kus & Whitfield 2011).

Although habitat for the least Bell's vireo on the interior of the Detachment is limited, the birds that do occur are near one of the largest populations in the region, which is on MCB Camp Pendleton. The majority of least Bell's vireos on the Detachment occur within the Santa Margarita River. The incised creeks and narrow riparian corridors, in combination with a legacy of reduced understory from cattle grazing, may contribute to the limited numbers of least Bell's vireo territories observed within the interior of the Detachment.

Least Bell's vireo management is based primarily on protecting riparian habitat in general and, more specifically, vireo occupied habitat and Management Priority Areas (WFMP, Map 3-4, p. 3-33; Map 3-10). Management Priority Areas are based on the mapping of relative habitat suitability, which are based on relative habitat values (WFMP, Map 3-4, p. 3-33; Map 3-10).

Least Bell's vireo is a common host to the brown-headed cowbird. Cowbird control is implemented by neighboring MCB Camp Pendleton, which is expected to provide some benefit to Detachment Fallbrook. However, it is not uncommon for some degree of parasitism to be documented during annual least Bell's vireo surveys on the Detachment (Appendix L). The brown-headed cowbird is currently controlled on a targeted basis through the removal of cowbird eggs and chicks from nests by permitted surveyors. Higher incidences of cowbird parasitism has been reported in specific locations (e.g., along parts of the Santa Margarita River), which may warrant consideration of cowbird control measures in those areas; however, potential negative effects on non-target species captured needs to be taken into consideration before this is implemented.

Objective: Implement management strategies that maintain a healthy, diverse, and intact riparian community that is able to support the least Bell's vireo, where appropriate, and other SAR and native sympatric species.
Key Considerations: • ESA, MBTA, and other regulations protecting birds, including WFMP BO. • Invasive species (plant and animal) that may detrimentally affect native birds, including upstream sources that are difficult to manage. • Management Priority Areas and habitat suitability and connectivity for least Bell's vireos. • Population distribution and relative abundance data for least Bell's vireos on a relevant scale and frequency to support management. • Protection of vireo habitat during prescribed burns or "fuel reduction activities" in adjacent habitat. • Protection of least Bell's vireo habitat from cattle grazing. • Status of the vireo on the Detachment as compared to a larger regional context and trends.

- Potential influence of wide-spread environmental stressors, including drought, climate change, diseases, etc., beyond the boundaries of the Detachment.
- As provided for under ESA Section 7(a)(1) for species conservation, consider implementing recovery actions described in the Draft Recovery Plan for the Least Bell's Vireo (USFWS 1998a).

4.13.5.1 AVOIDANCE AND MINIMIZATION

Overarching factors such as low levels of development, low-impact mission, and protection of wetlands (Section 4.2.2) as well as measures for the protection of birds in general (Section 4.11.1) are expected to avoid and minimize adverse effects to the least Bell's vireo. Additional specific measures that may support least Bell's vireo conservation and recovery include:

- *Legal status.* – Because the least Bell's vireo is a federally listed endangered species, any future project or activity that may affect the vireo or its habitat requires an ESA section 7 consultation with USFWS.
- *Seasonal restrictions.* – Work that that could potentially negatively affect nearby least Bell's vireos is not permitted during the breeding season or is not permitted without the presence of a qualified biological monitor. The breeding season restriction for the least Bell's vireo is typically from 15 March to 15 August.
- *Nest surveys and avoidance.* – Should it not be feasible to implement seasonal restrictions, avoidance of nests and occupied territories is aided by annual monitoring for least Bell's vireos.
- *Protection of riparian habitat and Management Priority Areas.* – Avoidance and minimization of impacts to the least Bell's vireo is primarily accomplished through the protection of riparian habitat. More specifically, occupied least Bell's vireo habitat and Management Priority Areas 1 and 2 (WFMP, Map 3-4, p. 3-33; Map 3-10), which are based on relative habitat values for least Bell's vireos. For example, willow woodland and willow-mule fat riparian scrub are protected to the greatest extend feasible during a wildfire, prescribed burn, weed control, and for other activities that may affect the vireo.
- *Protection from cattle grazing.* – To the greatest extent feasible, protect the least Bell's vireo Management Priority Areas from grazing, where grazing is determined to be a problem, through the use of fencing. Grazing is currently excluded from the Santa Margarita River, some parts of Fallbrook Creek, and in other isolated areas. A conservation recommendation in the WFMP BO is to fence more areas to exclude cattle from willow riparian habitat; additional exclusion fencing was added downstream of Lower Lake in 2014. The duration of grazing in Pasture 4 (Depot Lake area) is limited to a maximum of one month per year in accordance with WFMP BO.

4.13.5.2 SURVEYS AND MONITORING

Detachment Fallbrook maintains a survey protocol for the least Bell's vireo to facilitate the collection of consistent and repeatable data for monitoring population status and trends and habitat suitability (see Section 4.2.2). When possible, the least Bell's vireo survey results will be analyzed in association with data from vireo populations on adjacent MCB Camp Pendleton habitat. See Appendix L for additional details on the monitoring program for least Bell's vireo.

- *Five-year stationwide surveys.* – All riparian areas are surveyed for least Bell's vireo and mapped for habitat suitability every five years in accordance with the WFMP BO and the Detachment's monitoring protocol.
- *Annual, abbreviated surveys.* – A subset of riparian habitat (fixed linear transects) within the interior of the Detachment is surveyed annually for least Bell's vireos following the Detachment's protocol.

- *Cowbird parasitism.* – During the least Bell's vireo monitoring surveys, a subset of pairs may be nest-monitored to determine if any parasitism of nests by brown-headed cowbirds is occurring. If found present, eggs and chicks are removed by permitted biologists.
- *Short-term surveys.* – Few ESA section 7 project-level surveys have been conducted for the least Bell's vireo, in part, because few projects occur in riparian habitat or have the potential to affect vireos. Also, the annual vireo monitoring program has served the dual benefit of providing sufficient cumulative data to support avoidance and minimization for the few projects that have occurred near occupied habitat.

4.13.5.3 CONSERVATION AND RESEARCH

Least Bell's vireos are expected to benefit from the following conservation and habitat enhancement measures:

- *Exotics control.* – Non-native invasive plant control is expected to benefit the least Bell's vireo by improving habitat quality. Although the control of exotic plants predominantly occurs within the interior of the installation, where there are fewer least Bell's vireos, habitat improvements have been seen in areas that historically were dominated by non-native invasive species. For example, subsequent to the removal of large stands of giant reed in the late 1990s and early 2000s along Fallbrook Creek, just south of the administrative area, the willow and mule fat habitat that has expanded in the area has been periodically occupied by least Bell's vireos in recent years.
- *Cowbird monitoring and control.* – The Navy does not currently have a cowbird trapping program; however, incidences of cowbird parasitism of least Bell's vireos are documented during monitoring surveys and cowbird eggs may be removed from vireo nests by permitted surveyors. In addition, least Bell's vireos are expected to benefit from cowbird trapping that occurs on neighboring MCB Camp Pendleton. Cowbird trapping may be considered in the future if deemed warranted in collaboration with the USFWS.
- *Exclusion fencing.* – Exclusion fencing for the protection of vireos (and riparian habitat) from cattle grazing is listed as an "Avoidance and Minimization" measure above to protect existing habitat, but fencing is also a conservation recommendation in the WFMP BO that allows for the rehabilitation of potential vireo habitat that may be excessively degraded. It is not currently realistic or desirable to exclude all riparian areas from cattle, especially in areas where cattle are still dependent on the access to water; however, in 2015, additional exclusion fencing was extended along Fallbrook Creek, below the Lower Lake area, for the purpose of habitat rehabilitation due to excessive cattle impacts.
- *Riparian buffers.* – The WFMP proposes protection of riparian habitat through the establishment of an estimated 100-foot clear zone buffer between shrublands and least Bell's vireo Management Priority Areas. Such labor intensive measures would require consideration of potential effects to California gnatcatchers, and the benefits would need to be weighed against the costs. To date, this measure has not been pursued, but may be considered in the future.

4.13.5.4 MANAGEMENT ACTIONS

Actions presented within other sections of this chapter often directly or indirectly support the conservation and management of least Bell's vireos and riparian vegetation. Specific actions applicable to the species and its habitat:

- *Avoidance and minimization:*
  - Implement avoidance and minimization measures that protect least Bell's vireos and their riparian habitat to the greatest extent feasible. (See Sections 4.2.2 and 4.13.5.1)

- *Surveys and monitoring:*
  - Comprehensively monitor the least Bell's vireo population and habitat suitability in accordance with the WFMP BO once every five years, with annual abbreviated monitoring interim years or at intervals deemed appropriate to support adaptive management and decision making. A conservation recommendation in the WFMP BO is to coordinate with MCB Camp Pendleton regarding federally listed species surveys along the mutual boundary of the Santa Margarita River to avoid redundant efforts.
- *Conservation and research:*
  - Provide for the rehabilitation of habitat through the control of exotic invasive and other potential problem species, to the greatest extent feasible.
  - As feasible and appropriate, extend cattle exclusion fencing to protect more willow riparian habitat.
  - Evaluate approximately every five years, the priority management areas for least Bell's vireos in collaboration with the USFWS and CDFW to assess whether spatial adjustments or prioritization ranking changes are warranted.
  - Support mutually beneficial investigative research and studies that may yield insight into improved understanding and management of least Bell's vireos on the Detachment and/or may contribute the regional conservation of the species.

4.13.6 California Gnatcatcher

The coastal California gnatcatcher is listed as a federally threatened species primarily because of the continuing destruction and fragmentation of its habitat. Although the permanent loss of habitat is not a current or foreseeable threat on the Detachment, the temporal loss and fragmentation of habitat due to wildland fire is a concern. Wildland fires can render habitat unsuitable for gnatcatchers for an estimated three to ten years (Beyers & Wirtz II 1997, Wirtz et al. 1997, USFWS 2010a), depending on burn severity, rainfall, and other environmental conditions.

Excessive fire frequency can cause type conversion to grassland or may promote the dominance of shrublands by laurel sumac, both of which lower the value of habitat for California gnatcatchers. Other threats to the gnatcatcher population include habitat loss from project construction and habitat degradation from mowing and exotic plant invasion (USFWS 1993a, 2003b; Varanus 2002). While habitat degradation from grazing and parasitism from cowbirds have also been suspected threats to gnatcatchers (USFWS 1993a, 2003b; Varanus 2002), there has been scant evidence indicating the adverse effects of these potential stressors on California gnatcatchers at the Detachment (see below).

California gnatcatcher management is based primarily on protecting coastal sage scrub habitat in general and, more specifically, gnatcatcher occupied habitat and Management Priority Areas, which are based in part on relative habitat values as defined by Varanus (2002) (WFMP, Map 3-6, p. 3-49; Map 3-11). As identified in the WFMP and associated BO, a minimum of 2,000 acres of CSS shall be maintained "in a state suitable for occupation by gnatcatchers" (p. 10, WFMP BO). This acreage value was based on an estimate of Type I, II, and III CSS as defined by Varanus (2002), which contained a majority of the California gnatcatcher observations at that time, which was among the lowest estimated gnatcatcher population years on record at Detachment Fallbrook (Appendix L). The 2,000 acres of occupied gnatcatcher habitat is considered a very low threshold, below which the Navy and USFWS will "jointly determine actions required to promote regrowth of CSS above this acreage threshold" (p. 10, WFMP BO). Following the 2014 Tomahawk Fire, for example, the Navy and USFWS jointly discussed actions that would promote optimal CSS regrowth (e.g., increased weed control; possible protection from, and monitoring effects of, cattle

grazing). Revisions to the vegetation mapping protocol that are currently underway (see Section 4.6, Vegetation Communities, Habitats, and Land Cover Types) will not alter the underlying premise of priority management areas based on occupancy and relative suitability of habitat.

At the Detachment, natural resources management must balance the occasionally competing requirements of the California gnatcatcher, a shrub land species, with those of the Stephens' kangaroo rat, a grassland species. Management that benefits grasslands (such as prescribed burns) may be at the expense of shrub land habitat, and vice versa.

Prior to the DeLuz and Tomahawk Fires in FY 2014, shrub lands had been expanding on the installation (e.g., based on vegetation mapping [TDI 2011a], aerial photos, LTETM plots [TDI 2011b]) and the gnatcatcher population appeared to be relatively stable and even increasing, whereas the Stephens' kangaroo rats had been in severe decline and appeared to be persisting in a highly reduced and more fragmented state (Chapter 3, Appendix L). Under such conditions, potential conflicts with California gnatcatcher and Stephens' kangaroo rat management were expected to generally be resolved, in coordination with the USFWS, in favor of the Stephens' kangaroo rat. "In areas where occupied (gnatcatcher) and Stephens' kangaroo rat habitat occur in close proximity, certain trade-offs may be made between enhancement of Stephens' kangaroo rat habitat and loss of gnatcatcher habitat. An example is when a clear advantage can be demonstrated to adjacent Priority 1 Stephens' kangaroo rat area (i.e. providing connectivity)," (p. 3-39, WFMP).

Following the FY 2014 fires, prevailing conditions are expected to favor the Stephens' kangaroo rat and post-fire recovery will likely necessitate greater protection and possible enhancement of California gnatcatcher habitat for a period of time. Nonetheless, site specific management decisions will still be made on a case-by-case basis, taking into account conditions required for the recovery of both species.

Cattle grazing operations, implemented primarily for fire management benefits, are generally considered beneficial for Stephens' kangaroo rats (O'Farrell 1992, Germano et al. 2001, Kelt et al. 2005, Montgomery & CH2MHill 2008, Tetra Tech 2013), but considered potentially detrimental to California gnatcatchers and/or coastal sage scrub (Callaway & Davis 1993, TDI 2002). Nonetheless, cattle grazing has occurred throughout much of the coastal sage scrub (CSS) habitat since before the Navy owned the property and California gnatcatchers have continued to persist and appear to exhibit normal population fluctuations (Erickson & Minor 1998; also Chapter 3, Appendix L).

The potential direct and indirect effects of cattle grazing on gnatcatchers, including brushing against nests during the breeding season and an increase in nest parasitism from brown-headed cowbirds, were evaluated in the WFMP BO. Neither of these effects from cattle grazing has been observed. Since 2008, California gnatcatchers have been monitored annually; tracking relative changes in the distribution and abundance of breeding pairs within fixed survey polygons (see Appendix L). In any given year, typically at least 10-20 nests are monitored for parasitism and success/failure. To date, gnatcatcher surveyors have yet to report any observations of nest parasitism or failure due, or presumed to be due, to impacts from cattle.

It is possible that cattle may actually provide an indirect benefit to the gnatcatcher by helping keep the canopy of older, more mature stands of coastal sage scrub from overgrowing and closing in too much. While California gnatcatchers have been associated with a moderate degree (> 50%) of shrub cover (Beyers & Wirtz 1995), the species generally prefers relatively open sage scrub (e.g., Grishaver et al. 1998, USFWS 2007).

Some of the more consistently occupied Survey Areas, prior to the Tomahawk Fire, had no fires on record for over 30 or more years (based on the Navy's GIS inventory of fire history, Map 3-4). For example, much of the coastal sage scrub in survey polygons 5b and 5c (Appendix L), which had

among the highest gnatcatcher densities before the Tomahawk Fire, had not burned in over 46 years or at all in the 100+ years on record. Cattle have undoubtedly caused disturbances in these coastal sage scrub stands (e.g., creating cattle trails, knocking off dead branches) so it is possible some of this disturbance has helped improve the habitat in these older stands for gnatcatchers and possibly for other species, such as the coastal cactus wren. While cattle may affect the rate of coastal sage scrub expansion (inhibiting recruitment), the vegetation community still appears to have expanded in recent years. Post-fire or recovering coastal sage scrub, however, is likely to be more vulnerable to the impacts from cattle.

Objective: Implement management strategies that maintain a healthy, diverse, and intact coastal sage scrub community that is able to support the California gnatcatcher and other SAR and native sympatric species.
Key Considerations: • ESA, MBTA, and other regulations protecting birds, including WFMP BO. • Invasive species (plant and animal) that may detrimentally affect native birds. • Management Priority Areas and maintaining sufficient quantity of suitable, un-fragmented habitat for the California gnatcatcher. • Population distribution and relative abundance data for California gnatcatchers on a relevant scale and frequency to support management. • Status of the coastal California gnatcatcher on Detachment Fallbrook as compared to a larger regional context. • Potential influence of wide-spread environmental stressors, including drought, climate change, diseases, etc., beyond the boundaries of the Detachment.

4.13.6.1 AVOIDANCE AND MINIMIZATION

Overarching factors such as low levels of development and low-impact mission (Section 4.2.2) as well as measures for the protection of birds in general (Section 4.11.1) are expected to avoid and minimize adverse effects to the coastal California gnatcatcher. Additional specific measures applicable to gnatcatcher conservation and recovery include:

- *Legal status*. – Because the coastal California gnatcatcher is a federally listed threatened species, any future project or activity that may affect the gnatcatcher or its habitat requires an ESA section 7 consultation with USFWS.
- *Seasonal restrictions*. – Work that that could potentially negatively affect nearby coastal California gnatcatchers is not permitted during the breeding season or is not permitted without the presence of a qualified biological monitor. The breeding season restriction for the coastal California gnatcatcher is typically from 15 February to 31 August.
- *Nest surveys and avoidance*. – Should it not be feasible to implement seasonal restrictions, avoidance of nests and occupied territories is aided by annual monitoring for coastal California gnatcatcher.
- *Protection of coastal sage scrub and Priority Management Areas*. – Protect populations of the California gnatcatcher primarily through managing coastal sage scrub habitat. Protect California gnatcatcher Priority Management Areas 1 and 2 (WFMP, Map 3-6, p. 3-49; Map 3-11), and gnatcatcher territories, to the greatest extent feasible during a wildfire, prescribed burn, weed control, and for other activities that may affect the gnatcatcher.
- *Protection from cattle grazing*. – To the greatest extent feasible, protect the California gnatcatcher Priority Areas from adverse effects of grazing, e.g., through seasonal and/or rotational grazing; through strategic placement of water troughs, salt blocks, food supplements, and other attractants that could cause excessive cattle activity.

4.13.6.2 SURVEYS AND MONITORING

Detachment Fallbrook maintains a survey protocol for the coastal California gnatcatcher to facilitate the collection of consistent and repeatable data for monitoring population status and trends and habitat suitability (see Section 4.2.2 for guiding principles regarding surveys and monitoring). When possible, California gnatcatcher survey results will be analyzed in association with data from gnatcatcher populations on adjacent MCB Camp Pendleton habitat. See Appendix L for additional details on the monitoring program for the California gnatcatcher.

- *Five-year stationwide surveys*. – All coastal sage scrub on Detachment Fallbrook is scheduled to be surveyed for coastal California gnatcatchers and mapped for habitat suitability once every five years in accordance with the WFMP BO and the Detachment's monitoring protocol.
- *Annual, abbreviated surveys*. – A subset of coastal sage scrub habitat (fixed monitoring polygons) is surveyed for coastal California gnatcatchers annually following the Detachment's protocol.
- *Cowbird parasitism*. – During the coastal California gnatcatcher monitoring surveys, a subset of gnatcatcher pairs may be nest-monitored to determine if any parasitism of nests by brown-headed cowbirds is occurring.
- *Short-term surveys*. – On occasion, ESA section 7 project-level surveys have been conducted for the California gnatcatcher in support of USFWS consultations; however, the annual monitoring program has also served the dual benefit of providing sufficient cumulative data to support avoidance and minimization for many smaller mission projects over the years. Whether existing survey data are sufficient for assessing potential effects is determined on a case by case basis and in collaboration with the USFWS. Short-term surveys for the California gnatcatcher have also been conducted in support of various investigative studies (see "Conservation and Rehabilitation" below).
- *Regional plot monitoring*. – Detachment Fallbrook participates in a regional California gnatcatcher monitoring program throughout southern California that is coordinated by USFWS and USGS and generally expected to occur once every three to five years. Region-wide monitoring employs sampling techniques (e.g., plot/point counts) that may be less informative for local management, but allow for analysis of larger population trends, colonizations, extinctions, etc. throughout the region. Region-wide data points complement the Detachment's monitoring program by providing a means for comparing the gnatcatcher population on the Detachment with regional trends.

4.13.6.3 CONSERVATION AND RESEARCH

California gnatcatchers are expected to benefit from the following conservation and habitat enhancement measures:

- *Exotics control*. – Non-native invasive plant control is expected to benefit the California gnatcatcher by improving habitat quality. Possibly due in part to cattle grazing, less disturbance, and/or a lower fire frequency, certain exotic plants that can dominate scrub lands, such as fennel, are less common. Nonetheless, maintaining the weed management program helps keep those populations in check. One exotic plant species, bridal veil broom, first discovered in the mid-1990s as a rapidly expanding infestation throughout both sage scrub and grassland habitat, has been greatly reduced in numbers and is targeted for control and even eradication if off-installation source points are removed.
- *Cowbird monitoring and control*. – The Navy does not currently have a cowbird trapping program; however, cowbird parasitism of California gnatcatchers have never been documented on the installation. As cowbirds are known to parasitize gnatcatchers elsewhere

(e.g., Braden et al. 1997), should conditions change, cowbird trapping may be considered in the future if deemed warranted in collaboration with the USFWS.

- *Habitat restoration.* – Coastal sage scrub habitat restoration may be considered for situations such as temporary or permanent loss of habitat from projects (uncommon on the installation) or the unintended habitat loss from wildland fires. In most cases after temporary impacts, including wildland fires, coastal sage scrub vegetation will be allowed to re-grow naturally with heightened vigilance for weed treatment. However, additional restoration may be considered in situations where extensive stands of the slow-growing prickly pear or cholla cacti have been removed or where erosion or another significant negative environmental processes are anticipated.
- *Investigative research.* – To the extent feasible, the Navy encourages investigative research and hypothesis-driven studies that help inform management and conservation of the California gnatcatcher. After the Tomahawk Fire, for example, one question of interest is how the fire affected gnatcatchers (e.g., is there occupancy of lightly burned areas?) and the species post-fire recovery rates. Detachment Fallbrook is able to track this, in part, via the annual monitoring program, but the Navy is also participating in a USGS-coordinated post-fire gnatcatcher study throughout the region.
- *Genetics studies.* – In 2013, the Navy participated in a region-wide California gnatcatcher genetics study conducted by USGS. Results are expected to provide insight into the degree of potential gene flow between extant subpopulations which will help inform regional conservation initiatives and may have implications for gnatcatcher management at the Detachment.

4.13.6.4 MANAGEMENT ACTIONS

Actions presented within other sections of this chapter often directly or indirectly support the conservation and management of coastal California gnatcatchers and coastal sage scrub communities. Specific actions applicable to the species and its habitat:

- *Avoidance and minimization:*
  - Implement avoidance and minimization measures that protect coastal California gnatcatchers and coastal sage scrub habitat to the greatest extent feasible. (See Sections 4.2.2 and 4.13.6.1)
- *Surveys and monitoring:*
  - Comprehensively monitor the California gnatcatcher population and habitat suitability in accordance with the WFMP BO once every five years, with annual abbreviated monitoring interim years or at intervals deemed appropriate to support adaptive management and decision making.
- *Conservation and research:*
  - Provide for the rehabilitation of habitat through the control of exotic invasive and other potential problem species, to the greatest extent feasible.
  - As appropriate and feasible, and in coordination with the USFWS, implement habitat restoration and enhancement following the temporary or permanent impacts to coastal sage scrub vegetation.
  - Evaluate approximately every five years, the priority management areas for the California gnatcatcher in collaboration with the USFWS and CDFW to assess whether spatial adjustments or prioritization ranking changes are warranted.

- Support mutually beneficial investigative research and studies that may yield insight into improved understanding and management of the California gnatcatcher and/or may contribute the regional conservation of the species.

4.13.7 Stephens' Kangaroo Rat

The Stephens' kangaroo rat was listed as federally endangered primarily because of the reduction, degradation, and fragmentation of its habitat (USFWS 1988, USFWS 1997a). Although the 2011 five-year review for the species recommended "down listing" to a threatened status primarily due to the development and implementation of regional conservation plans, the USFWS acknowledged that recovery of the Stephens' kangaroo rat still requires continued habitat management and additional research and monitoring to better understand biological and ecological limiting factors (USFWS 2011d). Primary stressors to Stephens' kangaroo rat habitat, survivorship, and reproduction may include (list adapted from Brehme et al. 2006):

(1) Habitat fragmentation

(2) Succession to native scrub habitats or thick invasive grasslands

(3) Excessive soil compaction

(4) Lack of open habitat and/or corridors for dispersal

(5) Anthropogenic nighttime disturbances (e.g., artificial lighting)

(6) Low seed production due to drought

(7) Excessive predation (e.g., owls, snakes, coyotes, fox, feral cats, invasive ants)

(8) Excessive competition (e.g., other rodents and/or ants)

(9) Small and/or low density populations

(10) Direct mortality (e.g., pesticides, trampling, road kill)

In a landscape dominated by non-native annual grasses and where natural disturbances such as wildland fire are suppressed, management for Stephens' kangaroo rat typically requires more than just avoidance and minimization of adverse impacts. To maintain the bare-ground and open habitat that are important components of Stephens' kangaroo rat habitat, management typically requires some form of active vegetative manipulation or superficial ground disturbance to thwart the effects of unchecked growth of non-native annual grasses and to curb the succession of grasslands to shrublands. A well-managed grazing program, prescribed burns, wildland fires, and mechanical vegetation reduction are examples of disturbances that are considered potentially beneficial to this species (USFWS 2010b).

The primary means of keeping vegetation growth in check at the Detachment is via mowing and cattle grazing. Mowing is conducted for mission support purposes (e.g., clear zones around infrastructure for security and safety), but may provide a secondary benefit of habitat maintenance for the Stephens' kangaroo rat where the two co-occur. Cattle grazing, although implemented primarily for fire management at Detachment Fallbrook, is also generally considered beneficial for Stephens' kangaroo rats (O'Farrell 1992, Germano et al. 2001, Kelt et al. 2005, Montgomery & CH2MHill 2008, Tetra Tech 2013, USFWS 2010b).

Section 4.4 presents the grazing program and the measures that endeavor to avoid and minimize adverse effects while maximizing potential beneficial effects of grazing. Although prescribed burning is included in the WFMP for both fuels reduction as well as Stephens' kangaroo rat habitat management, this has been logistically difficult to support on the installation; however, prescribed burning remains a potential tool for future fire management and habitat enhancement initiatives.

Stephens' kangaroo rat habitat protection and management are guided, in part, by Management Priority Areas, which are presented in the WFMP (USDON 2003a) and covered in the associated BO (USFWS 2003a). Management Priority Areas (also referred to as Management Emphasis Areas or Priority Management Areas in the WFMP) are based on Stephens' kangaroo rat occupancy, potential habitat suitability, connectivity among occupied patches, and proximity to MCB Camp Pendleton's Stephens' kangaroo rat population (Map 3-9).

The purpose of Management Priority Areas is to provide a general guide for conservation and management prioritizations and serve as a fire management tool for suppression actions. These Areas have facilitated the selection of habitat treatment sites, grazing management decisions (e.g., placement of cattle water troughs, salt licks), and project avoidance and minimization measures. The basic concept of Management Priority Areas is fairly simple; however, their efficacy as a Stephens' kangaroo rat conservation and recovery tool will depend on implementation and adaptive management in response to new survey information. Adjustments to boundary lines, areas of prioritization, etc. should be subject to review and evaluation, in coordination with the USFWS, every five years or as appropriate.

Maintenance of at least 380 acres of occupied Stephens' kangaroo rat habitat at a minimum of low (versus trace) density levels is a management objective presented in the WFMP. This acreage value was based solely on an estimated population occupancy level as mapped in 2001-2002 (SJM Biological Consultants 2005), which was the lowest estimated occupancy level that had been documented for the species on the installation at the time. By the next stationwide mapping effort in 2007, conducted by the same surveyors as in 2001-2002, the estimated occupancy was 128 acres, well below the 380-acre minimum threshold (Montgomery & Grout 2011). Challenges with the stationwide mapping protocol have precluded subsequent stationwide occupancy estimates; however, the annual plot monitoring results suggest a continued increase in the species occupancy since 2008 (Appendix L).

The 380-acre minimum may be helpful for triggering regulatory discussions and mobilizing management responses, however, the 380 and 128 numerical values are estimates and must be interpreted with caution. One challenge is that stationwide mapping and occupancy estimates are not an exact science and it is difficult to generate repeatable, reliable data (see species mapping discussion below). Another challenge is a lack of knowledge about the estimated population viability (genetic diversity, spatial connectivity, gene flow, etc.). It is difficult to know, for example, whether Stephens' kangaroo rats that are spatially separated in apparent isolated patches of occupied habitat are in fact reproductively isolated. Gaining a better understanding of the genetics of the Stephens' kangaroo rat population and understanding the effective population size should contribute to a more informed minimum population viability estimate and management targets.

Also presented in the WFMP is a Stephens' kangaroo rat Conservation Accounting Plan, or "banking" ledger system, for providing habitat enhancement and promoting species occupancy as a means of compensating for potential future loss of suitable habitat due to future military projects (p. 7, WFMP BO). For the Conservation Accounting Plan to work, habitat enhancements would have to sustain a net gain in Stephens' kangaroo rat occupancy rates on Detachment Fallbrook in perpetuity. This has proven difficult for the Navy to achieve in recent years, and may not be a viable strategy in the long run. After the species occupancy was estimated to only be 128 acres in 2007 (Montgomery & Grout 2011), a more urgent management priority of species recovery prevailed, which included three years of localized habitat treatments (Innovative Inclosures 2013; Tetra Tech 2013) and eventual reinstatement of the grazing lease in 2010 after a five year hiatus. Prescribed burning was simultaneously pursued in 2007-2008, but the Navy was unsuccessful at getting this implemented.

Fundamental to Stephens' kangaroo rat management, and a prerequisite for application of habitat minimums and accounting plans, are reliable surveys and monitoring results. Yet this has proven to be a significant challenge for Stephens' kangaroo rat management.

An annual plot monitoring program was initiated in 2002, which has served as a proxy for tracking changes in Stephens' kangaroo rat relative abundance and distribution (e.g., Montgomery et al. 2008). However, the fixed monitoring plots have limits and were intended to be complemented with stationwide mapping surveys every five years. Stationwide mapping of Stephens' kangaroo rat abundance (densities), distribution (occupied habitat), and habitat availability (suitable, unoccupied habitat) once every five years is a management action described in the WFMP BO (p. 9). The five-year survey was to follow the protocol described in SJM Biological Consultants (2005), or a protocol jointly agreed to in advance by the Navy and USFWS (WFMP BO, p. 9).

The installation-wide scale and inherent subjectivity of the SJM Biological Consultants (2005) method introduced challenges of repeatability and error rates of the survey protocol. Although use of the same surveyors in the 2001-2002 (SJM Biological Consultants 2005) and the 2007 (Montgomery & Grout 2011) mapping efforts likely maintained some degree of comparability between the survey efforts, the protocol relies heavily on individual surveyors.

Although some effort has been invested in developing a new approach (including working group meetings with the USFWS, Navy, and subject matter specialists in 2012), a revised stationwide mapping protocol has yet to be developed and jointly agreed to by the Navy and the USFWS. As an interim solution, the Navy has been doing more intensive "panel" mapping; that is, surveying and trapping for Stephens' kangaroo rats with greater intensity than is feasible on a stationwide scale, but within a smaller swath (panel) of the installation.

One of the main drawbacks of the panel mapping is that it does not provide an estimate of Stephens' kangaroo rat occupancy for the installation in a single snapshot in time. Panel mapping does, however, provide a relatively more rigorous spatially explicit depiction of Stephens' kangaroo rat occupancy that can help inform management as to the status of the species in a given area. Although stationwide surveys and panel mapping does not normally suffice for project level surveys, these methods support the mission by providing a general picture of where the species has been known to, or may have a greater potential to, occur; by providing insight into potential effects of localized land use; and by helping identify when project level surveys are warranted; etc.

The potential presence of the sympatric Dulzura kangaroo rat confounds both plot monitoring and stationwide/panel mapping surveys for the Stephens' kangaroo rat. Both surveys are initially based on above-ground habitat conditions and detection of sign (e.g., burrows, scat, tail dragging), which is virtually indistinguishable between the two kangaroo rats. Multi-night trapping is labor intensive and also not completely definitive. If both species are present, for example, yet only Dulzura kangaroo rats are caught, one could erroneously conclude that the Stephens' kangaroo rat was not present. There is also an error rate with species identification in hand. Surveyor experience is especially important, but some kangaroo rat individuals (e.g., juveniles) will remain difficult to distinguish regardless of surveyor. The Navy is currently pursuing DNA confirmatory testing to help evaluate error rates, and provide definitive assessments in questionable locations.

As discussed in Section 4.13.6, natural resources management at the Detachment must balance the occasionally competing requirements of the Stephens' kangaroo rat, a grassland species, with those of the California gnatcatcher, a coastal sage scrub species. Prior to the DeLuz and Tomahawk Fires of FY 2014, succession to more shrub-dominated communities appeared to have reduced the extent of grassland habitat for the Stephens' kangaroo rat habitat. Habitat quality was also compromised with the removal of cattle between 2005 and 2010. These factors undoubtedly contributed to the observed declines in the Stephens' kangaroo rat population, with the species appearing to be in a highly reduced and more fragmented state by 2007 (Chapter 3, Appendix L).

Under such prevailing conditions, in situations where there were potential conflicts with gnatcatcher and Stephens' kangaroo rat management, the decision, to be made in coordination with the USFWS, was generally to favor the Stephens' kangaroo rat. "In areas where occupied (gnatcatcher) and Stephens' kangaroo rat habitat occur in close proximity, certain trade-offs may be made between enhancement of Stephens' kangaroo rat habitat and loss of gnatcatcher habitat. An example is when a clear advantage can be demonstrated to adjacent Priority 1 Stephens' kangaroo rat area (i.e. providing connectivity)," p. 3-39, WFMP.

Following the FY 2014 fires, however, prevailing conditions are expected to favor the Stephens' kangaroo rats for a period of time. Nonetheless, site specific management decisions will still be made on a case-by-case basis, and in coordination with the USFWS, taking into account conditions required for recovery of both species.

Lastly, managing grasslands in a condition favorable for Stephens' kangaroo rats also requires balancing the needs of other grassland species and natural resources management objectives. For example, grassland nesting birds may not do as well with the level of disturbance and bare ground that is optimal for Stephens' kangaroo rats. Similarly, grazing levels that are optimal for Stephens' kangaroo rats may not be ideal for soil conservation and erosion control. Grazing effects are typically heterogeneous across the landscape, and to the extent that activity levels can be managed (e.g., via placement of water troughs, salt licks), efforts will be made to target areas in a manner that would benefit Stephens' kangaroo rats.

Objective: Implement management strategies that maintain a healthy and diverse grassland community to benefit the Stephens' kangaroo rat and other sympatric species.
Key Considerations: • ESA and implementing agreements with USFWS, including WFMP BO. • Invasive species (plant and animal) that may detrimentally affect Stephens' kangaroo rats, especially non-native annual grasses. • Management Priority Areas and maintaining habitat suitability and connectivity; fragmentation and isolation of occupied habitat is of particular concern for this species. • Population distribution and relative abundance data for Stephens' kangaroo rats on a relevant scale and frequency to support management. • Grazing as a management tool for Stephens' kangaroo rat habitat enhancement. • Status of the Stephens' kangaroo rat on Detachment Fallbrook as compared to a larger regional context. • Population recovery to minimally meet the 2001-2002 estimated occupancy levels. • Minimum viable population size based on biologically based considerations, including genetics and dispersal. • Connectivity with the Stephens' kangaroo rat population within the Juliett area of neighboring MCB Camp Pendleton. • Reliably distinguishing Stephens' kangaroo rats from the congeneric and often sympatric Dulzura kangaroo rats. • Methods for avoiding and minimizing adverse effects of artificial night lighting. • Potential influence of wide-spread environmental stressors, including drought, climate change, diseases, etc., beyond the boundaries of Detachment Fallbrook. • As provided for under the ESA Section 7(a)(1) for species conservation, consider implementing recovery actions described in the Draft Recovery Plan for the Stephens' Kangaroo Rat (USFWS 1997a).

4.13.7.1 AVOIDANCE AND MINIMIZATION

Overarching factors such as low levels of development and a low-impact mission (Section 4.2.2) are expected to avoid and minimize adverse effects to the Stephens' kangaroo rat. Although the

Stephens' kangaroo rat is sometimes described as a "disturbance loving" species because superficial vegetation and soil disturbance can create the bare ground conditions favorable to the species, too much disturbance (e.g., severe soil compaction, digging, or earth movement) is detrimental.

Some activities, such as regular mowing of clear zones, are not considered to have a direct negative effect on Stephens' kangaroo rats, in part, because they are conducted during the day when the animals are below ground (p. 40, WFMP BO). Specific measures that support Stephens' kangaroo rat conservation and recovery include:

- *Legal status*. – Because the Stephens' kangaroo rat is a federally listed endangered species, any future project or activity that may affect the species or its habitat requires an ESA section 7 consultation with the USFWS.
- *Soil erosion BMPs*. – Measures that avoid and minimize soil erosion, runoff, and siltation are expected to benefit the Stephens' kangaroo rat. Severe runoff and siltation may fill in burrows, and rutting or gullies can make the landscape inhospitable to the species.
- *Seasonal avoidance*. – Many daytime activities that do not involve ground disturbance are unlikely to flush Stephens' kangaroo rats from their burrows. However, breeding season avoidance may be appropriate under certain circumstances (e.g., if a disturbance may prevent adults from foraging at night for an extended period, if a disturbance may cause adults to leave their burrows and not return to their young). A trap-and-hold exclusion effort, for example, should be done outside of the Stephens' kangaroo rat breeding season.
- *Trap and hold*. – Occasionally, avoidance of ground disturbing impacts within occupied Stephens' kangaroo rat habitat is not feasible by a project. In such situations, exclusion trapping by a 10(a)(1)(A) permitted biologist is conducted and animals are held in temporary captive housing until it is feasible to release them in the same location from which they were trapped. Temporary artificial burrows, with supplementary food, are provided for a "soft" release. Two projects have successfully implemented this method (the demolition of Building 366 in 2009 and the Remedial Investigation at UXO1 in 2015). Of the six Stephens' kangaroo rats released after the Building 366 demolition, five were re-captured within the release site two weeks later, and two months later, four of the original six animals were re-captured on site (ICF 2010). Follow-up trapping was not conducted for the UXO1 project.
- *Burrow avoidance*. – Avoiding potential kangaroo rat burrows is a crude means of avoiding and minimizing impacts to Stephens' kangaroo rats. In many instances it is not clear if the burrow is occupied (tunnels may have multiple openings), or if it is occupied by a Stephens' kangaroo rat, but avoidance of sub-surface soil-disturbing impacts within a radius around the burrows helps minimize potential adverse effects in areas where Stephens' kangaroo rats are known or suspected to be present. The distance for burrow avoidance depends in part on the nature of the activity (e.g., installation of a single fence post by hand versus large mechanized trenching operations), but 15 feet is typical for most small- to mid-sized activities. Within the WFMP BO and its amendments, burrow avoidance is programmatically covered for activities such as the annual maintenance of firebreaks and cattle fence maintenance.
- *Reduced pounds per square inch pressure*. – The pounds per square inch pressure that a vehicle exerts on the ground can directly affect soil compaction, and possibly crushing of Stephens' kangaroo rat burrows (especially if the soil is moist). Underinflating tires can greatly reduce the pounds per inch pressure of rubber-tired vehicles for activities that may need to occur on top of occupied habitat. Tracked vehicles can also have a lighter pounds per inch profile. Depending on the project, ply wood or steel plates can also help dissipate

the pounds per inch pressure and reduce the likelihood of soil compaction by heavy equipment.

4.13.7.2 SURVEYS AND MONITORING

Monitoring surveys for the Stephens' kangaroo rat are challenged by the fact that the species often occurs at trace densities, it has been documented in widely distributed patches of occupied habitat, it is subject to highly fluctuating population numbers, and the sign for this species is indistinguishable from the sympatric Dulzura kangaroo rat.

The primary method for tracking the status and trends of the Stephens' kangaroo rat population and habitat suitability has been via the annual plot monitoring program (see below). Of particular interest in monitoring and mapping surveys for this species is the collection of consistent and repeatable data for evaluating trends through time and providing feedback for adaptive management (see Section 4.2.2).

For mission support, it is also imperative that surveys provide spatially explicit results to help facilitate avoidance and minimization of impacts during routine maintenance and mission operations, and to help identify when project level surveys may be warranted (see Section 4.2.2).

The following monitoring, surveys, and research support Stephens' kangaroo rat management:

- *Annual plot monitoring*. – The annual Stephens' kangaroo rat plot monitoring program facilitates detection of major changes in the Stephens' kangaroo rat population and habitat parameters between stationwide mapping efforts. Plot monitoring formally commenced in the fall of 2002 and the protocol is best documented in Montgomery et al. (2008) and Montgomery (2014). The program is based on fixed-location plots within areas of historically occupied ("core" and "linear" plots) and adjacent suitable, unoccupied ("buffer") habitat. The annual Stephens' kangaroo rat plot monitoring employs a combination of active burrow counts and live-trapping. Observations of kangaroo rat burrows in a plot is a reasonably good indicator of the presence of one or both kangaroo rat species (habitat and confirmatory trapping help determine which species is/are present) (Diffendorfer & Deutschman c.2002, Brehme et al. 2006); however, the number of active burrows and the number of resident Stephens' kangaroo rat individuals are only weakly related (Diffendorfer & Deutschman c.2002). For this reason, plot monitoring provides only a general indication of Stephens' kangaroo rat distribution (location of occupied plots) and relative abundance (number of occupied plots and active burrows) for gross-scale changes through time. Annual monitoring plots may also be used to evaluate species response to localized habitat treatments or land use changes.
- *Five-year stationwide surveys*. – Stationwide mapping of Stephens' kangaroo rat distribution, relative abundance, and potential habitat is supposed to occur once every five years in accordance with the WFMP and associated BO. Stationwide mapping has the advantage of providing a spatially explicit estimate of the Stephens' kangaroo rat distribution and total occupied habitat across the installation in a single snapshot in time for comparison with stationwide survey efforts in prior years. However, concerns about the repeatability and degree of subjectivity of the methods have challenged development of a standardized stationwide mapping protocol. A large component of the 86% reduction in Stephens' kangaroo rat occupied habitat between the 1990-1992 (USFWS 1993b) and 2001-2002 (SJM Biological Consultants 2005) mapping efforts is thought to be due to methodological differences. Although the 2001-2002 and 2007 (Montgomery & Grout 2011) stationwide mapping efforts involved the same surveyors and are considered more comparable, the repeatability of the methodology remains a concern. Without having finalized a more robust protocol, the Navy did not conduct stationwide surveys in 2012. In the interim, the Navy has been implementing more intensive "panel mapping" surveys (see

below) in an effort to provide greater confidence in the results for localized areas of the installation. Future stationwide surveys remain a management objective.

- *Panel mapping*. – Panel mapping refers to Stephens' kangaroo rat mapping within a portion (panel) of the installation in order to survey the area with greater intensity than stationwide mapping can accommodate. Surveyor subjectivity remains inherent in the methods (e.g., occupancy polygons, which are based, in part, on positive captures, continuity of sign, and habitat suitability, are still manually drawn). Nonetheless, the increased transect coverage within the panel and more rigorous documentation (e.g., track log of transects; GPS points of sign, burrows, trap and capture sites) allows for greater confidence in the final mapping product. Unlike annual plot monitoring, panel mapping provides a spatially explicit map of where Stephens' kangaroo rats occur –and, where they have not been found -- outside of the plots which is valuable for mission support and helps inform the annual plot monitoring program (e.g., are plots still generally representative of the population distribution?). A single panel mapping effort does not necessarily suffice for project level surveys; however, the Navy and USFWS may agree that at a given location, the accumulation of stationwide, panel mapping, and other data over time may be deemed sufficient and appropriate for a given project. One drawback of the panel mapping is that it does not provide an estimate of Stephens' kangaroo rat occupancy for the installation in a single snapshot in time. Nonetheless, trends within given locations can still be evaluated. Panel mapping is labor intensive and may not be continued indefinitely, but is anticipated for at least a few more years. Future evaluation of the results, weighing the costs and benefits, will determine the longevity of the program.
- *Short-term surveys*. – Pre- and post-activity surveys may be conducted to evaluate the success of project-related activities targeted at Stephens' kangaroo rat habitat enhancement or impact avoidance/minimization. Examples of past short-term surveys include the habitat treatment surveys (Montgomery & CH2MHill 2008; Innovative Inclosures 2013; Tetra Tech 2013) and the trap-and-hold Building 366 Demolition project (ICF 2010). Short-term surveys also include project-level (USFWS protocol) surveys that may be required to assess the species occupancy within the action area of a project in support of an ESA section 7 consultation.
- *Shrub succession*. – Shrub dynamics and change in the shrub-grassland ecotone are monitored periodically with aerial photos, comparison of LTETM plots, and vegetation mapping.
- *Residual dry matter*. – Monitoring RDM levels is primarily a grazing management tool; however, it may be able to serve the dual purpose of evaluating habit suitability for Stephens' kangaroo rats. The relationship between Stephens' kangaroo rat habitat suitability and RDM would need to be more thoroughly evaluated for this to serve as a robust predictor.
- *Regional monitoring*. – Currently there is no systematic region-wide monitoring program for Stephens' kangaroo rats. There is tremendous value to contributing to such an effort should it be instigated. Region-wide monitoring often employs sampling techniques more broad-scale and less informative for local management needs. However, the collection of comparable data will allow the Navy to assess Detachment Fallbrook's resources in a regional context.

4.13.7.3 CONSERVATION AND RESEARCH

- *Habitat treatments*. – Various methods have been used or recommended to enhance habitat conditions favorable to Stephens' kangaroo rat including installation of artificial burrows in compacted soils and reducing excessive vegetation growth via herbicides, mechanical treatments (mowing, scraping, etc.), livestock grazing, or prescribed burning. Other than

grazing (see below), enhancement methods that have been applied at Detachment Fallbrook with some success include artificial burrows and mechanical treatments (Montgomery & CH2MHill 2008; Innovative Inclosures 2013; Tetra Tech 2013). Prescribed burning (e.g., five acres at least once every five years) is a proposed action within the WFMP, but this has not been administratively feasible on the Detachment and the FY 2014 wildland fires have effectively precluded the need for additional prescribed burning for several years.

Habitat enhancement treatments have mainly been conducted as compensation for project impacts (e.g., napalm removal) or as a stopgap measure to locally improve habitat until cattle grazing could be reinstated. Under certain circumstances, routine maintenance, such as mowing, provides habitat enhancement for Stephens' kangaroo rats. Firebreak maintenance has the potential to provide habitat enhancement, however, there has been little evidence of that in recent years. Stephens' kangaroo rats appear to be declining within firebreaks based on annual plot monitoring. One area of interest is to seek a firebreak maintenance solution(s) that is more "friendly" to Stephens' kangaroo rats while still being economically sustainable and effective as firebreaks. The WFMP includes a Conservation Accounting Plan that involves habitat treatments for compensating for potential future project impacts to Stephens' kangaroo rats; however, maintenance of minimum species occupancy, let alone occupancy above and beyond a minimum acreage, has eluded the Navy in recent years and it is unlikely that such a "surplus inventory" could be maintained consistently or "guaranteed" in perpetuity. Nonetheless, habitat treatments will remain a valuable tool for Stephens' kangaroo rat management and conservation, especially where it may promote temporary expansion and/or connectivity between populations.

- *Grazing management*. – Although the primary purpose of the cattle grazing is to support fire management, it is also considered a prescriptive tool for enhancing habitat for the Stephens' kangaroo rat. Grazing management endeavors to favor perennial grasses while also maintaining targeted grasslands in a state suitable for occupation by Stephens' kangaroo rat (see Section 4.4 [Agricultural Outleasing], for other range management objectives). The non-native forb, *Erodium cicutarium*, which is very resilient under grazing pressure, is also a plant species favorable to the Stephens' kangaroo rat (O'Farrell & Clark 1987, USFWS 1988). Every growing season is different and depends in part on the temperatures and amount/timing/pattern of rainfall of a given season, which makes it difficult to predict appropriate grazing prescriptions in a given year. To the extent feasible, the Navy monitors rangeland conditions and adaptively manages program elements to maximize the benefits of grazing and minimize the costs/impacts (e.g., adjusting AUM, grazing season dates, pasture rotations, water distribution, and fencing).

- *Exotics control*. – Detachment Fallbrook controls certain non-native, invasive plants, some of which (e.g., fennel, bridal veil broom), if left unchecked, could invade grasslands and reduce habitat suitability for the Stephens' kangaroo rat.

- *Investigative research*. – To the extent feasible, the Navy encourages hypothesis-driven studies that help inform management and conservation of the Stephens' kangaroo rat. For example, studies that evaluate the effects of land use and habitat treatments, such as grazing, firebreak maintenance, prescribed burning, and mechanical disturbance have clear management benefits. One area of interest is artificial nighttime lighting and the effects of different light reducing/mitigating measures. Genetics investigations have management implications within Detachment Fallbrook and at the regional level (see below).

- *Genetics studies*. – In 2011, the Navy provided DNA samples from Stephens' kangaroo rats in support of a region-wide genetics study of the species conducted by Dr. Debra Shier of the San Diego Zoo. Results are expected to minimally provide insight into the degree of potential gene flow between extant subpopulations. Based in part on a hypothesis that there may not be significant gene flow between Stephens' kangaroo rats within the North and South Magazines, in 2015 the Navy initiated its own genetics study to investigate allelic

diversity and gene flow within the installation. The DNA study contracted by the Navy is also expected to provide verification (accuracy rate) of surveyor's field determinations of Stephens' versus Dulzura kangaroo rat identification.

4.13.7.4 MANAGEMENT ACTIONS

Actions presented within other sections of this chapter may directly or indirectly support the conservation and management of Stephens' kangaroo rats and grassland communities. Specific actions applicable to the species and its habitat:

- *Avoidance and minimization:*
  - Implement avoidance and minimization measures that protect Stephens' kangaroo rats and their habitat to the greatest extent feasible. (See Sections 4.2.2 and 4.13.7.1)
- *Surveys and monitoring:*
  - Comprehensively monitor the Stephens' kangaroo rat and habitat suitability in accordance with the WFMP BO once every five years. Seek to establish a more repeatable, or at least more transparent (e.g., GPS track logs), protocol that provides a spatially explicit occupancy map prior to implementation. Should a comprehensive mapping protocol not be feasible at the stationwide scale, continue panel mapping (below) of subsections of the installation in the interim.
  - Conduct panel mapping surveys that allow more intensive transect and trapping coverage of rotating segments as opposed to the stationwide survey. Panel mapping cannot provide a stationwide estimate of Stephens' kangaroo rat occupancy; however, it has the benefit of providing greater confidence of mapping results within the panels surveyed.
  - Conduct annual plot monitoring to track the distribution (occupancy) of Stephens' kangaroo rats within fixed plots and relative abundance (using gross scale changes in burrow counts as a proxy for the relative number of animals present).
- *Conservation and research:*
  - Provide for the rehabilitation of Stephens' kangaroo rat habitat through grazing management, weed control, and other opportunities for habitat enhancement (e.g., during firebreak maintenance), to the greatest extent feasible.
  - Consider development of a proactive rapid response protocol for localized vegetation treatments following periods of heavy rainfall and biomass production, especially in the potential absence of cattle grazing.
  - Evaluate approximately every five years, the priority management areas for Stephens' kangaroo rat in collaboration with the USFWS and CDFW to assess whether spatial adjustments or prioritization ranking changes are warranted.
  - Partner with other stakeholders for conservation and research initiatives geared towards the recovery of the Stephens' kangaroo rat, to the extent feasible and compatible with the mission.

4.14 PEST MANAGEMENT AND ANIMAL CONTROL

Numerous laws and regulations govern the management and control of pests and problem animals, especially where measures may involve the use of toxic chemicals and/or where there may be risks to human health or the environment (e.g., Federal Insecticide, Fungicide, and Rodenticide Act;

Federal Noxious Weed Act; Executive Order 13112, Invasive Species; DOD Instruction 4150.07; OPNAVINST 6250.4B; OPNAV M-5090.1).

An Integrated Pest Management Plan (IPMP; USDON 2011) is maintained for the Detachment to aid in compliance with the appropriate laws and regulations concerning pest management. Integrated pest management is a broad-based approach to pest management that aims to suppress pest populations to acceptable levels using an integration of control techniques that minimizes the use of pesticides that are harmful to human health and the environment.

Within this INRMP, pest management and animal control are discussed with respect to their nexus with natural resources management. For additional information about pest management, refer to Detachment Fallbrook's IPMP.

Objective: Support an integrated pest management approach at Detachment Fallbrook that protects facilities, personnel, and native species from risk or loss due to pest species or their management.
Key Considerations: • Pest management is an inherently inter-organizational challenge that requires a collaborative approach to solutions. • The integration of different pest management approaches to reduce or obviate the need for chemicals that are toxic to humans and the environment. • Education that focuses on the prevention of pest problems and minimization of potential risks associated with pests (e.g., infectious diseases). • Long-term conservation of bats and minimization of conflicts with humans. • The regional spread of new pest species and their potential to occur on the Detachment.

Pests are defined as species that are detrimental or destructive to humans (e.g., disease vectors) or are of concern to humans (e.g., wood destroying termites, crop pests, rodents). Native species and occasionally sensitive native species (e.g., bats, birds, rattlesnakes, honeybees) can therefore be considered a pest or problem animal under the right circumstances. At the Detachment, every effort is made to address pest management concerns involving native species in a manner that avoids and minimizes adverse effects to those species. For non-native or invasive species, pest management measures may include lethal control of the pests while seeking to avoid and minimize potential indirect effects to non-target species.

The control of non-native, feral, or pest animals depends on the species and context, and is evaluated on a case-by-case basis. For invertebrate pests, localized treatment (e.g., insecticide spraying in response to an isolated ant infestation within a building or tenting of a building for termites) is typically effective at addressing the issue. One exception to this is the mosquito abatement program.

Detachment Fallbrook is part of a regional Vector Control Program for mosquito abatement. Mosquitoes can be vectors of diseases such as West Nile Virus, which became established in San Diego County in 2003, and are controlled in the county through the treatment of areas of standing water with applications by helicopter of a granular larvicide. Three ponds are treated under a contract managed by MCB Camp Pendleton: Depot Lake, Lower Lake and the pond behind Building 380. Aerial applications are conducted approximately every month during the mosquito breeding season, typically April to October. The granular larvicides, which consist of naturally occurring bacteria ("Bti" or *Bacillus thuringienis* ssp *israelensis, Bacillus sphaericus*, and/or *Saccharopolyspora spinosa*), act specifically on mosquito larvae and dissipate quickly.

Honeybees occasionally present a unique challenge. Although honeybees provide an important ecosystem service as pollinators, they can also cause health and safety concerns if a hive is

established within or around areas occupied by people. Safety concerns about honeybees increased after Africanized honeybees became established in California in the late 1990s/early 2000s.

Africanized honey bees, sometimes referred to as "killer bees", are more excitable, defensive, swarm more frequently than European honey bees, and have an ability to nest in a wide range of sites. Paul Holtzen, whose company relocates wild bee colonies that have become unsafe for humans, has estimated that more than 95 percent of the wild bees in San Diego County area are now Africanized (Fudge 2010). The preferred method for the control of honeybees that are established in unsafe locations is hive relocation; however, sometimes extermination is necessary. Preventing the establishment of hives within administrative areas is also encouraged through the removal of potential nesting sites (e.g., sealing openings greater than 1/8" in external walls, installing screens over vents).

Certain vertebrate species pose a nuisance and possible health hazard when they co-inhabit spaces with humans. Rodents, including mice, rats, and ground squirrels, can be especially problematic within and around some magazines and buildings. Rodents in general can be destructive to infrastructure and pose health hazards. Deer mice, for example, can potentially transmit hantavirus, a rare but deadly disease known to occur in San Diego County. Other rodents are also known to carry the virus. California ground squirrels (*Spermophilus beecheyi*) periodically cause damage with their burrows, undermining the stability of structures such as asphalt roads or exacerbating erosion (e.g., on top of earth-covered magazines).

For damage control purposes, mice had been regularly killed using bait in the magazines in the past (1990s, early 2000s). It was reported in the last INRMP that in December 2001 several buildings were fumigated with malathion, an organophosphate insecticide; a bobcat and 30 rabbits were inadvertently killed (along with many mice). Rodenticide baiting and other chemical rodent control methods have not been routinely authorized since the mid-2000s; however, rodent infestations are especially problematic in certain buildings and an integrated pest management approach to include potential authorization of certain rodenticides in specific locations is being reviewed in 2015.

Currently, non-chemical control methods (e.g., snap traps and sticky traps) are authorized within enclosed buildings, which is the current pest contractor's preferred method as rodenticides can leave rotting carcasses in inaccessible places inside buildings. However, these non-chemical control methods do not prevent rodents from entering buildings and are labor intensive when not used in conjunction with other methods. Personnel are encouraged to help prevent rodent infestations in the first place, e.g., by keeping a clean work environment, and Facilities is encouraged to seal possible rodent entry holes ¼" or more in diameter inside and out of buildings and structures. Non-toxic rodent repellants are also encouraged as part of an integrated pest management approach. Should rodenticides be authorized for short term, periodic applications outside of select buildings, only chemicals that have very low secondary poisoning risk will be used.

The primary concern in regards to use of rodenticides is the potential detrimental effects to non-target species, including native rodents, carnivores, and omnivores. This is likely already occurring to animals on the installation, as regional studies indicate the exposure of predators and scavengers to rodenticides is widespread. Carnivores are most likely being exposed through secondary poisoning after consuming contaminated prey. CDFW collected 74 animals from 1994-1999 in California and found residues of anticoagulants in 70% of the mammals and 68% of the birds (Hosea 2000). Lima and Salmon (2010) found that 92% of 53 birds tested from San Diego County had anticoagulant detections. In another California study, Riley et al. (2007) found that anticoagulant rodenticides were present in 35 of 39 (90%) bobcats tested.

Although secondary poisoning is known to have lethal effects, sublethal doses and repeated exposure may have chronic effects that eventually lead to death. Beginning in 2002, an epizootic

notoedric mange, a disease previously reported only as isolated cases in wild felids, greatly reduced the survival rate of bobcats from nearly 80% to less than 30% (Riley et al. 2007). Mange-associated mortality in bobcats showed a strong association with anticoagulant exposure (Riley et al. 2007). Anticoagulant rodenticides, specifically second-generation rodenticidal anticoagulants, appear to present the greatest threat for secondary poisoning; however, first-generation and non-anticoagulant compounds have also been implicated in non-target mortalities (Erickson & Urban 2004).

Because many of the buildings and structures are remotely located and surrounded by natural open space, native species that are not generally considered pests may occasionally become problematic or present health and safety concerns. For such species, the Detachment endeavors to implement humane, non-lethal removal and control measures. This includes the native rattlesnakes that are occasionally found in and around buildings where personnel work. Every effort is made to safely and humanely relocate these animals to more remote areas of the installation.

Other periodic "problem" animals include birds that get stuck in, or maybe even nest within, buildings or other infrastructure. As most birds are protected under MBTA, every effort is made to ensure birds are released unharmed from the confinement if they are trapped, and that nesting in problematic areas is discouraged. The nesting of birds on the outside of buildings and within some open bay structures has generally not been discouraged. Should nest building become a problem in a particular area, the nest may only be removed if the nesting behavior is caught at an early stage (no eggs or chicks present); however, the preferred approach is to discourage birds from nesting in undesirable locations in the first place.

Feral animals (domestic breeds that are now free ranging), such as dogs and cats, are not native to the natural environment and can present a threat to human health and native wildlife populations, including threatened and endangered species. For example, studies have implicated free-ranging domestic cats in the deaths of over one billion, and possibly close to four billion, birds annually in the U.S. alone (Dauphiné & Cooper 2009, Loss et al. 2015). Although feral animals are not commonly observed on the Detachment, they occasionally exist. Due to the potential of feral or free ranging cat populations acting as disease reservoirs and non-native predators on sensitive wildlife, the Navy does not endorse Trap Neuter Release (TNR) or similar programs (OPNAV M-5090.1). To the extent that a feral animal(s) may persist longer than a day or so, efforts are made to seek professional removal services. MCB Camp Pendleton Game Wardens often have depredation contracts for problem animals. However, depredation has been rare on the Detachment as most stray or feral animals do not seem to persist long enough for control as they are typically not observed more than once (K. Fischer, pers obs.).

Photo 49. Bat boxes to provide supplemental roost locations. (Photo by D.C. Stokes)

Bats occasionally present a management challenge when they take up residence in buildings and magazines; however, most are sensitive species protected under regulations of the California Department of Fish and Wildlife. Lethal control of bats is prohibited and, therefore, humane exclusion is the preferred alternative. In 1997-1998, bats were excluded from three structures including Building 326 (the Sidewinder), Building 218, and Magazine 584; the largest colony was using Building 326 with an estimated 500-600 bats. Since then, bat exclusion efforts (primarily by sealing roofline cracks with foam caulking in the winter, when the bats have migrated out) have been conducted again at additional above-ground magazines (e.g., 586, 587). Exclusion methods have only been partially effective for the above-ground magazines, and efforts are ongoing to resolve the situation.

In an effort to reduce bat reliance on manmade structures and avoid the need for future exclusions, artificial bat houses have been installed at various locations over the years to varying degrees of success (Photo 49). The first documented effort was in 1997-1998, with the installation of four bat boxes (two on Magazine 584 and one each at Depot Lake and the pond behind Building 380) (The Environmental Trust 2002). One of the boxes installed on Magazines 584 is being used as a nursery roost (predominantly Yuma myotis) and was found to be occupied by over 200 bats in 2013-2014 (Stokes 2015). The boxes at Depot Lake and the pond behind Building 380 no longer exist (reason unknown).

In August 2002, a free-standing bat "condo" was installed within a riparian area not far from inert storage Magazines 581-584 in an effort to draw bats away from roosting in the magazines. Although there is some evidence of use by bats, the bat condo does not appear to be a huge draw for roosting; the location, height, and a few other features are thought to be partially responsible. Additional bat houses assembled by volunteers during National Public Lands Day events in 2010 and 2012 have been hung on Magazines 584, 586, and 587. These alternate roost sites have been used by bats to varying degrees, but since exclusion efforts have not been entirely effective, the majority of bats seem to still prefer roosting in the magazines. To the extent that the supplementary bat houses are effective and become active roosting sites, it is important that the Navy commit to periodic monitoring and maintenance (replacing, if needed) these houses as bat colonies can return to the same root sites for decades.

Mid-sized mammals that have been subject to control on the Detachment since 2005 included one beaver (*Castor canadensis*) and one coyote. Beaver intermittently occur on the Santa Margarita

River and they are controlled as the pooled water behind their dams creates optimal American bullfrog breeding habitat in areas with the federally listed arroyo toad. With recent consideration of beavers possibly being native to the region (see Lanman et al. 2013), the rationale for future control efforts will be reconsidered. Coyotes were generally only considered for control if they exhibited threatening behavior around the residential housing area, which is no longer present on the Detachment.

One species of mammal that has not yet reached the Fallbrook region of San Diego County is the feral pig (*Sus scrofa*). Feral pigs began showing up in the county around 2008, and by 2014 there were estimated 1,000 pigs roaming primarily in the eastern and southern portions of the county (Walker 2014). Feral pigs are highly destructive to the environment and an eradication program in the county may successfully thwart their expansion north (Brennan 2014). Should feral pigs be detected on the Detachment in the future, their eradication will be a priority for management and likely require regional coordination.

4.14.1 Avoidance and Minimization

Avoidance and minimization measures for pest and problem animals are focused on the prevention of infestations and conflicts in the first place. Where control measures are necessary, methods shall: (1) be implemented as justified by sound ecosystem management, with the goal of avoiding adverse effects to non-target species; (2) take into account human health and safety considerations; and (3) be in accordance with federal and state laws. For the potential control of invasive and/or exotic species for the primary purpose of ecosystem management, see Section 4.15. Specific measures applicable to pest management and animal control:

- *Limited and controlled pesticide use*. – The Integrated Pest Management Plan seeks to minimize use of pesticides and herbicides unless deemed absolutely necessary. Use of animal pesticides (e.g., insecticides, rodenticides) is rarely applied and typically only authorized within the administrative area. This is partly due to concerns for direct poisoning of non-target species as well as the potential of secondary or bioaccumulation poisoning of predators and scavengers. Pesticide applications are approved by the Conservation Program Manager.
- *Discourage building habitation*. – To the extent feasible, animals will be discouraged from occupying buildings through humane exclusion methods, and by reducing potential attractants. All exclusionary remedies shall be installed outside of the species breeding season or when the species is not present (e.g., during seasonal migrations). Roosting bats and bird nests that have eggs or young shall not be disturbed. Specific dates will depend on which species are present, and periodic surveys may be necessary before exclusion measures can be implemented. All exclusions and building renovation projects should be preceded by an inspection to ensure no animal inhabitants are present. To help prevent habitual use of undesirable locations by birds, Nixalite ®, tactile repellents, exclusionary netting, or other humane deterrents may be employed.
- *No on-site housing pets*. – The Detachment no longer has on-site housing (demolished in 2011) since the transition from an active duty to civilian DOD police force, thereby eliminating potential conflicts with domestic or exotic pets originating from the installation. Free-roaming pets and feral animals are occasionally observed (and removed to the extent feasible) due to the proximity of housing in the town of Fallbrook and neighboring MCB Camp Pendleton.
- *Live-trapping*. – To the extent feasible, native animals that present a pest problem are live trapped for potential relocation (e.g., rattlesnakes, opossum, raccoons, birds). Live-trapping, where feasible, is also employed for feral or other problem animals (e.g., cats, to minimize potential impacts to non-target species). The services of MCB Camp Pendleton Game

Wardens, the San Diego County Animal Control, or other contracted services may be enlisted to support live-trapping or, occasionally, lethal animal control.

- *Predator control*. – Predator control for the purpose of protecting cattle or sensitive wildlife is not generally conducted at Detachment Fallbrook mainly because it has not been warranted. No records could be found of cattle predation on the Detachment since the Navy has been managing grazing leases, and some degree of predation pressure on sensitive species is considered natural and expected. Should a situation arise concerning excessive predation pressure in the future, potential control measures will be considered at that time and in coordination with regulatory authorities, as appropriate.
- *Honeybee hive relocation*. – Prior to implementing control measures for honeybees, the Environmental office first determines if the bees are just swarming or if a hive has been established. Swarming bees tend to be less aggressive because they are not defending a hive, plus they do not tend to stay in one location for more than a couple of days. If a hive has been established in an undesirable location, the preferable control approach is to have the hive relocated by a professional beekeeper. Should this approach not be feasible, extermination may be necessary.
- *Avoid impacts to non-target species*. – To the greatest extent feasible, avoid harming or killing of non-target species, regardless of the control measures employed.
- *Education*. – Education is an important component to pest management in that it can help reduce the root causes of pest problems in the first place, and minimize the potential risks to humans and adverse impacts to native wildlife caused by pests. Brochures, newsletters, emails, and other venues highlight pest management topics and raise awareness about how risks can be reduced. Seasonally transmitted fliers about birds, bees, and rattlesnakes, help increase vigilance when animals tend to be most active. The benefits of good house-keeping, sealing up old building gaps and cracks, not feeding wild animals are espoused as first-line of defense measures that may greatly reduce the likelihood of a pest problem.

4.14.2 Surveys and Monitoring

The detection of pests and problem animals is typically brought to the attention of the Environmental office by personnel working on the Detachment, and there has not previously been a single formal or systematic program for the proactive monitoring of pests. Nonetheless, surveys, monitoring, and data management that contribute to pest management are listed below.

- *Regional surveys*. – Occasionally the Detachment participates in short-term trapping surveys conducted by local, county, state, or other federal agencies (e.g., San Diego County Department of Agriculture, Weights, and Measures; California Department of Food and Agriculture; U.S. Department of Agriculture) for the purpose of early detection or monitoring of emerging pests of potential agricultural and economic concern (e.g., Mediterranean fruit fly, Asian citrus psyllid, Mexican fruit fly, emerald ash borer).
- *Watch list species/incidental observations*. – Although watch list species are generally species of potential natural resources management concern, a pest species (e.g., agricultural pest) could also be incidentally encountered during other species surveys.
- *Documenting pest problems*. – It is important to document reports of pest and problem animals so that areas with possible chronic or recurring problems may be addressed. The Environmental office at Detachment Fallbrook logs all “animal calls”, whether it is a pest related matter or not. Proactively speaking with personnel who frequent areas with pest problems will also determine if the problem persists.
- *Efficacy monitoring*. – For integrated pest management to be effective, it is important to document pest infestation conditions before and after treatments to determine the efficacy of

different approaches. Because integrated pest management seeks to avoid and minimize the use of toxic chemicals, control approaches are expected to require some adaptation to find the best and most cost effective complement of methods for a given set of circumstances. Monitoring the reported pest problems and the efficacy of control methods had not previously been formally implemented at Detachment; however, monitoring is expected to be facilitated by the implementation of a new Facilities pest management contract in 2015.

4.14.3 Conservation and Research

Specific measures applicable to pest management and animal control:

- *Supplemental roost/nest sites*. – Numerous bat houses have been installed over the years in an effort to provide alternate roosting locations for bats, especially as bats have been excluded from their preferred roosts within buildings and magazines. While a few bat boxes have been very effective, most have only had limited success at attracting bats. As bats remain a problem in several above-ground magazines and more effective exclusion measures are expected to evolve, finding more effective and permanent alternative roost sites will continue to be of management interest. Currently, bird nesting boxes are not employed on Detachment Fallbrook, but they could be in the future.
- *Testing low toxicity and other humane control methods*. – Finding optimal integrated pest management solutions will depend on site specific conditions, likely entail trial and error, and undoubtedly will require a multi-faceted approach. Background research and staying abreast of new studies and innovative approaches will contribute to a successful outcome.

4.14.4 Management Actions

Actions presented within this section will directly or indirectly support the conservation and management of native species. Specific actions applicable to pest management and animal control:

- *Avoidance and minimization*:
  - Implement avoidance/minimization measures outlined in Section 4.14.1.
- *Surveys and monitoring:*
  - To the extent feasible, provide access for regional initiatives for early detection and monitoring trapping for pest species.
  - Maintain vigilance for, and encourage the reporting of, potential pest infestations and emerging threats from problem animals.
  - Document pest infestation and control methods, and periodically monitor sites under treatment, to support informed decision making and adaptive management.
- *Conservation and research:*
  - Keep informed and up-to-date on improved methods for controlling pests and on revisions to laws, regulations, and policies.
  - Continue to seek effective and permanent alternative bat roost locations (e.g., artificial houses) that help draw bats away from areas that conflict with human activity and provide for the long-term conservation of the bat colonies on the Detachment. Consider installation of artificial bird boxes as well, as appropriate.
  - Support efficacy testing of low toxicity and other humane control methods for rodents in buildings and other undesirable structures.

4.15 INVASIVE SPECIES

Invasive species increase wildland fire hazard risks (e.g., annual grasses) and cause a loss of biodiversity (e.g., giant reed), habitat degradation, and other environmental problems. The detection and prevention of, and rapid response to, infestations of exotic and invasive species reduce costs and impacts to the mission, while enhancing native ecosystems.

Principle legal and regulatory drivers for invasive and exotic species management are the ESA, including the WFMP BO; Executive Order 11987 (Exotic Organisms) of 1977; Executive Order 13112 (Invasive Species) of 1999; the Federal Noxious Weed Act (Public Law 93-629) of 1974 and the 1990 amendment; and the Plant Protection Act (Public Law 106-224) of 2000. Department of Defense policy underscores the importance of invasive species management (DODINST 4715.03, OPNAV M-5090.1), and the DOD is a member of the National Invasive Species Council which provides high-level federal agency coordination, in part, through revisions to the National Invasive Species Management Plan (NISC 2008).

Objective: Control the spread and introduction of invasive and exotic species with priority on those with the greatest potential to degrade the populations and/or habitat of sensitive species.
Key Considerations: • Invasive species can cause great harm to people and the environment; however, many non-native or exotic species are not harmful, and some may even be beneficial (e.g., food and fiber for people, exotic trees that provide roost site for birds). • 100% prevention of the introduction and spread of invasive species is unrealistic, especially given today's highly mobile global community. • Early Detection and Rapid Response (EDRR) can greatly abate environmental and economic costs associated with the control of invasive species. • Relatively simple prevention measures (e.g., landscaping plant choices, surveyor checks for "hitchhiking" seeds on clothing, vehicles, or equipment) can reduce the likelihood of new introductions. • Control methods for invasive species can have potential adverse effects on non-target species that must be mitigated with avoidance and minimization. • Prioritization of invasive species control efforts must take into consideration associated costs and benefits (ecological and financial, short and long term), and the feasibility and efficacy of methods. • The long-term efficacy of, and costs associated with, invasive species control is directly influenced by off-site source populations and the level of management and control conducted by others in the region. • As global climate patterns shift, the distribution of species will change, and so will the susceptibility of particular habitats to the impacts of new species introductions. • Invasive species cross jurisdictional boundaries; partnerships and collaborative opportunities can help managers stay current with research and emerging concerns and yield mutually beneficial results from shared management interests.

The potential ecological effects and risks of invasive and exotic species, as well as the baseline conditions at the Detachment, are presented in Chapter 3. The introduction and dispersal of invasive species can occur through a variety of means (e.g., abiotic transportation by wind or water, or transport via animal dispersers including humans). Often, habitats that have experienced disturbances, both natural and human-induced, are more susceptible to colonization by invasive species.

Land uses on the installation that cause disturbances which can favor the introduction and expansion of invasive species include road and firebreak maintenance, magazine mowing, landscaping, cattle grazing, and even the movement of personnel in the field. Invasive plant control is included in the WFMP BO as a conservation measure to help mitigate the potential adverse

effects of the disturbances associated with land-use. Some invasive species, such as the brown-headed cowbird, are addressed in the WFMP BO for monitoring and potential management consideration in the future. The control of invasive species is a common recovery action identified within recovery plans for federally listed species.

This section addresses the management of invasive species in general at Detachment Fallbrook, highlighting species specific examples as appropriate. It is important to emphasize that strategic management based on specific treatment objectives for targeted species is very important for a cost effective invasive species management program (see "Control and Management" below). While treatments may be initiated under high uncertainty to take advantage of lag phases, longer term objectives and strategies must be developed and reviewed regularly. Inappropriate treatment objectives can result in wasted resources. Once species specific objectives are established they must be revisited in the context of an adaptive management approach to determine if they remain feasible.

The general management approach to invasive species follows the five "Strategic Goals" of the National Invasive Species Management Plan (NISC 2008):

(1) Prevention

(2) Early Detection and Rapid Response

(3) Control and Management

(4) Restoration

(5) Organizational Collaboration

Prevention

It is not possible to prevent the introduction and spread of all invasive species; however, risks can be reduced with greater awareness and the implementation of certain best management practices. Best management practices and other prevention measures are provided in Section 4.15.1 (Avoidance and Minimization).

Early Detection and Rapid Response

As prevention cannot stop all invasive species introductions, Early Detection and Rapid Response (EDRR) is considered a critical defense against the establishment of an invasive species. It is always easier to get a new infestation under control when it is at a manageable size. Early detection surveillance occurs on a variety of levels at the Detachment. For plants, the weed control personnel are often well versed in the identification of the major invasive species in the county and can serve as a means for the identification of a new species on the Detachment. Rare plant surveys and the LTETM program are also staffed by botanists who can usually identify or key out a new invasive species. Animal surveyors are similarly well suited for the identification of potential new or invasive species within their areas of expertise.

To help improve the odds that a new species occurrence will be recognized for its significance, surveyors are provided with the installation's animal and plant species lists. Any species lists included in survey reports must identify which, if any, are new species to the installation. To the extent feasible, voucher specimens or photographs and other details about the observation are required. The Detachment's plant and animal species lists are not only an inventory of what has been documented on the installation in the past, but they indicate the watch list species for which more information is desired if sighted. The watch species list also includes those not known to occur on the Detachment but which have been documented in the region and are of management interest (Appendix K). For a few priority species of management concern, the Environmental Office produced a handout with photos and descriptions to facilitate EDRR.

Photo 50. Ken Osborne conducting early detection trapping for invasive gold spotted oak borer. (Photo by C.M. Wolf)

Occasionally, targeted surveys are required to identify the potential presence of a new invasive species. As part of a larger invertebrate survey on the Detachment, several traps were deployed for the gold spotted oak borer between 2013 and 2015 as an early detection opportunity (Osborne Biological Consulting and Amec Foster Wheeler 2016, Photo 50). No GSOB has been detected to date; however, continued monitoring should be maintained for this invasive species. The GSOB has been spreading in the region and the early detection and rapid response (including proper disposal of oak trees within the infected area) may be the only way to protect the remaining coast live oaks on the installation. (See section 4.14 for participation in regional early detection surveys performed by other agencies for agricultural pests.)

Control and Management

There are three potential responses to an exotic species: (1) eradication (i.e., complete removal), (2) control (i.e., population suppression), or (3) no action. The response most appropriate in a given situation depends on the short- and long-term costs and benefits. The following factors help assess the feasibility and costs/benefits of treating an invasive species:

- *Size and scale of the infestation*. – A few, smaller populations are easier to contain than multiple, dispersed or widespread populations. Ability to identify the extent of an infestation (e.g., detectability of species at small densities) also influences the possible responses.
- *Population demographics*. – Is the infestation still in the lag phase (see section 3.8.3) or is it spreading at rates that make eradication infeasible.
- *Efficacy and feasibility of treatment methods*. – Not all control methods are practical, effective, and environmentally sound for every situation. Sometimes multiple techniques can be combined to improve treatment efficacy and feasibility.
- *Presence and relative control of off-installation sources*. – What is the likelihood of reintroduction? Abundant and uncontrolled populations outside of the installation's boundary will provide sources for repeated infestation and will make eradication unrealistic.

- *Potential biological or ecological effect of the invasive species*. – For example, determine how noxious or invasive a species is, what resources are at risk, and what is the ecological cost of not controlling the species.
- *Cost*. – Are there sufficient resources to affect control and still maintain treatment of higher priority species?

Eradicating an invasive species can be an attainable goal under certain circumstances and should be considered for highly invasive or noxious species to the extent feasible. Although the short-term costs may be high, they can be outweighed by long-term benefits of eradication. Species that appear to have been completely eradicated from the Detachment include pampas grass (*Cortaderia selloana*) and artichoke thistle (*Cynara cardunculus*). Aggressive measures in the 1990s and early 2000s greatly reduced giant reed (*Arundo donax*) and peppertree (*Schinus* spp.) populations. Although priorities and resources shifted to focus on other more pressing and emergent weed concerns (e.g., barbed goatgrass, which is detailed below, or the explosion of castor beans following the Tomahawk fire), it may be feasible to eradicate giant reed and pepper trees within the next decade or so.

Bridal veil broom (*Genista [=Retama) monosperma*) and barbed goatgrass (*Aegilops triuncialis*) are two species currently targeted for eradication (see Chapter 3):

- *Bridal veil broom*. – It is possible the current distribution of bridal veil broom may make eradication difficult; however, with off-site sources under better control (see "Organizational Collaboration" below, Photo 51), treatment efficacy may increase in the next few years. Further evaluation will determine whether future efforts should focus on eradication or a maintenance level of control.
- *Barbed goatgrass*. – Following the treatment and eradication plan in Lawson et al (2012), barbed goatgrass is currently on the path of eradication. The Tomahawk Fire destroyed the seedbank study plots, but seed viability prior to the fire had already been greatly reduced; few, if any, seeds were expected to be viable beyond 2015 (Lawson & Wolf, in prep). Herbicide treatments at the eradication site are expected to continue in 2016 and 2017 to help ensure the soil seedbank is exhausted. Following Lawson et al. (2012), intensive vigilance surveys will continue for three to five years after cessation of treatments.

The barbed goatgrass project underscores some of the challenges that can be associated with fully eradicating an invasive species, the value of clearly articulating objectives and assumptions in management, and the importance of understanding an organism's biology. The initial barbed goatgrass infestation was a small dense patch (approximately 1.6 acres, 50% cover) (Giessow et al. 2008). Although the objective of eradication had been explicit, the assumptions in the management approach had not been articulated and early eradication efforts for this annual grass were unsuccessful. Spot herbicide treatments conducted by hand required finding each and every individual plant. As treatments progressed and as the population of this grass became progressively less dense, detection rates rapidly declined. This led to many plants not getting treated and an expansion of the infestation perimeter.

Photo 51. Removal of invasive bridal broom from neighboring properties helps eliminate off-site seed sources. (Photo by R.S. Lockwood)

Eradication requires 100% removal of the plants for multiple years until the seedbank is exhausted. It was clear a new treatment method had to be employed that did not rely so heavily on visual detection. Moreover, the biology of the species had to be considered. Barbed goatgrass is unusual for an annual grass; it exhibits seed dormancy. An eradication approach had to ensure exhaustion of the soil seedbank. By 2011, a revised eradication approach by Lawson et al. (2012) was adopted that included boom spraying of herbicide at the treatment site (to obviate the need for individual plant detection) and a seed longevity study (to determine the minimum number of treatment years necessary). Unless new plants are discovered during intensive surveillance, barbed goatgrass is expected to be eradicated from the installation by around 2018.

If 100% removal of an invasive species is not feasible or cost-effective, control measures can help mitigate potential adverse effects of the species. Aquatic exotic animal control (e.g., exotic fish, crayfish, bullfrogs) in the Santa Margarita River is not going to completely eliminate the invasive species from the system; however, suppressing their numbers is expected to greatly reduce predation/competition pressure on the endangered arroyo toad, the endangered steelhead if and when present, and many other native species.

Relative to some areas in the region, most invasive plant species subject to control on the Detachment are being kept at relatively low levels of infestation. Cattle grazing has likely contributed to the low levels of some species such as fennel (*Foeniculum vulgare*). Although exotic annual grasses are still abundant, cattle grazing effectively reduces their height and densities to the benefit of some species at least, most notably the Stephens' kangaroo rat (see Section 4.4). Many invasive plants receive a maintenance level of herbicide spot treatment, with the level of effort depending in part on what kind of growth occurs in a given season. Certain conditions will favor some species in one year and other species in another year. Targeting areas of disturbance, such as roadsides, mowed areas, along the installation perimeter, and recent burn areas can help prevent an excessive accumulation of invasive seed sources. Nonetheless, it is also important to keep areas of low density infestations treated to help maintain areas of native strong holds.

Occasionally, neither eradication nor control is considered feasible or cost effective for some exotic or invasive species. Plant species such as vetch (*Vicia* sp.), filaree (*Erodium* sp.), and mustards

(*Brassica* sp.), for example, are not systematically treated for this reason, and because they are considered to carry low ecological risk. In fact, although filaree is exotic and widespread on the installation, it is considered a good food source for Stephens' kangaroo rats and cattle.

Weeds not systematically treated may still be targeted in certain site specific situations (e.g., within the disturbance footprint of a project), and may be elevated for more systematic treatment in the future. For example, following an increase in sea lavender (*Limonium* sp.) and gazania (*Gazania linearis*) along Ammunition Road, these species were elevated for control to keep these populations in check before they became a larger problem. Mustards had not generally been controlled in the past; however, their rapid expansion in 2015 following the record drought and fires may make mustards a candidate for targeted control in the future.

Other than incidental and opportunistic control (e.g., cowbird egg removal during least Bell's vireo surveys, red-eared slider removal during western pond turtle surveys), there is not a formal program for the control of invasive animals within the interior of the installation. Some species, such as the Argentine ant (*Linepithema humile*) for example, are so pervasive that any efforts at control are unlikely to be effective.

In accordance with the WFMP BO, a subset of nests is monitored for brown-headed cowbird parasitism during the least Bell's vireo and California gnatcatcher surveys. To date, no incidences of cowbird parasitism of gnatcatcher nests have ever been observed on the Detachment (see Appendix H for list of gnatcatcher survey reports). Periodic occurrences of cowbird parasitism of least Bell's vireo nests have been observed in the interior of the Detachment; however, not at a rate to warrant cowbird trapping. Higher incidences of parasitism within the Santa Margarita River may be grounds for cowbird trapping in the future.

Restoration

As there are few large scale projects on the installation, typically restoration simply entails the maintenance of a site as weed free until native species become established naturally. Often there is sufficient seed stock in the soil that the removal of exotic or invasive species allows native species to re-grow naturally without having to reseed or plant native species. Occasionally, restoration at disturbed sites has been facilitated with seeding or planting of native species (e.g., ACCI 2015).

Organizational Collaboration

Organizational collaboration occurs both internal to the installation as well as through regional partnering opportunities. The Environmental Office works with Facilities and other internal departments to reduce the risk of introduced exotics, for example (see 4.16.1 Avoidance and Minimization). Periodically, Facilities projects also dovetail with environmental objectives such as invasive species control. Following the Tomahawk Fire, for example, Facilities conducted a massive tree removal effort around power lines and other potential fire hazard areas to reduce future fire risks. Several thousand trees, the majority of which were Eucalyptus or other exotic species, were removed (Agrichem 2015). As the Eucalyptus and other invasive species began to re-sprout, the Environmental Office followed up with re-treatments.

The importance of regional partnering for invasive species control cannot be overstated. A larger, coordinated approach to invasive species management greatly improves the long-term efficacy of treatments. For coordinated invasive plant control, the Environmental Office periodically partners with several neighboring agencies, including MCB Camp Pendleton, Mission Resources Conservation District, Fallbrook Public Utilities, Fallbrook Airpark, and Color Spot Nursery. In 2015, bridal veil broom plants on private properties just outside the installation's boundary in Fallbrook were treated for the first time owing to collaborative efforts with the San Diego County office of Agriculture, Weights, and Measures (Agrichem 2015). Often these cross-boundary or regional collaborative efforts are included in annual INRMP metrics presentations; however, the

Environmental Office is endeavoring to make sure such invasive species partnering efforts are also documented in future annual weed reports.

For invasive animal species, the Environmental Office has partnered with MCB Camp Pendleton on the control of exotic aquatic species in the Santa Margarita River annually since 2012 (e.g., ECORP 2013). The Navy/Marine Corps partnership has reduced contract administration and other costs, and has expanded the treatment of aquatic exotics control along the entire reach of the river within the DOD enclave. Detachment Fallbrook has easier access points in the upstream reach.

Should certain other invasive animals be detected on the Detachment in the future, regional collaboration will facilitate a rapid and more effective response. The Navy would benefit greatly, for example, from the subject matter expertise and coordinated eradication efforts for species such as the red imported fire ant or feral pigs.

Regional collaboration is instrumental for staying abreast of current invasive species research and emerging concerns. Certain organizations, such as the California Invasive Plant Council (Cal-IPC) and Calflora, provide excellent resources for the consolidation of regional data. Professional participation is encouraged to keep databases up to date and relevant. Detachment Fallbrook has both benefited from, and contributed to, these resources. In addition, in 2013-2014, the Detachment was one of six DOD installations that participated in a DOD Legacy-funded Cal-IPC project aimed at improving the effectiveness of invasive plant management by incorporating a regional perspective and through the prioritization of eradication, control, and surveillance using new datasets and analytic tools (e.g., CalWeedMapper, WHIPPET, and Calflora's database) (Cal-IPC 2015). Lastly, the San Diego Weed Management Area member meetings have also provided a useful venue for learning about regional invasive plant work, staying current on relevant laws and regulations, and collaborating with other agencies, land managers, and biologists.

4.15.1 Avoidance and Minimization

Below are measures to help avoid and minimize the introduction and spread of invasive species, as well as potential adverse effects from species control:

- *Limit disturbance*. – As a best management practice, the Environmental Office requires the footprint of a project (area of disturbance) be kept to a minimum. This reduces the size of the area susceptible to colonization by invasive species.
- *Landscaping/restoration plant list*. – Landscaping or other restoration efforts that may involve seeding or planting are not permitted to use exotic invasive species. Appendix G provides a list of preferred species for landscaping, and unauthorized species which include any classified by Cal-IPC as exotic pest plants of ecological concern in California. For restoration projects, only native species are permissible.
- *Timing of mowing*. – The timing of mowing can help control invasive exotic weeds. Mowing too early can cause increased seed production (CDFA 2001) and may induce resprouting. It also can negatively impact native species (Tu et al. 2001). Mowing too late can promote certain weeds, and mowing young plants can prevent seed production. It is important to note that this minimization measure has been difficult to monitor and influence. Given how infrequently mowing is conducted and how rapidly weeds can respond, the timing of mowing may have only a limited benefit. However, the potential merits of this measure are worth implementing to the extent feasible.
- *Avoid adverse effects to sensitive species*. – Although the removal of invasive species is expected to provide a net benefit to native species, it is important to avoid and minimize potential direct or indirect short-term impacts. Avoidance of nesting birds is an important aspect to the removal of exotic plants. To the extent feasible, species are treated outside of

the avian breeding season. When treatments must occur during the breeding season, nest avoidance is implemented. Likewise, any invasive species removal work in the Santa Margarita River must avoid and minimize potential effects to the arroyo toad and other native species.

- *Limited and controlled herbicide use*. – Herbicides are rarely used in landscaped areas; however, they are employed regularly as part of the weed management program in wildland areas. The use of herbicides on the Detachment is highly regulated. Avoidance and minimization measures help minimize potential adverse effects to non-target species.

  Almost all herbicide applications are conducted by spot treatments (hand application) of individual invasive plants which greatly minimizes non-target plant mortality. Wildlife that are strongly associated with native vegetation are expected to be less adversely affected by, and may indirectly benefit from, weed control, which is conducted almost exclusively on invasive and exotic plants.

  Herbicides applied within riparian habitat or near waters of the U.S. must be approved for use in aquatic settings and are only permissible if the water body is dry, or there is a sufficient buffer between the target site and the water to avoid any potential pesticide drift.

- *Soil and other substrate movement*. – The importation of soil and other potential substrate such as gravel requires approval from the Environmental Office and is avoided to the greatest extent feasible (on site borrow pits are maintained for this reason). If importing such materials is approved, they must be certified as clean from both a hazardous waste consideration and for potential organic material. Importing soil from red imported fire ant (RIFA) quarantine areas in neighboring counties is prohibited. Potted plants for landscaping or restoration projects shall be from local nurseries and not from RIFA quarantine areas. Movement of materials onto the installation, such as firewood which can harbor the gold spotted oak borer, is considered unlikely since there is no longer housing on the Detachment.

- *Cattle management*. – Current and proposed cattle management practices are designed to help prevent the introduction and spread of invasive species. Fortunately, the timing of cattle arrival is usually in the late winter or early spring, before many plants would have gone to seed at the cattle source location. The use of supplemental hay is rarely approved, and if so, only weed free hay is generally permitted. One potential project is to develop a paddock for the temporary holding of new cattle arrivals such that the passage of gut contents, and dispersal of potential plant seeds on fur, would likely occur within a designated area. This would facilitate targeted weed vigilance surveys for EDRR. Logistical challenges, to include adequate water and weed-free food source, would need to be resolved prior to realization.

- *Field personnel*. – Field personnel, often consisting of environmental surveyors, are encouraged to check clothing and equipment for possible plant propagules before arriving and leaving the installation. The barbed goatgrass eradication site has its own quarantine measures (e.g., single ingress/egress route treated with herbicide and a decontamination area for equipment and personnel clothing).

- *Education and outreach*. – Education and awareness are an important first defense in preventing the introduction and spread of invasive species.

4.15.2 Surveys and Monitoring

Surveys and monitoring provide for the early detection of a potential invasive species, and help track treatment and infestation trends:

- *Watch list species/incidental observations*. – Existing surveys (e.g., rare plant, LTETM, invertebrate, herpetofauna) provide excellent opportunities to leverage surveyor expertise and field exposure for the early detection of new species occurrences. Watch list species, contract requirements, surveyor qualifications, kick-off meetings, and work plans can reinforce early detection as a management priority.
- *Targeted surveillance*. – Surveys targeted at certain invasive species are occasionally used to increase EDRR opportunities. Examples include gold spotted oak borer trapping, and monitoring for cowbird parasitism of least Bell's vireo and California gnatcatcher nests.
- *Treatment maps*. – Documentation of invasive species control includes mapping of treatment areas. In recent years, track log data of weed control personnel routes are used to illustrate the level of treatment coverage. If a species is absent from an area on a treatment map, the track log helps discern whether the species may not have been present/detected or if the location was even within the treatment coverage. Although treatment efforts may not be consistent from year to year, treatment maps often provide insight into weed infestation trends and treatment efficacy.
- *Infestation maps*. – An infestation map provides a snapshot in time of the status of invasive species to help prioritize management and to track long-term changes. For most species, treatment maps (described above) have been the primary means of monitoring changes in invasive species abundance and distribution over time. Given the level of effort expended in finding many invasive species, it is often more cost effective to treat the species at the same time. For this reason as an example, treatment maps, not infestation maps, are produced for aquatic exotics. However, inconsistencies in treatment coverage from year to year can confound trend assessments. Moreover, some species (e.g., exotic trees) may not be treated at all in a given year. For this reason, stationwide mapping of select invasive species every five to ten years can help guide management strategies and provide long-term trend data.

4.15.3 Conservation and Research

The control and eradication of invasive and exotic species is a form of habitat restoration that is expected to benefit many species. Specific measures include:

- *Exotic plant control*. – Weed control, including treatments for eradication, must be conducted annually to keep invasive species populations from exploding and becoming much larger and more costly problems. Large weed populations can be difficult to get under control because of the prevalence of the seeds in the soil seedbank. Management prioritization should be based on long-term cost/benefit considerations, species specific control versus eradication objectives, and existing field conditions. Treatments should be applied within optimal seasonal windows for maximum efficacy for each targeted species. When treatment timing is not as critical, weed control shall avoid migratory bird and arroyo toad breeding seasons.
- *Prescriptive grazing*. – To the extent feasible, adjust grazing parameters (e.g., number of AUM, seasonal timing and duration of grazing) to provide a competitive advantage to native grassland species over exotic annual grasslands. (See Section 4.4.)
- *Aquatic exotic animal control*. – The control of aquatic exotic animals (e.g., exotic fish, crayfish, bullfrogs) in the Santa Margarita River provides habitat enhancement for the endangered arroyo toad and steelhead, as well as for other native species. Maintaining annual control efforts will not only help suppress invasive species populations within the reach of the river along the boundary of the Detachment, but it will also provide a benefit to MCB Camp Pendleton by reducing the immediate upstream source populations.

- *Brown-headed cowbirds*. – Trapping and removal of adult brown-headed cowbirds is not currently warranted. However, permitted and qualified surveyors are encouraged to carefully remove cowbird eggs, or chicks, if encountered in the nests of federally listed species.
- *Research*. – The efficacy of invasive species treatments is often influenced by unknown factors. Individual species vary in terms of life history characteristics (e.g., reproductive strategies, seed longevity, dispersal mechanisms), distribution (both on and off site), population dynamics, environmental influences, etc. Likewise, the most effective treatment(s), including the timing and method of application, can also vary depending on species and environmental conditions. Successful invasive species management can almost always be attributable to knowledge gained from investigative studies. While much information can (and should) be gained from literature reviews and other people's experience, existing data can sometimes be limited. An investigative and adaptive approach can inform management decisions and greatly improve the efficacy of treatments.
- *Barbed goatgrass eradication*. – The barbed goatgrass eradication project exemplifies EDRR, and the benefits and efficiencies gained from an investigative approach. For the first couple of years of treatment, the project also exemplified the problems that can arise – notably, enlargement of the infestation area – when status quo control measures are applied without an investigative approach. Several questions were researched, and a few hypotheses tested, during the barbed goatgrass eradication project (e.g., dispersal distances, most effective treatment methods and erosion control measures, the effect of herbicide drift). Because barbed goatgrass exhibits seed dormancy, it was critical to understand the potential maximum seed longevity to establish how long field treatments would be necessary. For the population to be eradicated, not a single viable seed can remain. A seed longevity study was implemented with support from Dr. Dawn Lawson (SPAWAR) and Dr. Andrew Dyer (University of South Carolina, Aiken) which greatly helped inform the eradication program for this species.

4.15.4 Management Actions

Below are measures specifically applicable to the management of invasive and exotic species:

- *Avoidance and minimization*:
  - Implement measures outlined in Section 4.15.1.
- *Surveys and monitoring:*
  - Maintain plant and animal watch species lists and continue to reinforce the value of incidental observations during existing surveys for early detection opportunities.
  - Periodically trap for the gold spotted oak borer (e.g., using flight-intercept prism traps and other lures).
  - Continue to monitor for cowbird parasitism of least Bell's vireo and California gnatcatcher nests, minimally during the 5-year stationwide surveys for each species. Discuss findings with the USFWS in accordance with the WFMP BO; draft results are included in annual INRMP metrics presentations.
  - Consider targeted surveys to support EDRR for other invasive species as indicated by management priorities and potential emerging regional threats.
  - Continue to map invasive species treatment locations to include applicator's track logs during weed control.

- Implement stationwide mapping of select invasive plant species every five to ten years.

- *Conservation and research:*
  - Conduct weed control annually. Prioritize management based on long-term cost/benefit considerations, control versus eradication objectives, and existing field conditions.
  - Continue annual aquatic exotics control in the Santa Margarita River.
  - Encourage removal by permitted and qualified surveyors of cowbird eggs, or chicks, if encountered in the nests of federally listed species.
  - Consider treatment of other invasive animal species as indicated by management priorities and potential emerging regional threats.
  - Support research and efficacy testing of invasive species control methods, including development of an analytical framework based on population viability analysis to inform adaptive management of invasive species control. Endeavor to apply adaptive management and scientific rigor to the testing of management hypotheses.

- *Regional partnering:*
  - Continue to engage with regional partners on the control and management of invasive species to the extent compatible with resource management goals and consistent with the mission.

4.16 WILDLIFE LAW ENFORCEMENT

The effectiveness of natural resources conservation laws, such as ESA, MBTA, CWA, and Marine Mammal Protection Act, depends on their implementation and enforcement. To underscore the importance of enforcement, Navy guidance states: "Conservation law enforcement shall be an integral part of a natural resources program... and requirements shall be coordinated with installation security forces and appropriate conservation law enforcement agencies. Commanders shall permit federal and state conservation officers access to enforce natural resources laws after taking proper safety and security measures" (p. 12-41, OPNAV M-5090.1).

With the public access and land use restrictions in place for safety and security reasons, there is low risk for violations of conservation laws. Environmental compliance is largely managed in-house with project reviews, approvals, and implementation oversight. That said, the Commanding Officer of Detachment Fallbrook permits the escorted access of federal and state conservation officers to enforce natural resources laws in accordance with the installation's safety and security requirements.

4.17 OUTDOOR RECREATION

The Sikes Act requires each military service to provide to the public opportunities for outdoor recreation, specifically the sustainable multipurpose use of natural resources (e.g., hunting, fishing, trapping, nonconsumptive uses), where and when it is compatible with military safety and security needs.

Public access to the Detachment and access by installation personnel to the magazine areas (within the ESQD "explosive" arcs) are restricted and tightly controlled for safety and security reasons. Outdoor recreation opportunities are, therefore, (1) only available to installation personnel and (2) limited to administrative areas (see Section 2.4.6). Due in part to these restrictions, no hunting, fishing, or trapping are permitted. Although fishing (strict catch and release policy) and boating

used to occur at the Detachment, these recreational activities were discontinued in 2004 when Depot and Lower Lakes were classified as MRP sites.

Detachment personnel may engage in bird watching and other wildlife viewing in administrative areas, or even during the course of their duties within magazine areas; however, most physical outdoor recreation tends to be limited to walking, jogging, cycling, or other forms of exercise within the administrative area (see Section 2.4.6).

Although natural resources related recreational opportunities are not permitted within the ESQD arcs, Detachment Fallbrook upholds the spirit of the Sikes Act with the sustainable multipurpose use of resources through cattle grazing, and by providing public access and outreach in other ways (see Sections 2.4.6 and 5.7.4).

4.18 BIRD/ANIMAL AIRCRAFT STRIKE HAZARD

There are no aerial training operations and military activities do not contribute to bird/animal aircraft strike hazards at the Detachment.

4.19 COASTAL/MARINE MANAGEMENT

The Detachment is not located within coastal or marine environments.

4.20 FLOODPLAINS MANAGEMENT

Facilities and infrastructure at the Detachment are not located within floodplains. Future or potential projects must be submitted for review and approval to allow for incorporation of floodplain management considerations.

4.21 DOCUMENTS, RECORDS, AND DATA MANAGEMENT

Documents, records, and data inform virtually every aspect of natural resources management and mission support. Effective and efficient planning and project support rely on accurate information about the past, present, and potential future natural resources and land use context. Inaccurate or missing data can hinder compliance and cause costly delays.

Legal and regulatory drivers for documents, records, and data management includes the Records Management by Federal Agencies (44 USC §3101-3107); Federal Information Policy (44 USC §3501-3521, which encompasses the Data Quality Act, also known as the Information Quality Act, §515 of Pub L. 106-544). The Navy's policy for INRMP implementation includes guidance on "Recordkeeping and Data Management" (p. 12-13, §12-3.4(c)(9) of OPNAV M-5090.1). Proper management of documents, records, and data also supports implementation of the Environmental Management System (Chapter 5.6) and compliance with numerous environmental laws (e.g., ESA, MBTA, CWA).

Objective: Provide for the optimal collection, storage, and management of data to facilitate compliance, project reviews and support, resource assessment monitoring, adaptive management, and informed decision making.
Key Considerations: • The quality, utility, and integrity of data depend on how well data were collected in the first place. A data management system is only as good as the data that are stored in it.

- Quality assurance and quality control are time consuming but necessary prior to the approval of data. Inaccurate data are unreliable, can promulgate misinformation, and can cause costly mistakes.
- Most natural resources data have a geospatial component and should be stored in GIS to allow graphical depiction and analyses by natural resources managers.
- Spatial Data Standards for Facilities, Infrastructure, and Environment (SDSFIE) systematically defines geospatial features to create a universal language and framework across the DOD.
- Detachment-specific survey protocols and GIS-templates help produce repeatable data and standardized results for long-term trend analysis.
- A data management system provides organized and systematic approach to the collection, documentation, administration, storage, and retrieval of data.
- Data management should facilitate avoidance and minimization of potential impacts to federally listed species and contribute to measures that preclude the need for the listing of SAR.
- A well-implemented data management system supports adaptive management, Environmental Management System (EMS) and compliance tracking, INRMP implementation tracking, INRMP updates/revisions, data calls, and environmental planning efforts.
- Data storage must consider data security to include system redundancy or back-ups, access control, encryption.

Possibly one of the most under-appreciated aspects of natural resources management is recordkeeping and data management. Data integrity and management are vital to a successful program. Responsible and defensible decision making is based on data. Evaluating potential effects of land use is based on data. Consultations with the USFWS and other agencies require data. Assessing potential population trends necessitates data. Essentially, information management is critical to the installation's ability to maintain compliance and responsibly manage its assets. In contrast, poorly managed data can be costly, not only in terms of time and money (e.g., having to re-collect information), but also in terms of potential mistakes.

In accordance with OPNAV M-5090.1, the Environmental Office has developed a "data management system" for natural resources documents, records, and data at the Detachment. The data management system is expected to be refined and updated as appropriate, for example, as storage platforms change (e.g., upgraded Conservation Module in Environmental Management System (EMS) Web is currently undergoing beta testing as a tool for improved document storage).

Part of the process for fully realizing a data management system has been review and incorporation of past data. Unlike some disciplines where data may have a "shelf life" or expiration date, natural resources data often retain their value with age and may even become more important. Although inferences may be limited, historical data can provide a context for understanding the relative quality and quantity of contemporary habitat and ecosystems (e.g., species richness and diversity, population numbers, extent of weed infestation, habitat patch size and connectivity) as well as the potential effects of land use over time.

The value and utility of data begins with the initial data collection, processing, and documentation. As with any data, but especially with field data, there will always be error rates, detection probabilities, unmeasured variables, and other factors that limit interpretation of results. Nonetheless, there are measures that can improve confidence in, and utility of, the data (e.g., surveyor qualifications, standardized protocols, rigorous documentation of methods, accuracy assessments, objectivity in approach and interpretations).

The Environmental Office strives for continual improvement in the data collection process within the context of survey objectives. For example, installation-specific survey protocols were developed for the California gnatcatcher and least Bell's vireo to improve repeatability and comparability of annual and stationwide monitoring surveys over time. Similarly, to better

document coverage of rare plant and Stephens' kangaroo rat surveys as well as annual weed treatments, GPS track log data of surveyor routes are required. Such measures help reduce ambiguity. For example, track log data can help determine if the lack of documentation of a species at a given location is because the surveyor looked but did not detect it (evidence for absence), or because the area was not actually covered (absence of evidence).

A critical step in helping to ensure data integrity is quality control, or the careful review of all deliverables before acceptance. Quality control is possibly one of the most tedious steps in the process of data management, but deliverables with errors undermines the reliability and utility of the data.

The Environmental Office continues to improve the storage and management of information to maximize its utility. Reliance on "best available scientific" data in decision making implies that the information is accessible and able to be used. Organized data management not only improves efficiency and utility of the data, but it facilitates "institutional knowledge" and continuity through staff turnovers. One product of this endeavor is a reference index (spreadsheet) with an inventory of all known historical and contemporary natural resources surveys and studies that have occurred on the Detachment that is updated regularly; a copy of this index is provided in Appendix H.

Additional information management initiatives have included improved maintenance of plant and animal species lists (to include watch list species; Section 4.2.5 and Appendices J and K) and the development of data logs for institutional documentation and to streamline information tracking. To date, data logs have been developed for incidental observations (Section 4.2.5); "animal calls" (when installation personnel phone the Environmental Office for wildlife related issues, such as trapped birds, venomous snakes, dead animals); document transfers to the USFWS and CDFW; and contractor hazard control brief, security vetting, badging, and recall list (greatly improves administrative efficiency for installation access requirements for field personnel).

The plant and animal species watch lists include regionally sensitive species, and other species of potential management concern, and identifies whether the species is currently occurring on the Detachment, has occurred there during the past, or if there is inadequate information to determine presence/absence. For species not known to occur on the installation, the nearest known occurrence is recorded if known. Starting in 2015, the species watch list will be provided to the USFWS and CDFW for review as part of the annual INRMP metrics. Maintenance of these lists will provide an indication of potential future mission risk.

The Environmental Office generally supports, and has engaged in, the sharing of appropriate natural resources data with other government agencies, regional conservation organizations, and educational/research institutions. Data sharing can yield numerous mutual benefits (e.g., studies can provide insight into resources on the installation, notification of a new invasive species on the installation can facilitate EDRR in the region). Although not a common practice, occasionally data may be submitted to regional databases for archival value as a means of preserving for future use. Examples include the Coordinated Bird Monitoring Database, which is maintained by USGS, and the eBird program, managed by Cornell Laboratory of Ornithology.

4.21.1 Management Actions

- *Data management and analysis:*
  - Ensure data and document standards and requirements are addressed appropriately in scopes of work, and reiterated during contract kick off meetings.

- Continue to maintain existing standardized survey protocols (e.g., California gnatcatcher and least Bell's vireo) and create (or finalize) additional protocols for other recurring surveys as applicable.
- Maintain, and improve where necessary, natural resources GIS data storage and management processes.
- To the extent feasible, ensure data security (e.g., system redundancy and back-ups, access control).
- Maintain official animal and plant species list for installation.
- Maintain a species "watch list" and formal log of incidental encounters. Starting in 2015, the watch list will be submitted to the USFWS and CDFW for review and discussion as part of the annual INRMP metrics. See Sections 4.2.5
- Collaborate with other organizations within the Navy for the development and use of non-environmental data (e.g., roads, buildings, magazines, security fencing, utilities) for the accurate and appropriate depiction of land use cover features in map productions and spatial analyses.
- Consider enlisting a subject matter specialist for an external evaluation of data collection and analysis standards (e.g., statistical robustness).

- *Deliverable quality control:*
  - Ensure GIS is in proper format, conforms to specified standards, and is complete and accurate.
  - Review GIS data and report deliverables for consistency to include performing queries on the data to see if results are in alignment with the report.
  - Require submission of raw data, to the extent feasible, to answer potential questions or reconcile discrepancies in processed data formats.
  - Review report deliverables for internal consistency, compliance with contract requirements, and responsible presentation and interpretation of data. To greatest extent feasible, ensure maximum "quality, objectivity, utility, and integrity" of the information presented (44 USC §3516).
  - Ensure "recommended citation" is included on all report deliverables to facilitate consistency in document referencing and tracking.
- *Documents and records management:*
  - Maintain, and improve as necessary, the natural resources data management system.
  - Maintain the inventory and index of natural resources documents and records, to include both paper and electronic copies of reports, as feasible.
  - Endeavor to populate the NAVFAC SW library with a set of archival hard copies of natural resources surveys and studies.
  - Improve utilization of EMS Web as a tool for back-up electronic copies of natural resources documents and records.
  - Track documentation supporting regulatory compliance (e.g., survey reports in fulfillment of WFMP BO terms and conditions, mitigation tracking).

- Maintain data logs (e.g., incidental observations, animal calls, document transfers to USFWS and CDFW, hazard control briefs and badging).

- *Citation/bibliographic data:*
  - Establish and periodically update annotated bibliographies of research within areas of management interest (e.g., range management and prescriptive grazing; weed management; federally listed species management; avoidance and minimization measures; habitat restoration techniques; etc.).

- *Regional partnering:*
  - As appropriate and feasible, contribute to regional natural resources databases as a means of collaboration in areas of mutual interest, and to provide historical documentation and data storage redundancies (e.g., Cal-IPC WeedMapper, Coordinated Bird Monitoring Database).

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CHAPTER 5
PLANNING, INTEGRATION, AND IMPLEMENTATION

This chapter describes the management aspects and processes in place for planning and integration with Facilities, Planning, and Operations implementation of this INRMP for Detachment Fallbrook. DOD policy (DODINST 4715.03) requires that current and planned installation activities (e.g., development plans, construction requests, site approval requests, host-tenant agreements, and outleases) are effectively coordinated and consistent with activities described in this INRMP.

Under the Sikes Act, the Detachment must provide for the "conservation and rehabilitation of natural resources" and ensure "no net loss" to the military mission due to implementation of this INRMP.

This chapter also addresses the funding, staffing, coordination, and documentation associated with INRMP implementation. As specified in DODM 4715.03 (2013, p. 10), "DOD Components implement INRMPs by:

(a) Actively requesting and using funds for natural resources management projects, activities and other requirements in support of goals and objectives identified in the INRMP.

(b) Ensuring that sufficient numbers of professionally trained natural resources management personnel are available to perform the tasks required by the INRMP.

(c) Inviting annual feedback from the appropriate USFWS and State fish and wildlife agency offices on the effectiveness of its INRMP.

(d) Documenting specific INRMP action accomplishments undertaken each year.

(e) Evaluating the effectiveness of past and current management activities and adapting those activities as needed to implement future actions."

The Navy intends to implement this INRMP within the framework of regulatory compliance, mission obligations, anti-terrorism and force protection limitations and funding constraints. Any requirement for the obligation of funds for projects in this INRMP shall be subject to availability of funds appropriated by Congress, and none of the proposed projects shall be interpreted to require obligation or payment of funds in violation of any applicable law, most notably the Anti-Deficiency Act (31 USC 1324, et seq.).

Successful implementation of this INRMP will depend upon not only the guidelines set up and projects described, but how well these are translated into performance work statements (who will do what and with what money), project lists and scopes of work, and a workload plan. It must fit into the formal Environmental Management System (EMS) established at Detachment Fallbrook for integrating environmental considerations into day-to-day activities across all levels and functions of Navy enterprise. Detachment Fallbrook depends on natural resources for the sustainability of many mission-related programs (i.e. aesthetics and recreation for military personnel, stormwater collection and transport, etc.) and will manage natural resources to ensure sustainable use. This INRMP is not intended to impair the ability of Detachment Fallbrook to perform its mission. However, the INRMP does identify usage restrictions on sensitive attributes such as environmentally sensitive habitat areas.

5.1 RESPONSIBILITIES FOR IMPLEMENTATION

The responsibility for development, revision, and implementation of INRMPs is shared at every level among many different command elements (see also Section 1.3). The SECNAV Instruction 6240.6E assigns responsibility for establishing, implementing, and maintaining the natural resources programs under the jurisdiction of SECNAV to the Chief of Naval Operations (CNO)/ Commander of Navy Installations Command (CNIC). Regional command and coordination is provided by the major claimant, Navy Region Southwest, and the Regional Environmental Coordinator. These entities ensure the programming of resources necessary to establish and support an integrated natural resources program consistent with legislative requirements, DOD policy, and stewardship. As the Navy shore infrastructure continues to evolve through organizational and mission changes, many natural resources functions are provided by regional commanders and area coordinators as part of their responsibilities in support of the installation Commanding Officer.

Naval Facilities Engineering Command Southwest (NAVFAC SW) is responsible for providing technical assistance for both compliance and stewardship obligations, and to evaluate and validate requests for funds for natural resources projects. This engineering activity administers the Navy forestry and agricultural outlease budgets, fish and wildlife/hunting and fishing fee and permit projects, contracts, and cooperative agreements. Upon request from CNO/CNIC, NAVFAC SW coordinates natural resources requirements with other federal, state, or local agencies, including the acquisition of INRMP mutual agreements between the Navy, USFWS, and state fish and wildlife agencies. Natural resources program information needed to satisfy reporting requirements, legislative information requests, and to support project requests is also maintained by NAVFAC SW. This information is collected in the NAVFAC Natural Resources Data Call Station and applicable geographic information systems (GIS) programs.

The installation Commanding Officer is responsible to act as the natural resource steward of lands under his or her jurisdiction and integrate natural resources requirements into the day-to-day decision-making process. To accomplish this, the Commanding Officer involves appropriate tenant, operational, training, and research and development commands in the INRMP review process to ensure no net loss of the military mission. The Commanding Officer may ask the Navy Judge Advocate General or Office of the General Counsel Legal Counsel to provide advice and counsel with respect to legal matters related to natural resources management and INRMPs.

Formal adoption of an INRMP by the Commanding Officer constitutes a commitment to seek funding and execute, subject to the availability of funding, all “must fund” projects and activities in accordance with specific time frames identified in the INRMP. Under the Sikes Act (as amended), any natural resources management activity that is specifically addressed in the INRMP must be implemented (subject to availability of funds). Failure to implement the INRMP is a violation of the Act and may be a source of litigation. Since the Sikes Act (as amended) requires implementation of the INRMP, there is a clear fiscal connection between INRMP preparation, revision, implementation, and funding. Funding to implement natural resources management will largely come from program sources through Commander Navy Region Southwest from CNIC.

Adequate training of natural resource personnel is important to the success of military sustainability and land management. The OPNAV M-5090.1 requires that Navy commands develop, implement, and enforce the management plan through personnel with professional training in natural resources.

5.2 INTEGRATED MANAGEMENT

Preparation of the INRMP was coordinated with other existing plans and management procedures, including: facilities master plan, operational plans and procedures, Integrated Cultural Resources

Management Plan (ICRMP), Integrated Pest Management Plan, Installation Restoration Program and Munition Response Program plans that address contaminants covered by CERCLA and related provisions, and other appropriate plans and offices. Key interrelationships with other planning efforts and management procedures are summarized in this section and Section 5.3.

5.2.1 Environmental Management System (EMS) Framework for Natural Resources Integration

The NAVWPNSTA Seal Beach, Detachment Fallbrook uses an EMS as the primary framework to effectively manage all Environmental Programs, including the Natural Resources Program. The EMS formal management framework provides a systematic way to ensure natural resources management is fully integrated into all planning and mission functions. The EMS supports the command's fulfillment of both stewardship and environmental compliance and is founded upon the principles of continual improvement and is conformance to the ISO 14001 standard and OPNAV M-5090.1 (see USDON 2015).

Programmatic Management of natural resources and the implementation of the INRMP is therefore an integral component of the EMS. The EMS processes include written procedures, training, oversight and self-identification and self-correction of non-conformance to the installation natural resources policies and procedures to ensure consistent and fully integrated INRMP implementation. The EMS is therefore the means by which natural resources management concerns are programmatically managed and integrated into mission operations, facilities planning and maintenance, and across all Navy organizational components.

Section 5.7 describes implementation procedures and processes.

5.2.2 Planning and NEPA: Environmental Aspects and Requirements Review

The National Environmental Policy Act (NEPA) is the basic national charter for the protection of the environment and a procedural planning tool, which primarily requires a clear evaluation of all federal decisions potentially affecting the human and natural environment. The Detachment must consider environmental consequences of its actions before making a commitment to proceed with a project or proposed action

The NEPA review process is a central component of the EMS. The organization continually reviews new and changes to operations/process and facilities through the EMS in order to identify relevant environmental aspects and regulatory requirements. The command's environmental policy is to utilize the EMS to integrate environmental considerations into all business practices from the earliest stages of planning, design, and procurements in order to reduce the impact to environmental resources and maximize mission capabilities by reviewing Proposed Actions.

The Environmental Aspects and Requirements Review (EARR)/NEPA process is linked to other requirements review processes, most notably reviews performed by the Explosives Safety Officer, Facilities Planning & Asset Management ("Site Approval Process"), Security Officer and Public Affairs Officer.

See Section 5.4 below for further description of the planning and project review process.

5.2.3 Cultural Resources Program Coordination

The installation has issued an Integrated Cultural Resources Management Plan (ICRMP; USDON 2012) which presents cultural resources management long rang goals, summary of resources and tasks for compliance to comply with requirements set forth in Sections 106 and 110 of the NHPA, DODINST 4715.03: *Natural Resources Conservation Program*, and OPNAV M-5090.1.

Natural resources management activities that may require consultation under Section 106 of the NHPA include, but are not limited to, those activities that are ground disturbing or may have an adverse effect on archaeological resources such as all ground disturbing activities associated with land and facility management (landscaping and planting), habitat management, pond and wetland construction, and maintenance (terrain modification for erosion control and restoration).

Activities in this INRMP that have the potential to affect cultural resources will be reviewed by facilities planning (Section 5.3) and through the EMS/NEPA processes (Section 5.4) to ensure compliance with all applicable federal laws.

5.2.4 Installation Restoration and Munition Response Program

The Installation Restoration Program (IRP) and the Munitions Response Program (MRP) were designed to identify, investigate, and clean up areas of past contamination from hazardous substances, pollutants, and contaminants to protect human health and safety, and the environment. The IRP and MRP generally follow the same procedures, but the MRP has unique characteristics to include munitions and explosives of concern (MEC).

The IRP and MRP follow the cleanup protocol of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980 and the Superfund Amendments and Reauthorization Act (SARA) of 1986. In recent years, Navy expanded the IRP to include response actions necessary to address contaminated sites under the Resource Conservation and Recovery Act (RCRA) Corrective Action (CA) and underground storage tank (UST) Program when they are deemed appropriate. Although CERCLA (also known as Superfund) did not apply to military installations, its provisions were adopted by the DOD as a model for environmental cleanups by the military components and, in 1986, Congress passed the Superfund Amendments and Reauthorization Act (SARA), which mandated DOD to follow the same cleanup regulations that apply to private entities. As a matter of DON policy, CERCLA is the preferred process for conducting cleanups. The National Oil and Hazardous Substances Pollution Contingency Plan (NCP) (40 CFR 300) is the regulation that implements CERCLA. DON policy is to comply with the NCP for all sites under CERCLA authority.

NEPA is not applied to actions taken under CERCLA and the NCP. Like NEPA, CERCLA and the NCP establish a decision-making process with respect to the cleanup of past contamination that involves public notice and participation. The United States Department of Justice (DOJ) determined that these provisions of CERCLA, enacted into law after NEPA, are the functional equivalent of the NEPA process. Accordingly, compliance with the requirements of CERCLA satisfies NEPA's twin objectives of informed decision making and public participation.

On-site CERCLA response actions are exempt from permitting processes, which are considered administrative procedures; however, substantive requirements under environmental laws such as the Endangered Species Act, Clean Air Act, and Clean Water Act do apply and are addressed by the CERCLA process. Under CERCLA Section 121(e), no federal, state, or local permit is required for on-site CERCLA response actions. Instead, Congress created a process whereby cleanup standards found in other federal and state laws and regulations are applied to a particular CERCLA action. This process is known as selection of "applicable or relevant and appropriate requirements" or "ARARs." A law or regulation is "applicable" if the legal standard would apply independently of CERCLA. Generally, a law or regulation is "relevant and appropriate" if it is well-suited to the circumstances found at the CERCLA site in question, even though it would not otherwise be legally required.

During selection of ARARs, natural and cultural protection laws are considered at each step of the IRP/MRP environmental restoration process and the Navy works closely with applicable regulatory agencies to ensure compliance with the substantive provisions of applicable environmental laws.

At each step of the IRP/MRP environmental restoration process, the Navy considers applicable or relevant and appropriate natural and cultural protection laws and works closely with regulatory agencies to ensure compliance with the substantive provisions of such laws.

5.3 FACILITIES INTERFACE AND COMPLIANCE WITH INRMP

Department of Defense policy seeks to ensure that current and planned installation activities are effectively coordinated and consistent with INRMP requirements, goals, and objectives.

Planning activities include: installation master plans, project and site development planning, construction requests, site approval requests, host-tenant agreements, and real estate actions (i.e. easements, licenses, leases, etc.). Land use and natural resource decisions are supported by existing DOD, SECNAV, DON, and installation command instructions and procedures (Appendix B).

Facilities management and maintenance activities with specific relevance to natural resources management at Detachment Fallbrook include: magazine maintenance, explosives safety, physical security, and ongoing management of facilities infrastructure in support of the military mission.

5.3.1 Integrated Facilities Planning and Compatible Use

The Sikes Act and DOD guidance require that INRMPs ensure that no net loss of available land and operational carrying capacity for military support occurs while pursuing environmental protection needs (DODINST 4715.03). Federal legislation and regulations, and DOD and Navy policy applicable to land use/natural resources management are provided in Appendix B. The Navy's Integrated Planning Process and EMS provide the management framework and process for achieving the "not net loss" goal.

Important facilities planning decision need to consider alternative locations for competing uses and the relative impacts of each alternative. Executive Order 13112 directed federal agencies to design, use, or promote construction practices that minimize adverse effects on the natural habitat where cost effective and to the extent practicable. More importantly, numerous regulatory requirements apply and are driven by the Clean Water act (CWA), Clean Air Act (CAA), Endangered Species Act (ESA), NEPA, and Soil Conservation Act. Economics and military needs shall be balanced with environmental impacts. Significant environmental impacts from land use can eventually inhibit military mission.

Facilities, Planning, and Management Responsibilities

- Facilities, planning, and management actions will be consistent with INRMP requirements and objectives and targets.
- Align infrastructure to contribute to the military mission and concentrating it in operations areas.
- Begin the NEPA process at the earliest development and planning states as part of the decision making process and to develop specific guidance for projects.
- Work with neighbors and other agencies to plan for encroachment, including that based on environmental compliance.
- Maintain a healthy ecological environment, using principles of sustainability and ecosystem management to balance short-term projects with long-term goals.
- Work in conjunction with environmental personnel to establish protocols for emergency repair of infrastructure so that human life, health and safety are given precedence, but sensitive resources are also protected.

5.3.2 Site Approval Process

The Public Works Department (PWD) Facilities Management Division administers the installation Site Approval Process which ensures that all proposed site planning, project development and facilities use requests meet DON facilities management requirements. These requirements include:

- OPNAVINST 11010.20H – Facilities Project Instruction
- SECNAVINST 11011.47C – "Acquisition, Management, and Disposal of Real Property and Real Property Interests by the Department of the Navy" NAVFAC P-73 - NAVFAC Real Estate Procedural Manual

The Site Approval Process also considers explosives safety requirements and coordinates, when required, approval of proposed projects to Naval Ordnance Safety and Security Activity (NOSSA).

5.4 PROJECT PLANNING, REVIEWS, AND APPROVAL

The siting of proposed actions is carefully considered and potential impacts evaluated early in the planning process. As part of ongoing efforts to avoid and/or minimize impacts on special status species, sensitive habitat, and cultural or other relevant resources, consideration will first be given to use of lower value management areas. (Map 5-1 provides an overview of the main biological constraints at Detachment Fallbrook.) This will assist planners in avoiding areas that support more sensitive resources, and in turn enable planners to reduce costs (in terms of funding, manpower and time) to plan, obtain regulatory approvals, and implement proposed actions.

Projects, or proposed actions, with potential to impact the natural or human environment require review and approval through the NEPA process. A notable exception includes CERCLA/RCRA projects evaluated and approved in a parallel review process through Installation Restoration and Munitions Response Programs.

Identification of potential conflicts between projects and natural resources early in the process allows for proper planning and support. The use of existing data from population monitoring and species richness surveys has been instrumental in facilitating project reviews. Procedures are set forth by NAVWPNSTA Seal Beach command Instruction 5090.5B –EARR and NEPA Documentation Process. Proposed Actions for operational and facilities changes are reviewed and evaluated by Facilities Planners and the Environmental Office to identify potential impacts to natural resources, compliance with applicable law, regulations and DOD policies, and conformance to this INRMP.

A project review typically starts with and utilizes the EARR process, and may require support with avoidance and minimization strategies, regulatory consultations and permitting, and in rare instances, compensatory mitigation. Individual projects are evaluated on a case by case basis with possible pursuit of regulatory consultation and public participation. The EARR process is performed in conjunction with other program and functional reviews (e.g., Explosives Safety, Safety, Facilities Site Approval, Security, Mission Operations).

Project review can be as simple as participation in early planning discussions or as involved as conducting formal consultations, obtaining regulatory permitting, and implementing compensatory mitigation. Classification of projects is driven by their potential impacts, and subsequent required level of review and approval, which fall into three NEPA levels:

- Categorical Exclusion (CATEX),
- Environmental Assessment (EA), and
- Environmental Impact Statement (EIS).

Regulatory approval requirements vary depending upon the project's environmental footprint, which could be "lightened", for example, by adjusting the project scope and/or design. Approval can fluctuate from 2 weeks, if no detailed analysis or regulatory consultation is needed allowing issuance of CATEX, up to even 3 years for significant impacts (despite mitigating measures) requiring a full Environmental Impact Statement. Not only could the time required for a review increase but also the costs.

The majority of projects on the Detachment avoid and minimize potential adverse effects to sensitive resources such that review and approval action may be covered under a CATEX. Where necessary, natural resources personnel work directly with project proponents to find ways to avoid and minimize impacts to natural resources so the project may be approved without additional time or cost delays.

Common avoidance and minimization measures:

- re-locate project to an area with no or limited natural resources
- adjust size/shape of the project to avoid sensitive natural resources
- avoid sensitive times (seasons) of the year (e.g., bird breeding season)
- daytime work only to avoid impacts from nighttime lighting
- install soil conservation Best Management Practices (BMPs)
- avoiding creating "pitfall" traps/holes within which wildlife can get captured
- delineate project perimeter, staging areas, and ingress/egress routes in the field to limit impact areas
- use a biomonitor to ensure project stays within approved limits
- implement mitigating measures to reduce long-term effects of facility operation and maintenance (e.g., reduce or eliminate nighttime lighting, or install berms or catchments for stormwater runoff)

As federally-owned property, Detachment Fallbrook has a legal obligation to consider, and therefore protect, state listed species during the NEPA process. The Navy endeavors to protect species at risk (SAR) and other sensitive species in accordance with the Sikes Act and the DOD implementing regulations (e.g., SECNAVINST 5090.8A and OPNAV M-5090.1). Protection of SAR and other sensitive species today helps prevent them from becoming federally listed as threatened or endangered (or worse, extinct) in the future.

During project reviews and approvals, the Navy takes into consideration current mission requirements, long-term planning, and future mission flexibility. Encroachment pressures on the mission present an increasing challenge as urbanization within the region surrounding the Detachment continues, and available lands for development diminish. Not only does the depletion of developable lands increase pressure for development on military lands, but the loss and degradation of habitat in the region affects the sustainability and resiliency of remaining resources.

The Detachment currently benefits from a level of connectivity with MCB Camp Pendleton's open space and habitat along the Santa Margarita River corridor; however, regional fragmentation and loss of habitat increasingly isolates military lands, making the resources more vulnerable to genetic bottlenecks and stochastic events.

5.5 NATURAL RESOURCES CONSULTATIONS AND PERMITTING

Much of the flora and fauna on Detachment Fallbrook is subject to some level of Federal and/or State regulation (e.g., ESA, Migratory Bird Treaty Act [MBTA], CWA). Occasionally, ESA section 7 consultations and/or other regulatory permitting (e.g., CWA §401 and §404) are required for project approval.

Project approvals and permitting requirements that are not part of the natural resources program may also be identified during the NEPA process, including, for example, National Historic Preservation Act (NHPA) and tribal consultations, which are detailed in the ICRMP (USDON 2012).

5.5.1 Endangered Species Act (ESA)

Activities that may affect federally listed species, or destroy or adversely modify critical habitat, are subject to section 7 ESA consultation with the USFWS and/or National Marine Fisheries Service (NMFS), and may require "incidental take" authorization. At the Detachment, ESA consultations are typically conducted with the USFWS, as NMFS generally manages marine species; although, the southern California steelhead is regulated by NMFS. Currently, no critical habitat is designated on the installation (see Section 3.10.10).

When a species is listed as threatened or endangered, it is protected from unauthorized "take" and being traded or sold. Section 3(18) of the federal ESA defines "take" to include "harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct." The law also protects against interfering in vital breeding and behavioral activities of threatened or endangered species. Under section 7 of ESA, issuance of a concurrence letter, or biological opinion (BO) and incidental take statement, is required by the USFWS or NMFS if a proposed federal action may affect a listed species.

There are two types of section 7 ESA consultations: informal and formal. An informal consultation is completed when a project "may affect, but is not likely to adversely affect" a federally listed species. An informal consultation requires written concurrence from the USFWS or NFMS with the Navy's determination of the "not likely to adversely affect" assessment. A flow chart illustrating the informal section 7 ESA consultation process is presented in Figure 5-1.

At the Detachment, the majority of ESA section 7 consultations are "informal" in that potential effects are able to be kept below a threshold of "take", typically due in part to implementation of avoidance and minimization measures. A list of ESA consultations conducted at the Detachment is found in Appendix F.

A formal consultation is necessary when a proposed action "may affect, and is likely to adversely affect" a federally listed species. For the Navy to legally proceed with the proposed action, the USFWS or NMFS must issue a BO and incidental take statement. ESA section 7 requires minimization of the level of take. "Conservation measures" are actions that are included as part of the proposed action that serve to minimize or compensate for project effects on the species. The USFWS or NMFS may also specify "reasonable and prudent measures" and their implementing "terms and conditions" to further minimize anticipated impacts of incidental take. A flow chart illustrating the formal section 7 ESA consultation process is presented in Figure 5-1.

Occasionally, the USFWS issues a programmatic BO to cover an ongoing action with documented implementation of any associated terms and conditions. Detachment Fallbrook has a programmatic BO (USFWS 2003a) for activities associated with the Wildland Fire Management Plan.

Both informal and formal ESA consultations require that the Navy prepare a biological assessment (BA) of the potential effects of the proposed action on federally listed species. Once a biological assessment has been accepted by USFWS as complete, the regulated length of time associated with an informal and a formal consultation is typically 30 and 135 days, respectively (see Figures 5-1 and 5-2). However, the length of time to produce a complete BA can vary greatly depending on several factors, including:

- available data (e.g., whether new surveys are required)
- complexity of project or proposed action
- development of appropriate avoidance, minimization, and conservation measures

All aspects of a project or proposed action (e.g., temporary and permanent, and direct and indirect effects) must be evaluated and quantified. Should the USFWS determine the BA is not complete, or request additional information, the consultation clock may re-start.

For additional detail on "Endangered Species Consultation Handbook: Procedures for Conducting Consultations and Conference Activities Under Section 7 of the Endangered Species Act" (USFWS & NMFS 1998).

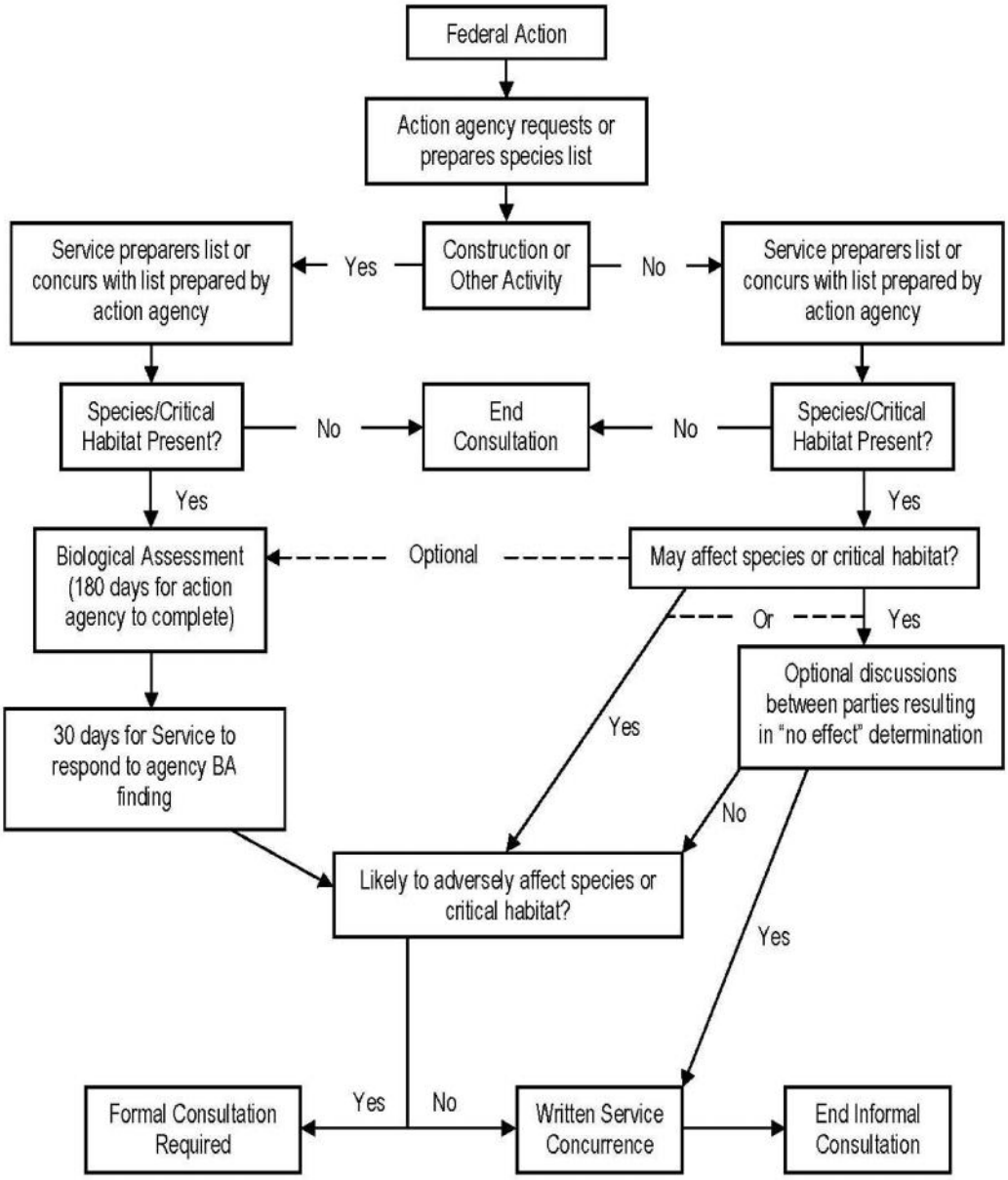

Figure 5-1. Informal Endangered Species Act consultation process, adapted from Final ESA Section 7 Consultation Handbook (USFWS & NMFS 1998).

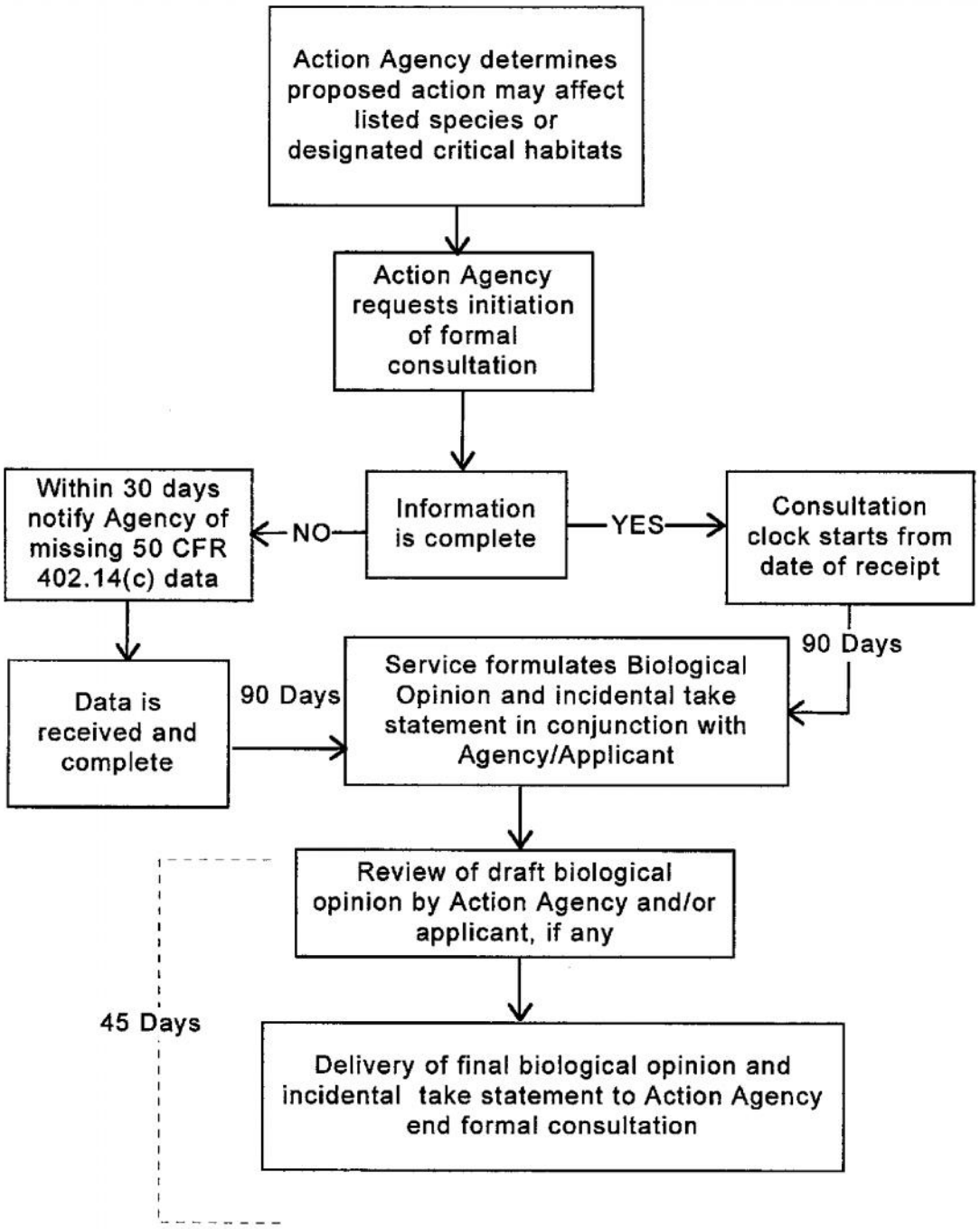

Figure 5-2. Formal Endangered Species Act consultation process, adapted from Final ESA Section 7 Consultation Handbook (USFWS & NMFS 1998).

5.5.2 Migratory Birds and Eagles

The Migratory Bird Treaty Act of 1918 (16 USC 703-712) implements four bilateral treaties, or conventions, between the US and Canada, Japan, Mexico and the former Soviet Union for the protection of migratory birds. The MBTA makes it illegal for anyone to take, possess, import, export, transport, sell, purchase, barter, or offer for sale, purchase, or barter, any migratory bird, or the parts, nests, or eggs of such a bird except under the terms of a valid permit issued pursuant to federal regulations (e.g., salvage permit, depredation permit, etc. issued by the USFWS). The Bald and Golden Eagle Protection Act of 1940, as amended (16 USC 668 et. seq.), provides for the

protection of the bald eagle and the golden eagle by prohibiting, except under certain specified conditions, the taking, possession, and commerce of such birds.

In Fiscal Year 2003, the National Defense Authorization Act (NDAA; Public Law 107-314) exempted DOD from the MBTA for the incidental take of migratory birds that result from authorized military readiness activities. As directed by the language in the NDAA, the USFWS, in cooperation with DOD, developed the Migratory Bird Rule (*Take of Migratory Birds by the Armed Forces*; 50 CFR Part 21) to carry out congressional intentions.

Although the Migratory Bird Rule provides for incidental take of migratory birds that result from authorized military readiness activities, the Rule is not a blanket exemption and it does not automatically exempt military readiness activities from incidental take. More importantly, few if any activities that occur on Detachment Fallbrook would qualify for exemptions under the Migratory Bird Rule. As defined in NDAA, a "military readiness activity" includes: (1) all training and operations of the Armed Forces that relate to combat and (2) the adequate and realistic testing of military equipment, vehicles, weapons, and sensors, for proper operation and suitability for combat use. The term does not include: (1) routine operation of installation operating support functions (e.g., administrative offices, water treatment facilities, storage facilities), (2) the operation of industrial activities, or (3) the construction or demolition of facilities used for the purpose of military readiness activities.

To remain compliant with all laws and regulations as they relate to birds (e.g., MBTA, ESA, Bald and Golden Eagle Protection Act, EO 13186), the DOD must assess the potential adverse effect for both military readiness and non-readiness activities on migratory birds, in accordance with, and through the NEPA process (see Section 5.4).

5.5.3 CWA and Jurisdictional Wetlands

Actions under jurisdiction of Section 404 or 401 in the CWA necessitate permitting from U.S. Army Corps of Engineers (USACOE), which has jurisdiction in fresh waters including the channel itself for waters (defined by the Ordinary High Water Mark) to the outer edge of adjacent wetlands. Some water bodies are specifically exempted from regulation, such as irrigation ditches or drainage ditches excavated in uplands. All waters of the U.S. require permits for ground disturbing activities and possible mitigation. Questions about site-specific impacts must be addressed to the USACOE. On the Detachment, jurisdictional waters include but may not be limited to the Santa Margarita River, Fallbrook Creek, and tributaries to those waters.

5.5.4 Compensatory Mitigation

Mitigation refers to measures taken to offset potential adverse effects to listed species and/or other sensitive resources from a proposed action. Ideally, mitigation in the form of avoidance and minimization provides sufficient environmental protection to preclude the need for compensation. In rare instances at the Detachment, projects may necessitate some form of compensatory mitigation for unavoidable impacts.

According to OPNAV M-5090.1, compensatory mitigation measures must have, at the very least, some reasonable expectation of success based on prior practice or best available commercial or scientific information. For more information about laws, regulations, and Navy guidance regarding compensatory mitigation, see OPNAV M-5090.1. Implementation of compensatory mitigation measures that may restrict future land use flexibility must first be coordinated with the installation Commanding Officer. For this reason, off-site mitigation should be considered whenever possible so on-site mitigation does not foreclose options for future mission requirements. In either case, the area selected for mitigation should be within the same watershed as the affected wetland or aquatic site.

5.6 FUNDING INRMP IMPLEMENTATION

The Navy intends to implement recommendations in this INRMP within the framework of regulatory compliance, national Navy mission obligations, anti-terrorism and force protection limitations, and funding constraints. Any requirement for the obligation of funds for projects in this INRMP shall be subject to the availability of funds appropriated by Congress, and none of the proposed projects shall be interpreted to require obligation or payment of funds in violation of any applicable federal law, including the Anti-Deficiency Act, 31 USC § 1341, et seq.

For the purposes of this INRMP, the terms stewardship and compliance have specific meanings as criteria for implementing project lists. Project rankings are assigned based on whether an activity is mandatory to comply with a legal requirement such as under the ESA, CWA, or MBTA. Alternatively, a project may be considered good land stewardship but is not considered an obligation for NAVWPNSTA Seal Beach to be found in compliance with environmental laws. Projects considered necessary to comply with the law are generally funded within budget constraints, whereas stewardship projects are ranked lower for funding consideration when projects are competed among multiple installations. Current policy is, however, that they will eventually be funded.

Projects in support of this INRMP are defined and prioritized in Appendix N. The budgeting plan for the INRMP is based on programming and budgeting priorities for conservation programs described in OPNAV M-5090.1

5.6.1 Environmental Readiness Program Assessment Database

Environmental Portal and Environmental Program Requirements (EPR) Web is an optimized online database used to define all programming for the Navy's environmental requirements. EPR-Web records data on project expenditures and provides immediate, web-based access to requirements entered by the multiple Navy environmental programs, including environmental compliance, pollution prevention, conservation, radiological controls, and range sustainment as related to environmental costs on military ranges. It is the Navy's policy to fully fund compliance with all applicable federal, state and local laws, Executive Orders (EO), and associated implementing rules, regulations, DOD Instructions (DODINST) and DOD Directives (DODD), and applicable international and overseas requirements (OPNAV M-5090.1). All natural resources requirements are entered into the EPR-Web and are available for review/approval by the chain of command by the dates specified in the Guidance letter that is provided annually by CNO (N45). This database is the source document for determining all programming and budgeting requirements of the Environmental Quality Program. EPR-Web is also the tool for providing the four Environmental Readiness Level (ERL) capabilities used in producing programming and budgeting requirements for the various processes within the budget planning system.

5.6.2 Navy Assessment Levels for Budget Prioritization

The Navy budget programming hierarchy for this INRMP is based on both DOD and Navy funding level classifications. The four programming and budgeting priority levels detailed in DODINST 4715.03 (2011) Natural Resources Conservation Program, implement policy, assign responsibilities, and prescribe procedures for the integrated management of natural and cultural resources on property under DOD control. Budget priorities are also described in OPNAV M-5090.1.

Navy Assessment Levels for Assigning Budget Priorities

Four Navy ERLs have been established to enable capability-based programming and budgeting of environmental funding and to facilitate capability versus cost trade-off decisions. ERL 4 is

considered the absolute minimum level of environmental readiness capability required to maintain compliance with applicable legal requirements. Navy policy requires funding of all "must fund" projects, which the Navy INRMP guidance identifies as ERL 3 and ERL 4 projects. The Navy funding programming hierarchy of recurring and non-recurring projects consists of four ERLs. The definitions of ERL 1 through ERL 4 follow:

1. **Environmental Readiness Level 4 ("must fund")**
   - Supports all actions specifically required by law, regulation, or EO.
   - Supports all DOD Class 0 requirements as they relate to a specific statute, such as hazardous waste disposal, permits, fees, monitoring, sampling and analysis, reporting, and record keeping.
   - Supports recurring administrative, personnel, and other costs associated with managing environmental programs that are necessary to meet applicable compliance requirements.
   - Supports minimum feasible Navy executive agent responsibilities, participation in Office of the Secretary of Defense (OSD) sponsored inter-department and interagency efforts, and OSD mandated regional coordination efforts.
2. **Environmental Readiness Level 3 ("must fund")**
   - Supports all capabilities provided by ERL 4.
   - Supports existing level of Navy executive agent responsibilities, participation in OSD sponsored inter-department and interagency efforts, and OSD mandated regional coordination efforts.
   - Supports proactive involvement in the legislative and regulatory process to identity and mitigate requirements that will impose excessive costs or restrictions on operations and training.
   - Supports proactive initiatives critical to the protection of Navy operational readiness.
3. **Environmental Readiness Level 2**
   - Supports all capabilities provided under ERL 3.
   - Supports enhanced proactive initiatives critical to the protection of Navy operational readiness.
   - Supports all Navy and DOD policy requirements.
   - Supports investments in pollution reduction, compliance enhancement, energy conservation, and cost reduction.
4. **Environmental Readiness Level 1**
   - Supports all capabilities provided under ERL 2.
   - Supports proactive actions required to ensure compliance with pending/strong anticipated laws and regulations in a timely manner and/or to prevent adverse impact to Navy mission.
   - Supports investments that demonstrate Navy environmental leadership and proactive environmental stewardship.

Budget priorities for threatened and endangered species management, especially compliance with a BO, receive the highest possible budgeting priority, and supports the Detachment Fallbrook's need to avoid Critical Habitat designations under Section 4(b)(2) of the ESA, or Section 4(a)3 of the ESA (exemption from Critical Habitat designations for national security reasons).

5.6.3 DOD Funding Classifications

Funds will be requested for tasks within this INRMP. The guidance on DOD funding classifications has been updated and Enclosure 4 of DODINST 4715.03 defines the four classes of conservation programs. The projects recommended in this INRMP have also been prioritized based on compliance and stewardship criteria provided in the hierarchy below. The first three listed below are considered "must fund" under Navy funding criteria as they are needed to maintain compliance with applicable laws and regulations.

Recurring Natural Resources Conservation Management Requirements

These activities are needed to cover the administrative, personnel, and other costs associated with managing the DOD Natural Resources Conservation Program that are necessary to meet applicable compliance requirements in Federal and State laws, regulations, EOs, and DOD policies, or in direct support of the military mission. DOD Components ("DOD Components" collectively refers to multiple departments, offices, and organizational entities within DOD chains of command, as appropriate) shall give priority to recurring natural resources conservation management requirements associated with the operation of facilities, installations, and deployed weapons systems. These activities include day-to-day costs of sustaining an effective natural resources management program, as well as annual requirements, including manpower, training, supplies, permits, fees, testing and monitoring, sampling and analysis, reporting and record keeping, maintenance of natural resources conservation equipment, and compliance self-assessments.

Non-Recurring Current Compliance

These projects and activities are needed to support an installation currently out of compliance, signed compliance agreements or consent order, meeting requirements with applicable federal or state laws, regulations, standards, EOs, or policies, immediate and essential maintenance of operational integrity or military mission sustainment, and projects or activities that will be out of compliance if not implemented in the current program year.

Non-recurring Maintenance Requirements

These projects and activities are needed to meet an established deadline beyond the current program year and maintain compliance. Examples include, compliance with future deadlines, conservation, GIS mapping, and data management to comply with federal, state, and local regulations, EOs, and DOD policy, efforts undertaken in accordance with non-deadline specific compliance requirements of leadership initiatives, wetlands enhancement to minimize wetlands loss and enhance existing degraded wetlands, and conservation recommendations in BOs.

Non-Recurring Enhancement Actions beyond Compliance

These projects and activities enhance conservation resources or the integrity of the installation mission or are needed to address overall environmental goals and objectives, but are not specifically required by law, regulation, or EO, and are not of an immediate nature. Examples include community outreach activities, educational and public awareness projects, restoration or enhancement of natural resources when no specific compliance requirement dictates a course or liming of action, and management and execution of volunteer and partnership programs.

5.6.4 Staffing

The Sikes Act (as amended) specifically requires that there be "sufficient numbers of professionally trained natural resources management and natural resources enforcement personnel to be available and assigned responsibility" to implement an INRMP.

NAVWPNSTA Seal Beach, Detachment Fallbrook is responsible for identifying personnel requirements to accomplish INRMP goals and objectives. The Commanding Officer, via his Environmental staff and Conservation Manager, is responsible for providing input into budgeting and staffing processes Commander, Navy Region Southwest (CNRSW) and higher authority endorse these requests and allocate budgetary and personnel resources. Personnel assigned to natural resources management, such as the installation Environmental Director and the installation Conservation Manager, are the core staff responsible for overseeing implementation of the INRMP. These personnel ensure that a consistent conservation program is carried out by using strategies outlined in this plan to support the Navy mission and achieve INRMP goals and objectives.

5.6.5 Federal Anti-Deficiency Act

NAVWPNSTA Seal Beach intends to implement recommendations in this INRMP within the framework of regulatory compliance, national Navy mission obligations, anti-terrorism and force protection limitations, and funding constraints. All actions contemplated in this INRMP are subject to the availability of funds properly authorized and appropriated under federal law. Nothing in this INRMP is intended to be nor must be construed to be a violation of the Anti-Deficiency Act (31 USC 1341, *et seq*.). Budgeting protocols based on DOD and DON guidance, such as must fund projects and ERL, are discussed throughout Section 5.6.1.

5.6.6 Funding Sources

To implement the various research, surveys, and programs necessary to fulfill program elements of the INRMP, funding must be identified and acquired. Funding sources for the natural resources program are derived from General and Administrative, Operations and Maintenance Navy (O&MN), and input into the Navy Environmental Program Requirements (EPR) system for funding. This primary budgetary source is the basis for maintaining the personnel and core programs inherent to the natural resources program. These appropriated funds are the primary source of resources to support must-fund, just-in-time environmental compliance (i.e. Navy Level ERL 4 projects). It is the responsibility of Environmental Programs and Services Office (EPSO) to manage the natural resources program budget and funding. Once O&MN funds are appropriated for core personnel and the program, funding can be justified for other project requirements.

There are other avenues of funding available beyond the O&MN budget that allows the inclusion of additional projects to assist the Environmental Office in their mission-related and stewardship endeavors. These alternative funding sources include, but are not limited to the DOD Legacy Resource Management Program and forestry revenues and agricultural outleasing funds.

5.7 IMPLEMENTATION PROCESS

This INRMP will become effective upon the acceptance and signatory release described in Section 5.1. Current projects, activities, and plans have been incorporated into the INRMP, as the plan serves as a formal structuring and integration of the existing natural resources management program.

Future work identified herein will be implemented as funding becomes available. Priorities will be based, in part, on annual requirements, environmental conditions, and mission support needs. The Environmental Office will determine what projects and activities are appropriate to initiate, given funding, at any particular time. The INRMP is meant to be flexible, dynamic, and adaptable to the immediate concerns and needs of natural resources management and the Navy mission.

5.7.1 Programmatic Management and Facilities Integration

Natural resources management and implementation of INRMP policies entail an on-going effort to integrate requirements and objectives into existing facilities and operational processes and procedures. The following on-going facilities management activities are regularly reviewed to ensure conformance to the INRMP policies and implementation objectives.

- Landscape management and grounds maintenance.
- Vegetation clearing to support fire, explosives safety and security clear zones.
- Road and road side maintenance, both paved and dirt roads.
- Fire management actions, including both pre-suppression and suppression.
- Facilities routine maintenance and repair.
- Utilities routine maintenance and repair.
- Normal and on-going mission operations.

Existing management processes and written procedures, or "operational controls," are leveraged to the maximum extent in order to effectively implement the INRMP policies and objectives (Appendix E). The following Public Works and mission business processes and operational controls are reviewed to ensure that natural resources programmatic requirements are fully integrated.

- Installation Command policies and procedures in the form of written "instructions."
- Facilities Service Contracts (i.e., grounds maintenance, pest management)
- Facilities Repair and Construction Contract standard specifications
- PW recurring maintenance work orders using the MAXIMO system
- Standard Operating Procedures for ordnance and security operations

5.7.2 Natural Resources Project Support

Many projects may be carried out with Navy staff, however, limitations to staff time at the installation usually necessitate utilizing contracted services or other federal agency services. Typically, targeted surveys are contracted as this also enables retention of needed expertise. Opportunities for external assistance with natural resource programs at Detachment Fallbrook are identified below.

Contractors

In accordance with Circular No. A-76, the federal government is mandated to use commercial sources to supply the products and services the Government needs. Contractors are able to provide a wide variety of specialties to aid Detachment Fallbrook with implementation of this INRMP. Specialties range from NEPA documentation, vegetation surveys, wildlife surveys, vegetation surveys, water quality surveys, invasive species control, production of management plans, and similar activities. Contractor supported projects require preparation of a request for proposal to acquire services, which should be considered during project planning, to ensure appropriate funding can be obtained.

USFWS and Other Agencies

Detachment Fallbrook recognizes the importance of cooperating with federal and state agencies in addition to private organizations. These organizations, in particular the INRMP signatory partners,

will continue to assist with implementation of various aspects of this INRMP. Moreover, when contracting for services to implement the provisions of an INRMP, it is DOD policy to give priority to federal and state agencies having the responsibility for the conservation and management of fish and wildlife (DODINST 4715.03, USDOD 2014c).

University Assistance

Universities are an excellent source of assistance for research and provide resource specific expertise, as well as assistance with implementation of restoration activities. Collaborative investigations performed in conjunction with the Detachment biologist provide the most likely and cost effective sources of assistance with implementation of this INRMP.

Use of Cooperative Agreements and Partnerships

Cooperative agreements are legal relationships between the Navy and states, local governments, institutions of higher education, hospitals, non-profit organizations or individuals. The principal purpose of the relationship is to transfer a thing of value to the state, local government, or other recipient to carry out a public purpose of support or stimulation authorized by a law of the U.S. instead of acquiring (by purchase, lease, or barter) property or services for the direct benefit or use of the U.S. Government. Cooperative agreements may be entered into for inventories, monitoring, research, minor construction and maintenance, and public awareness, to provide for the maintenance and improvement of natural resources or conservation research on DOD installations (DODINST 4715.03). To use a cooperative agreement, substantial involvement is expected between the Navy and the state, local government, or other recipient when carrying out the activity contemplated in the agreement. Cooperative agreements provide a mutually beneficial means of acquiring, analyzing, and interpreting natural resources data, which can then be used to inform natural resources management decisions. Cooperative agreements are funded by the Navy and produce information that can be used to help resource managers achieve project-specific compliance with environmental laws. Authorization for cooperative agreements is arranged through NAVFAC.

Detachment Fallbrook recognizes the importance of cooperating with federal and state agencies, in addition to private organizations. Current cooperative agreements and memorandum of understandings are listed below.

Cooperative Ecosystem Studies Units

The Cooperative Ecosystem Studies Units (CESU) program is a working collaboration among federal agencies, universities, state agencies, non-governmental organizations, and other nonfederal institutional partners. The CESU National Network provides multidisciplinary research, technical assistance, and education to resource and environmental managers. Although the overall program is overseen by U.S. Department of Interior (DOI), one of the participating agencies is DOD.

5.7.3 Partnerships

Partnering, which can range from building relationships and maintaining communication on areas of shared interest to close collaboration on specific projects, is essential to the success of natural resources management and the implementation of this INRMP. INRMP implementation often requires a cooperative planning effort among the parties directly responsible for operating and maintaining the Detachment. The natural resources management also benefits from partnerships with external stakeholders. Cooperative planning groups often include representatives from federal, state, and local agencies, citizen groups, developers, and universities.

5.7.3.1 INTERNAL ORGANIZATIONAL PARTNERSHIPS

Implementation of projects or initiatives within the INRMP has been facilitated on numerous occasions through a collaborative relationship between EPSO and Facilities, as well as with other individuals and departments on the installation. Examples include but are not limited to Facilities assistance on the following projects: provision of labor and equipment during Earth Day and National Public Lands day trash clean up and habitat enhancement events, installation of raptor protection devices on high risk power poles, installation of bat boxes on magazines, helping with utility hookup and installation of livestock water troughs, cost-sharing for the Fallbrook Creek culvert and streambank erosion repair project, and cost-sharing for the replacement of several miles of post-fire livestock fencing.

Photo 52. Environmental and Facilities partner on many natural resources related projects: (A & B) Facilities personnel, Jaime Campbell and Cruz Martinez, help remove shopping carts and other large debris from Fallbrook Creek during an Earth Day event (photos by C.M. Wolf); (C) Kevin Bourelle installs bat boxes on the side of a magazine (photo by R.S. Lockwood); (D & E) Facilities helped fund several hundred thousand dollars worth of livestock fencing following Tomahawk Fire (photos by MC1 Eli J. Medellin); (F) Christy Wolf and Don Moon oversee fence repairs and flag new gate locations (photo by MC1 Eli J. Medellin).

5.7.3.2 MCB CAMP PENDLETON PARTNERING

MCB Camp Pendleton surrounds the Detachment on three sides and shares many of the same federally listed species, sensitive resources, and overall management objectives. EPSO personnel have engaged in cross-boundary partnerships on numerous occasions with personnel from

organizations on MCB Camp Penleton, including Environmental Security, Fire Department, Facilities, and Office of Water Resources.

The Camp Pendleton Fire Department not only provides a range of emergency response services to Detachment Fallbrook, but they, in addition to the Wildland Fire Coordinator within Environmental Security, support Detachment Fallbrook natural resources personnel with fire management planning and fire safety training. Following the Basilone Complex fires, which included the Tomahawk Fire, both installations collectively hosted the U.S. Forest Service's Burn Area Emergency Response team to facilitate post-fire assessments (USFS 2014).

Natural resources partnering has ranged from basic data sharing and communication on projects of mutual interest to cost sharing and collaborataive contracting. In recent years, partnering has included the aquatic exotics control in the Santa Margarita River, early detection trapping for invasive bark beetles that are threatening trees in the region (Photo 53), coordinated efforts for Stephens' kangaroo rat conservation, invasive plant control along our shared boundaries, lead toxicity testing in turkey vultures, climate change adaptation planning, and post-fire coastal sage scrub research.

Photo 53. Early detection trapping for the invasive and destructive Shot Hole Borer beetles exemplifies Detachment Fallbrook and MCB Camp Pendleton partnering endeavors. (Photo by D.M. Lawson)

5.7.3.3 FISH AND WILDLIFE INTER-AGENCY COORDINATION

USFWS and CDFW are cooperating and signatory federal and state agencies, respectively, for implementation of this Plan in accordance with the Sikes Act. Cooperative efforts with USFWS involve identifying potential federally listed threatened and endangered species on the Detachment, and ESA consultations prior to implementation of any action included in this INRMP that may affect listed threatened or endangered species. CDFW is responsible for managing fish and wildlife in California. The Environmental Office works with both agencies to manage fish and wildlife on the installation. Cooperative management of the Detachment's natural resources is required under

the Sikes Act. The Sikes Act provides a mechanism whereby DOD, DOI, and host states cooperate to plan, maintain, and manage fish and wildlife on military installations.

5.7.3.4 OTHER AGENCIES AND ORGANIZATIONS

Detachment Fallbrook has partnered with multiple other agencies and organizations for the successful implementation of INRMP objectives and projects. Many of these collaborations involve cross-boundary partnering, which is a hallmark of ecosystem management, and has been highlighted above in Section 5.7.3.2, MCB Camp Pendleton Partnering, and 4.2, Ecosystem Management. Cross-boundary partnering has involved Fallbrook Public Utilities, Color Spot Nursery, and private land owners, often with the logistical support of third party organizations such as Mission Resources Conservation District and the County of San Diego Department of Agriculture, Weights, and Measures.

Sponsored access has also been granted on occasion for research that is of mutual interest and compatible with natural resources management objectives (see Sections 4.2.8, 5.7, Photo 54). For specific examples of partnerships with other agencies and organizations, see Section 4.2.8.

Photo 54. Lisa Allen with USGS mist netting California gnatcatchers to collect DNA samples for regional genetics study. (Photo by MC1 Eli J. Medellin)

5.7.4 Public Access and Outreach

Safety and security regulations at Detachment Fallbrook severely restrict public access and the recreational use of natural resources (see Sections 2.4.6, 4.17). Implementation of the Sikes' Act directive to provide public access, outreach, and the sustainable multipurpose use of natural resources is achieved at the Detachment via sponsored access and an agricultural outlease.

Sponsored and escorted access is also periodically provided for educational events (e.g., Earth Day, National Public Lands Day). Public access and multipurpose use of natural resources are also provided via an agricultural lease agreement for livestock grazing (see Section 4.4). Other outreach opportunities have included educational fliers, training briefs, and newsletter contributions to help

gain recognition and raise awareness of the importance of environmental stewardship at Detachment Fallbrook and on public lands and in general.

5.8 REVIEW AND UPDATES

INRMP reviews and updates, and revisions if necessary, are anticipated to follow the most current guidance. In 2013, a Memorandum of Understanding (MOU) was signed by the DOD, USFWS, and Association of Fish and Wildlife Agencies to further a cooperative relationship between the agencies in preparing, reviewing, revising, updating, and implementing INRMPs (USDOD et al. 2013). In June of 2015, the USFWS also produced Guidelines for Coordination of Integrated Natural Resources Management Plans (USFWS 2015), which provides updated guidance to USFWS personnel for reviewing INRMPs and implementing the Sikes Act as described in the 2013 tripartite MOU. Soon after, in a July 2015 memorandum from the Office of the Assistant Secretary of the Defense, the military provided "Guidelines for Streamlined INRMP Review" (USDOD 2015a).See below for greater detail on the annual Navy Natural Resources Conservation Metrics (aka INRMP metrics) and document reviews, revisions, and updates.

5.8.1 Annual Metrics Review

DOD policy requires installations to review INRMPs annually in cooperation with the applicable federal and state fish and wildlife agencies. Annual reviews facilitate "adaptive management" by providing an opportunity for the parties to review the goals and objectives of the plan, as well as establish a realistic schedule for undertaking proposed actions. The Navy Natural Resources Conservation Metrics, available on the Navy Conservation Website, provide a guide for evaluating the implementation and efficacy of the INRMP implementation and addressing the annual INRMP review. This information directly supports the annual Environmental Management Review (EMR) and Defense Environmental Programs Annual Report to Congress (DEP ARC) (USDOD 2015b).

The INRMP metrics can be used to gather and report essential information required by Congress, EOs, existing U.S. laws, and the DOD. There are seven focus areas that comprise the metrics to be evaluated during the annual review of the Natural Resources Program/INRMP.

(1) *Ecosystem Integrity***.** – Evaluate the current status, management effectiveness, and trends of the ecosystems at the installation to support and maintain a community of organisms that have a species composition, diversity, and functional organization comparable to those in the respective region. This Focus Area is intended to define the ecosystems that occur on the installation and assess the integrity of those ecosystems. Terrestrial ecosystems are defined by Nature Serve's "Ecological Systems of the United States: A Working Classification of U.S. Terrestrial Systems" (Comer et al. 2003).

(2) *Listed Species and Critical Habitat***.** – Evaluate the extent to which federally listed species have been identified and the INRMP provides conservation benefits to these species and their habitats.

(3) *Recreational Use and Access***.** – Evaluate the availability and adequacy of public recreational use opportunities, such as fishing and hunting, and access for handicapped and disabled persons, given security and safety requirements for the installation.

(4) *Sikes Act Cooperation (Partnership Effectiveness)***.** – Determine to what degree USFWS, state fish and wildlife agency, and when appropriate, National Oceanic and Atmospheric Administration (NOAA) – National Marine Fisheries Service (NMFS), partnerships are cooperative and result in effective INRMP development and review for operation and effect.

(5) *Team Adequacy*. – Asses the adequacy of the natural resources team (the natural resource management professional and installation support staff) in accomplishing INRMP goals and objectives at each installation.

(6) *INRMP Implementation*. – Evaluate the execution of actions taken to meet goals and objectives outlined in the INRMP.

(7) *INRMP (Natural Resource Program) Support of the Installation Mission*. – Evaluate the level to which existing natural resources requirements support the installation's ability to sustain the current operational mission, ensuring no net loss of mission capability.

As required by DOD and Navy policy, Detachment Fallbrook completes an annual evaluation to determine the effectiveness of this INRMP. This annual review process also generates Navy conservation program metrics to measure effects of the natural resources conservation program on the installation mission as well as the status of the Detachment's relationship and level of coordination with the wildlife agencies. The annual evaluation must be completed in cooperation with the appropriate field-level offices of the federal and state wildlife agencies. The cooperating partners will work together to measure both the successes and issues resulting from INRMP implementation for continuous improvement of the program.

5.8.2 INRMP Reviews, Revisions, and Updates

The INRMP is required to be reviewed "as to operation and effect" by the primary parties on a regular basis, but not less often than every five years. Section 101(b)(2) of the Sikes Act (16 USC 670a(b)(2) as amended) emphasizes that the review is intended to determine whether existing INRMPs are being implemented to meet the requirements of the Sikes Act (as amended) and contribute to the conservation and rehabilitation of natural resources on military installations. Guidance for the INRMP reviews, revisions, and updates is provided by DODM 4715.03 and OPNAV M-5090.1 and summarized here.

A five-year review is final once the relevant installation(s), the USFWS, and appropriate State fish and wildlife management agencies have signed the document or provided signed record of coordination. The DOD Components are to:

(5) Ensure the USFWS and appropriate State fish and wildlife agencies review each INRMP on a regular basis, but not less often than every five years. NOAA Fisheries is included in the five-year review if it participated in the INRMP development, if listed species are included in its jurisdiction or the near-shore environment is involved, or if the INRMP will benefit from its participation and review.

(6) Conduct a review for operation and effect to determine whether the installation is implementing the existing INRMP to:

(c) Meet Sikes Act requirements.

(d) Contribute to the conservation and rehabilitation of natural resources on military installations.

(e) Update or revise INRMPs as necessary based on the results of these reviews.

(7) Update or revise INRMPs as necessary based on the results of these reviews.

During the DOD annual review of the INRMP, the DOD Components review the INRMP goals and objectives, establish a realistic schedule for undertaking proposed actions, determine

adjustments needed to keep INRMPs current, and generate annual assessments of the Natural Resources Conservation Metrics (see Section 5.8.1).

The DOD Components may use the documented annual reviews when developing the reports required by section 670a(f) of the Sikes Act, as well as expedite or, in appropriate cases, substitute for the more formal five-year reviews, provided these reviews comprehensively address all items that have changed significantly since the last review, and the DOD Component documents the parties' mutual agreement.

During the review process, the DOD Components, USFWS, and appropriate State fish and wildlife agencies should determine whether an existing INRMP needs formal "revision" or whether only an "update" is required. Circumstances that may suggest that a revision is necessary include:

(1) The current INRMP no longer provides adequately for the conservation and rehabilitation of the natural resources on the base;

(2) The installation mission or physical features have changed significantly; or

(3) There are substantial natural resources effects anticipated from base realignment and closure, such as: a new species listing, new construction, new training, changes to training type or tempo, or other factors that were not addressed in the existing INRMP.

In most circumstances an INRMP may only require an update to accommodate changes to the information contained in the INRMP. These are circumstances in which no substantial changes in the way natural resources are managed occur. The DOD will provide a means to easily identify all such updates when forwarding the INRMP to the other parties for review (e.g., by providing a summary iterating all changes or by providing the updated INRMP in a track changes format).

Although not expressly required by the Sikes Act, installations should offer members of the public an opportunity to comment on an INRMP revision, as appropriate. In addition, if the proposed revisions reflect changes in the natural resources management actions described in the existing INRMP, NEPA review must, in most cases, be performed before the new INRMP may be adopted. Installations should afford the appropriate USFWS and State fish and wildlife management offices the opportunity to review all public comments received on any revised INRMP.

There is no legal obligation to invite the public either to review or to comment upon the parties' mutually agreed upon decision to continue to implement an existing INRMP without revision. If the parties determine that substantial revisions to an INRMP are necessary, public comment shall be invited in conjunction with any required NEPA analysis per DODM 4715.03.

In most cases INRMPs will incorporate by reference the results of an installation's previous ESA consultations, as appropriate, including any reasonable and prudent measures identified in an incidental take statement. Neither a separate biological assessment nor a separate formal consultation should be necessary. Nonetheless, if an action proposed in an INRMP may affect a federally listed species, section 7 consultation under ESA shall be completed, and the USFWS should assist the installation in incorporating conservation measures into development of the INMRP (USFWS 2015).

5.9 INRMP IMPLEMENTATION SUMMARY AND SCHEDULE

The objectives, strategies, and projects that support INRMP implementation are detailed in Chapter 4 with the implementation schedule provided in Appendix N for long-term planning purposes. The projects and schedule, provided in Appendix N, are to be reviewed annually and

may be modified based on need, available funding, resources, seasonal requirements, and the results of the annual metrics evaluation.

This INRMP will become effective upon the acceptance and signatory release described in Section 5.1. Current projects, activities, and plans have been incorporated into the INRMP, as the plan serves as a formal structuring and integration of the existing natural resources management program.

Future work identified herein will be implemented as funding becomes available. Priorities identified in this INRMP will generally determine the order of implementation. The EPSO will determine what projects and activities are appropriate to initiate, given funding, at any particular time. The INRMP is meant to be flexible, dynamic, and adaptable to the immediate concerns and needs of natural resources management and the Navy mission.

The installation Environmental Office is responsible for oversight and monitoring of the overall program identified within this INRMP. Cooperative projects among different Navy organizations will be monitored by the originating or controlling office as specified prior to project implementation.

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MAPS

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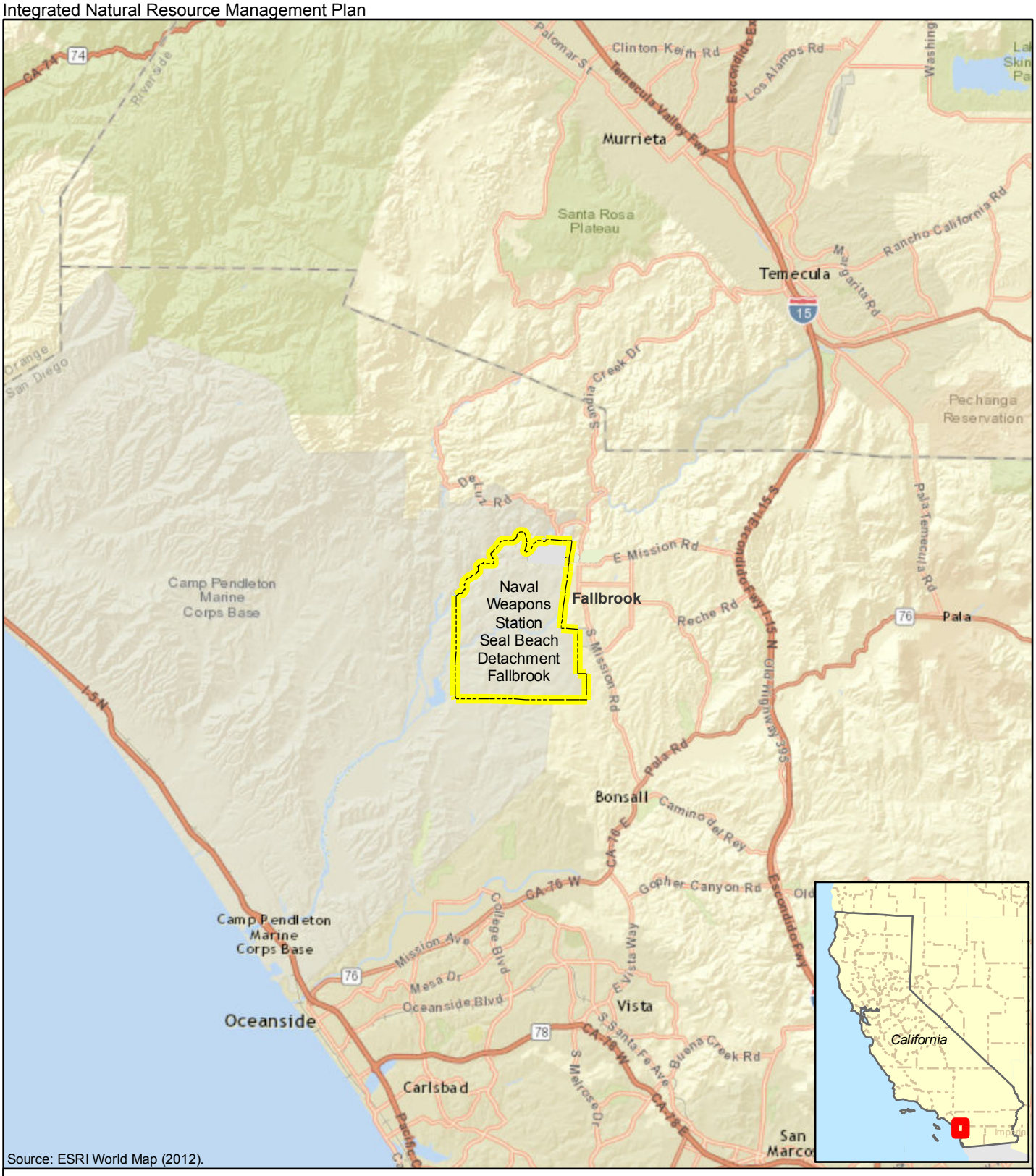

Legend

Detachment Boundary

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Miles

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Map 2-1
Detachment Fallbrook Location
Naval Weapons Station Seal Beach Detachment Fallbrook

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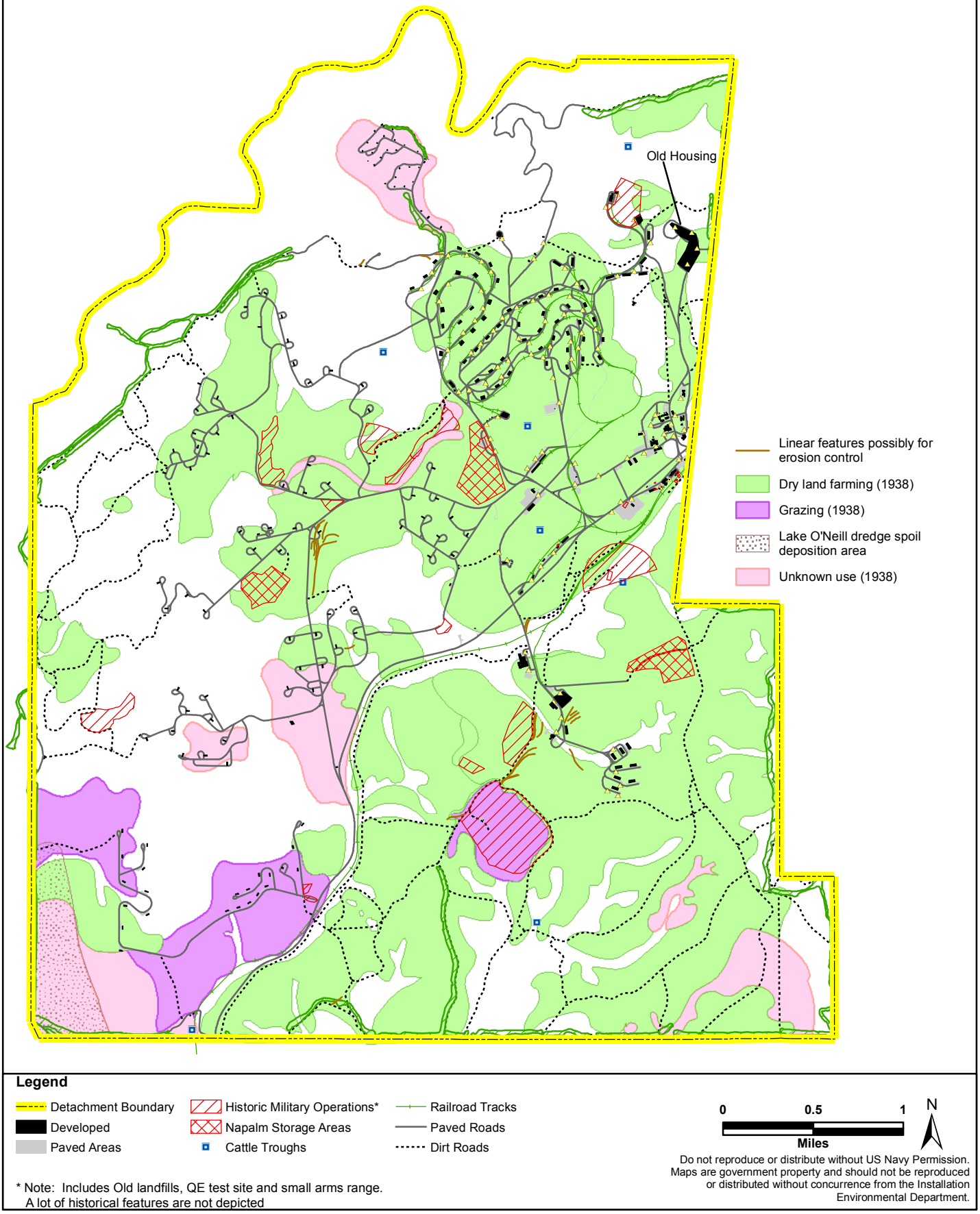

Map 2-2
Historic Land Use Designations
Naval Weapons Stations Seal Beach Detachment Fallbrook

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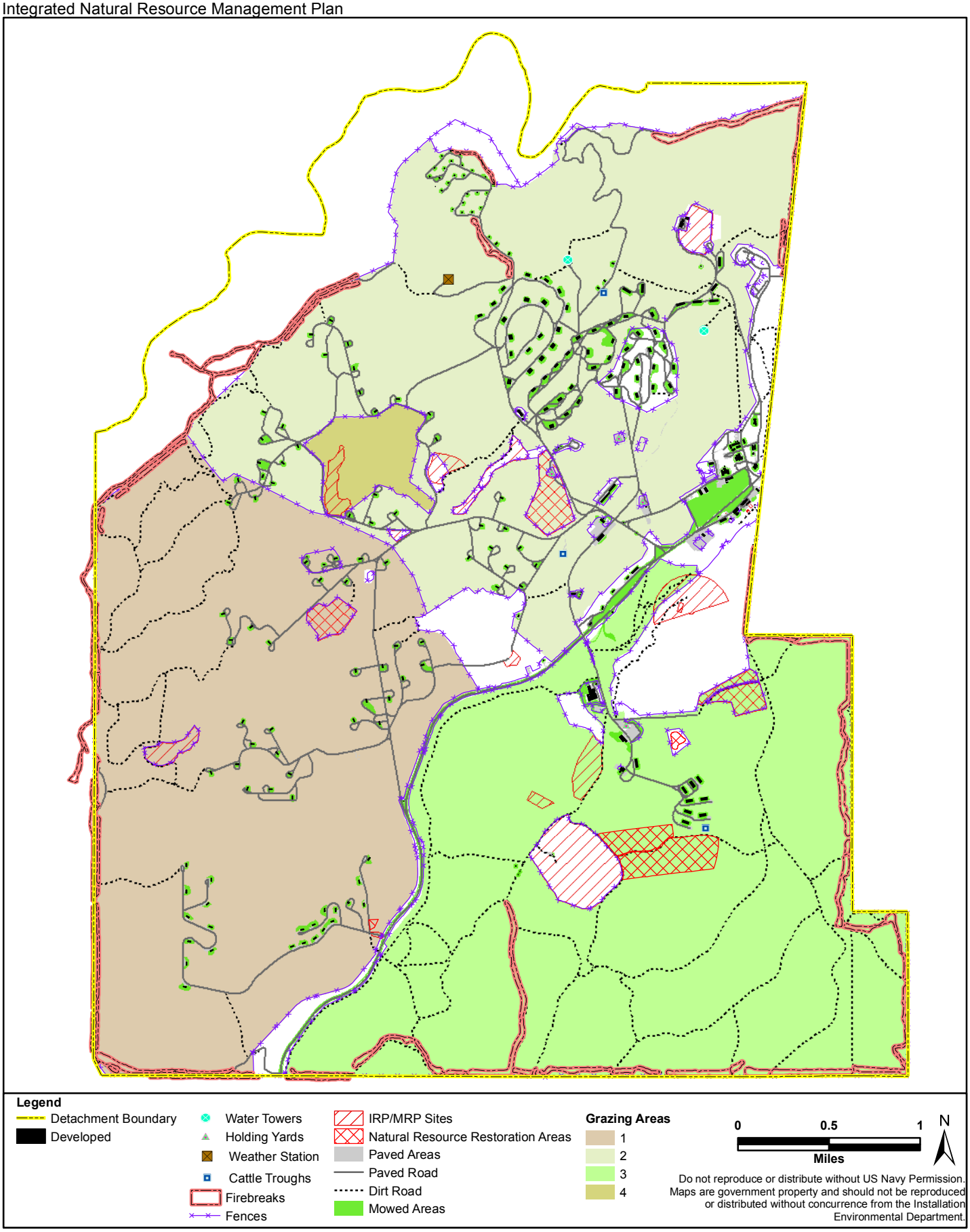

Map 2-3
Current Land Use Designations
Naval Weapons Stations Seal Beach Detachment Fallbrook

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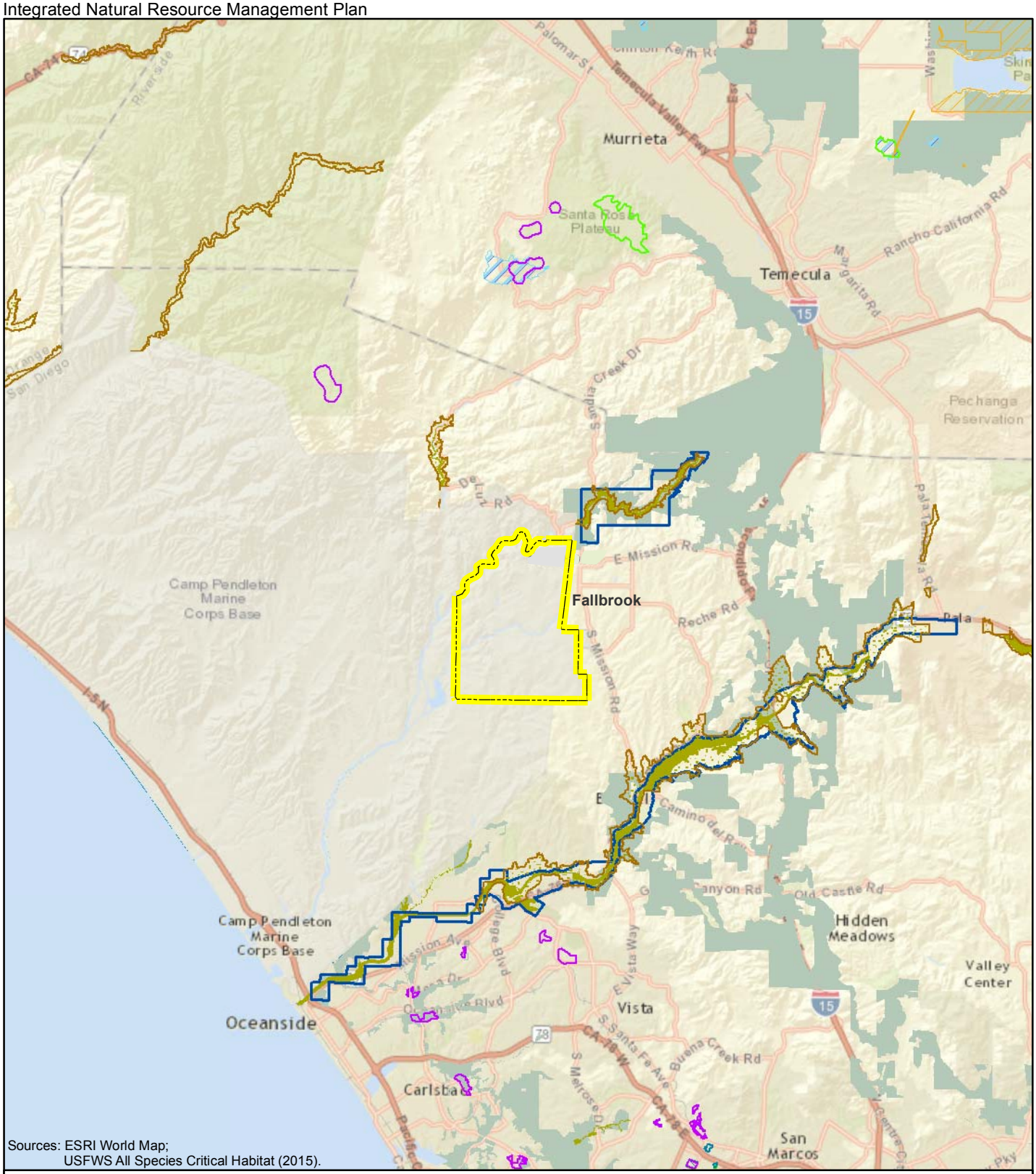

Legend

- Detachment Boundary

Critical Habitat (* Data were updated for DoD installations)

- Arroyo Toad *(Anaxyrus californicus)*
- Southwestern Willow Flycatcher *(Empidonax traillii extimus)*
- Least Bell's Vireo *(Vireo bellii pusillus)*
- Coastal California Gnatcatcher *(Polioptila californica californica)**
- Spreading Navarretia *(Navarretia fossalis)**
- Thread-leaved Brodiaea *(Brodiaea filifolia)*
- Quino Checkerspot Butterfly *(Euphydryas editha quino)*
- Riverside Fairy Shrimp *(Streptocephalus woottoni)*
- San Diego Fairy Shrimp *(Branchinecta sandiegonensis)**

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Map 2-4
Critical Habitat Designations
Naval Weapons Station Seal Beach Detachment Fallbrook

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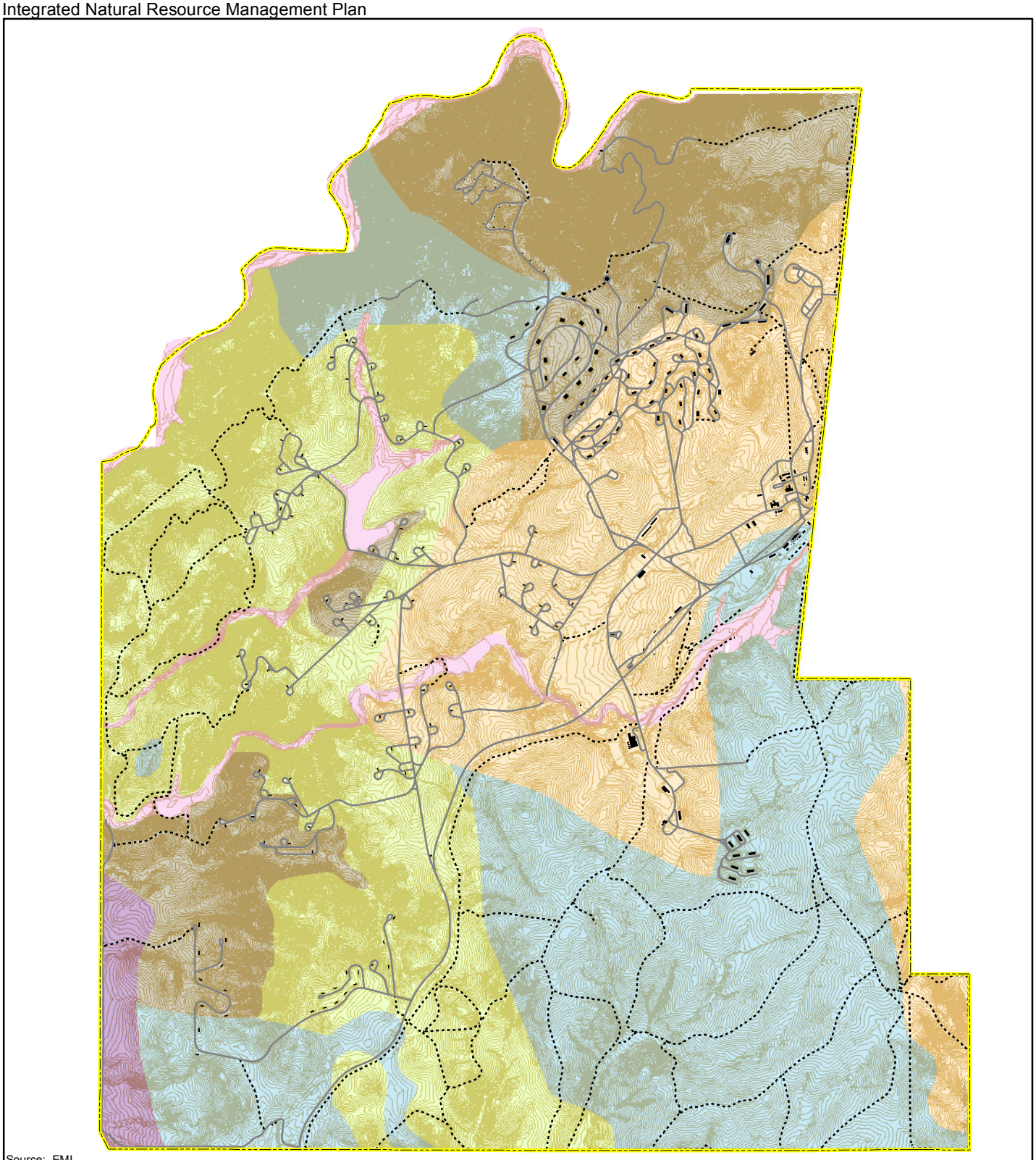

Source: EMI

Legend

- Detachment Boundary
- Buildings and Bunkers
- Paved Road
- Dirt Road

Geology

- Kgb - Diorite/Gabbro
- Kgd - Monzogranite
- Kgt - Tonalite
- Kjm - Volcanics
- Qal - Alluvium
- Qoa - Older Alluvium
- Elevation Contours

0 0.5 1 Miles

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Map 3-1
Geology/Topography
Naval Weapons Stations Seal Beach Detachment Fallbrook

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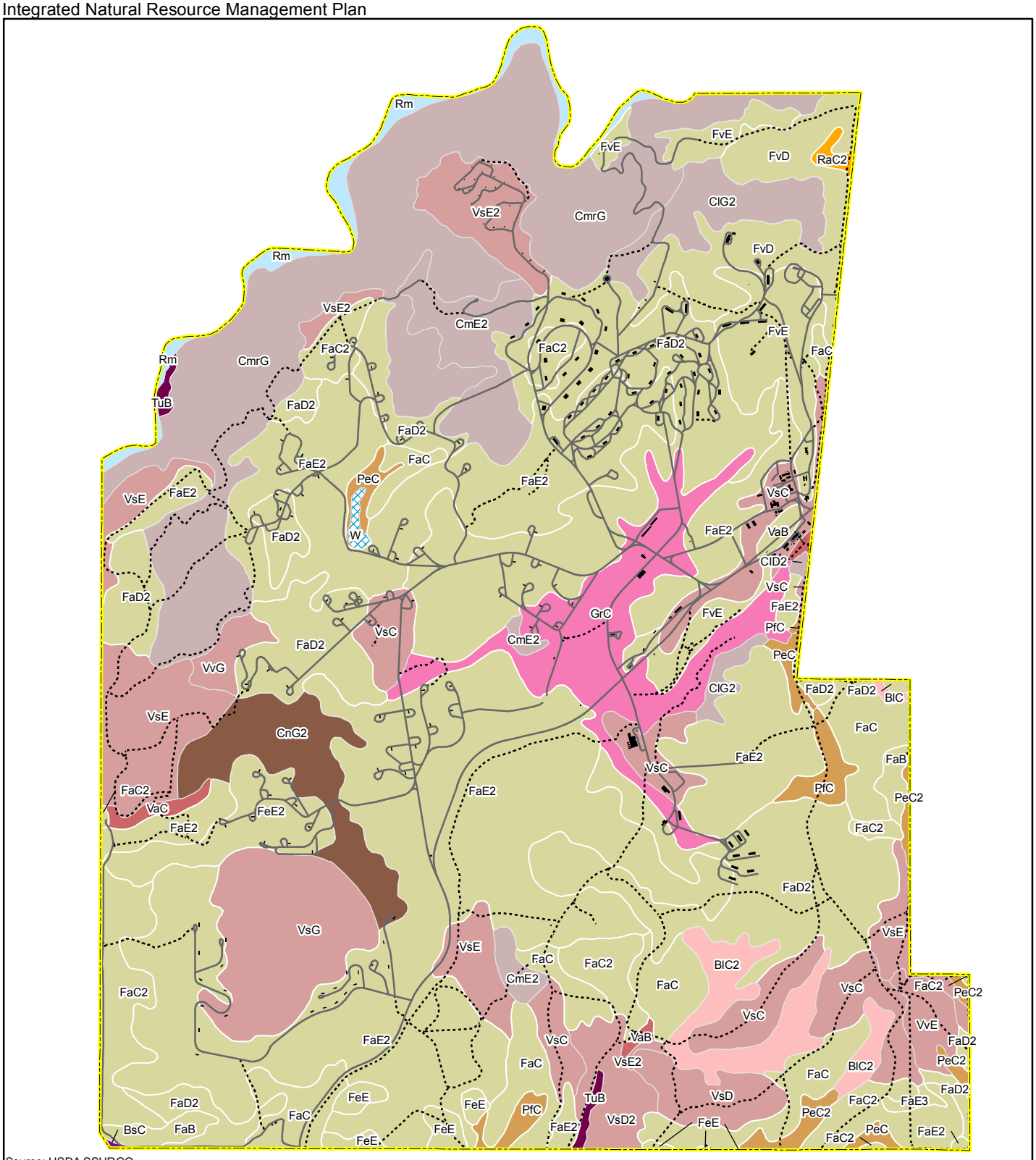

Map 3-2
Soils
Naval Weapons Stations Seal Beach Detachment Fallbrook

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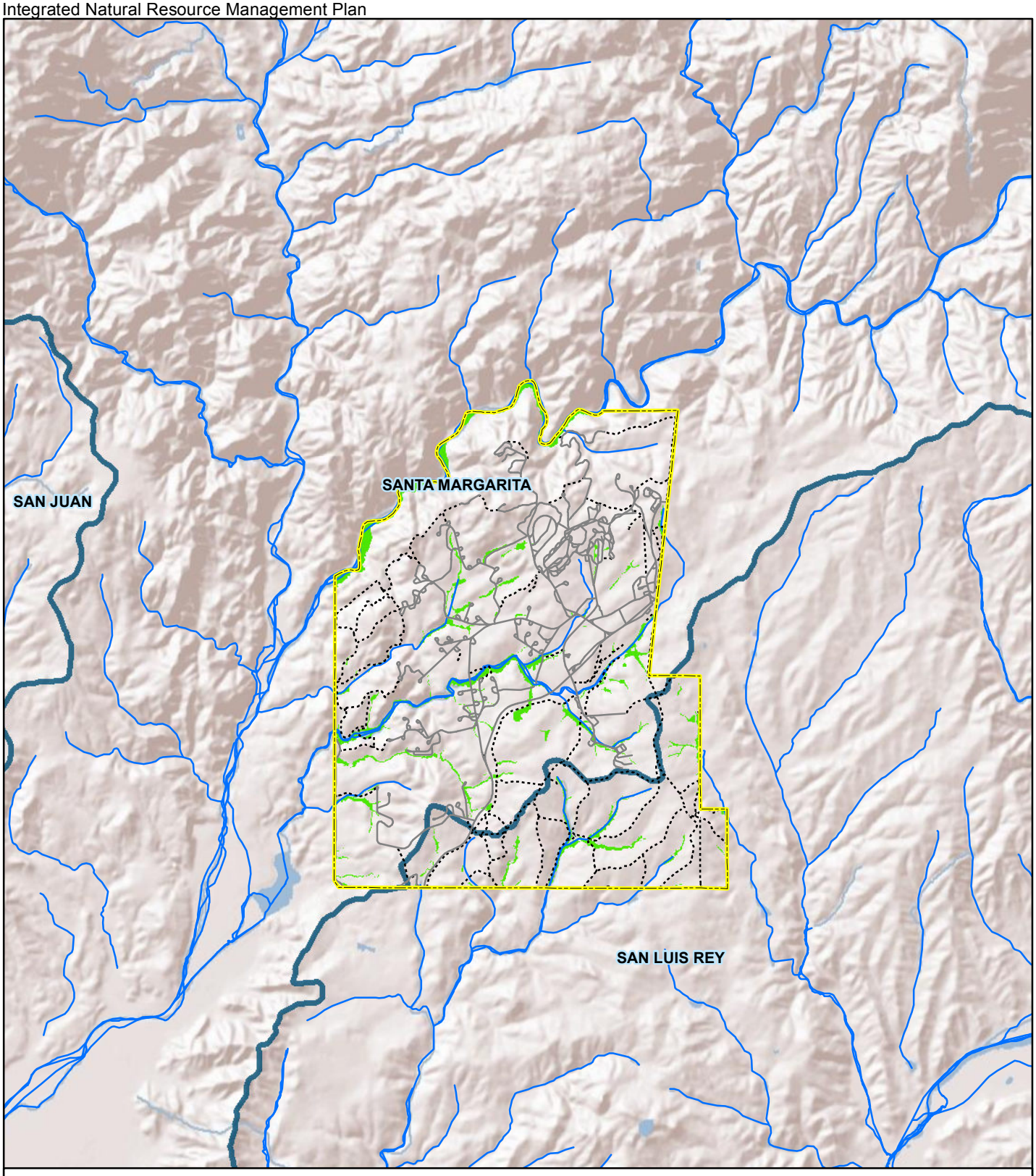

Map 3-3
Watersheds
Naval Weapons Stations Seal Beach Detachment Fallbrook

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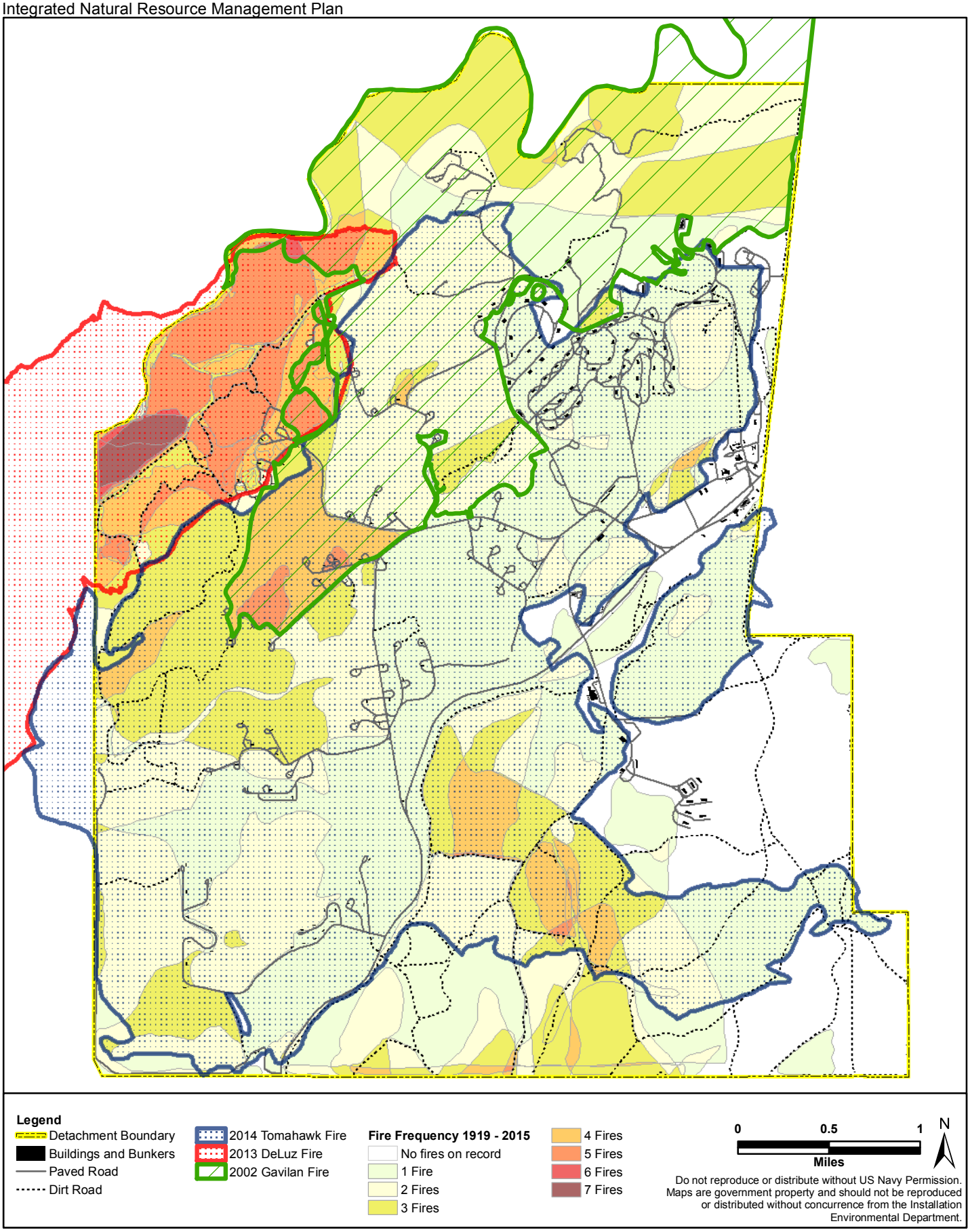

Map 3-4
Fire Frequency
Naval Weapons Stations Seal Beach Detachment Fallbrook

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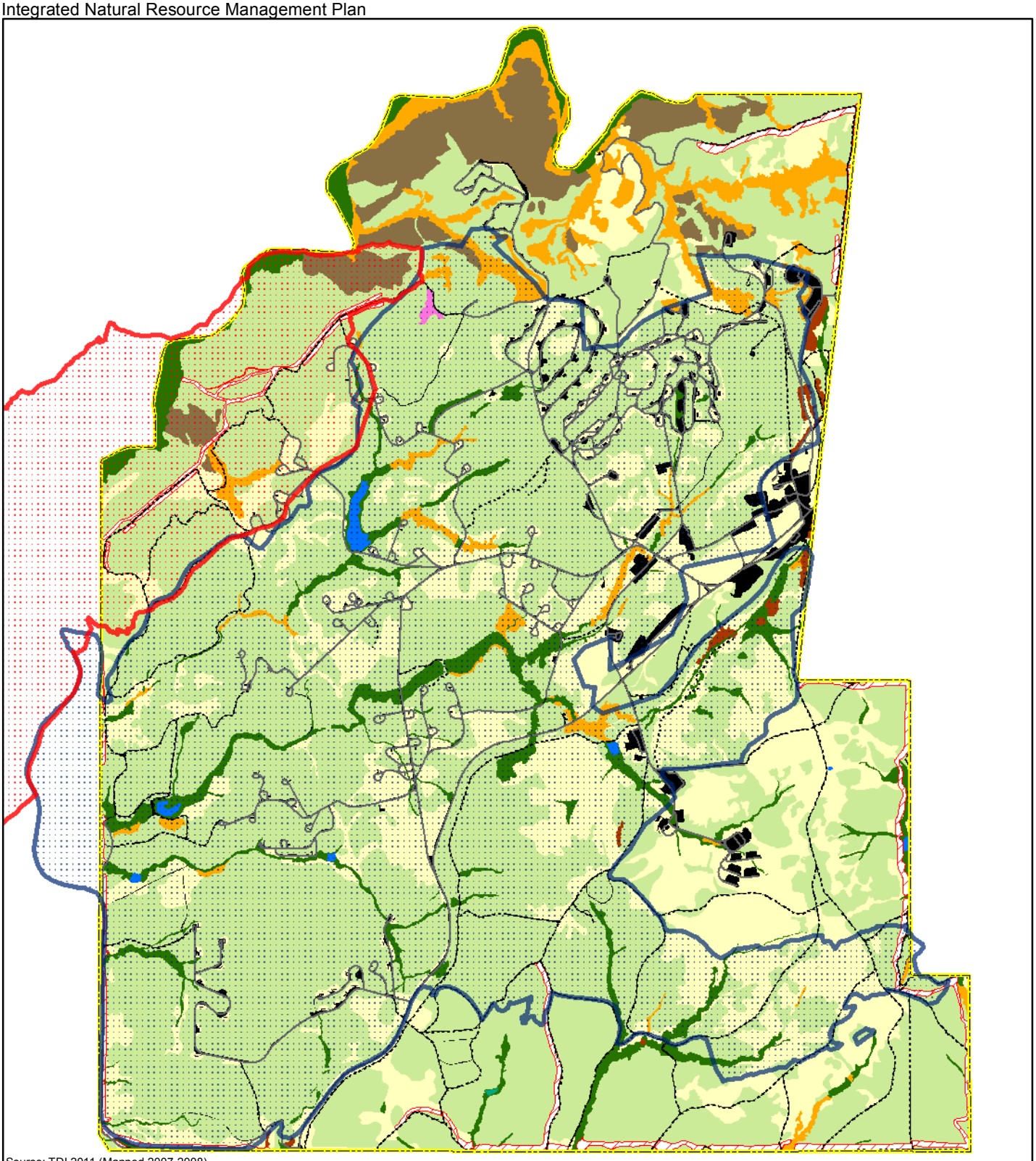

Source: TDI 2011 (Mapped 2007-2008)

Legend

- Detachment Boundary
- Paved Road
- Dirt Road
- Developed
- 2014 Tomahawk Fire
- 2013 DeLuz Fire

Vegetation Community

- Coastal Sage Scrub (>20% cover)
- Chaparral
- Grassland
- Oak Woodland
- Eucalyptus Woodland
- Marsh
- Open Water/Pond
- Riparian
- Vernal Pool
- Firebreak

0 0.5 1 Miles

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Map 3-5
Vegetation
Naval Weapons Stations Seal Beach Detachment Fallbrook

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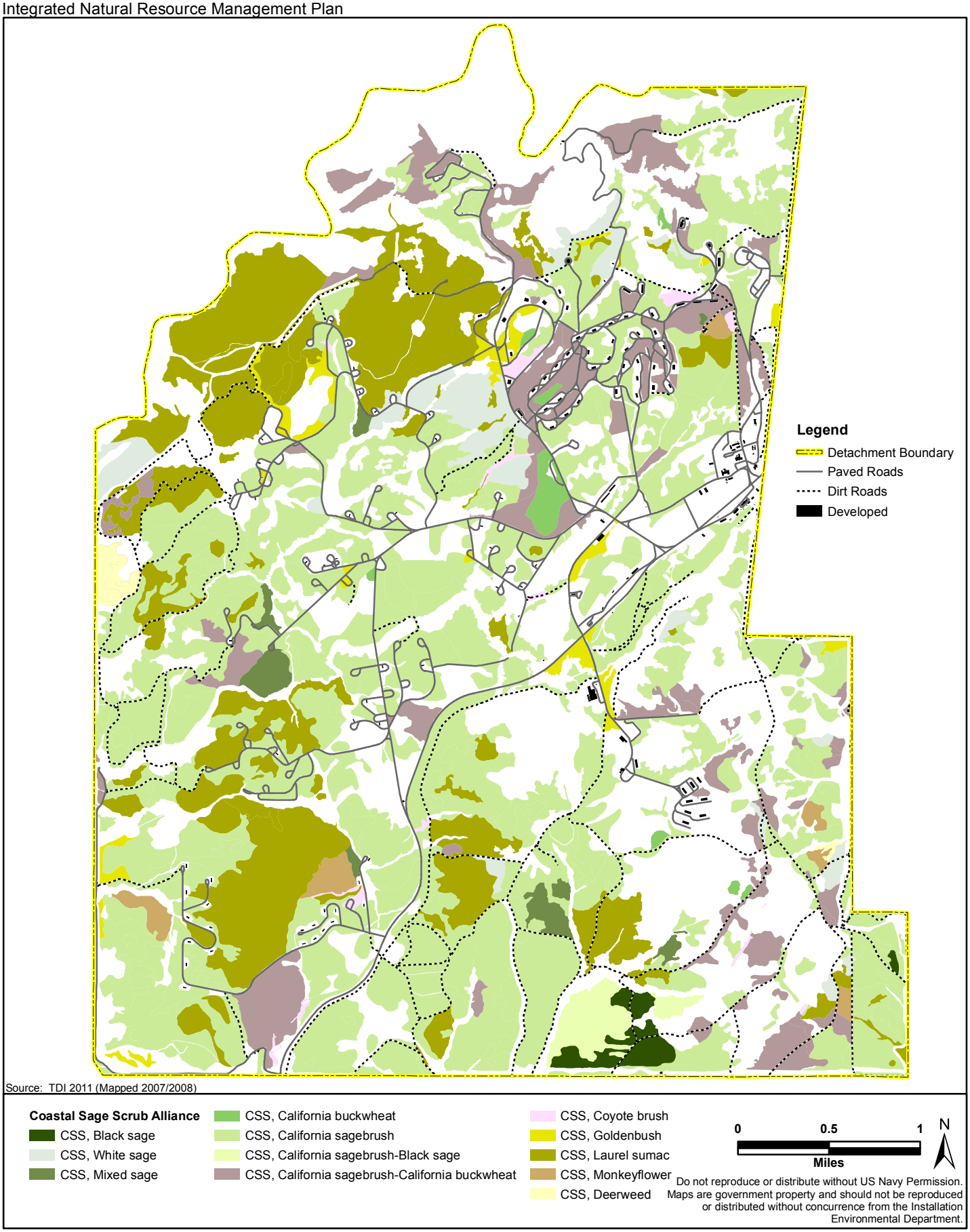

Map 3-6
Coastal Sage Scrub Alliances
Naval Weapons Stations Seal Beach Detachment Fallbrook

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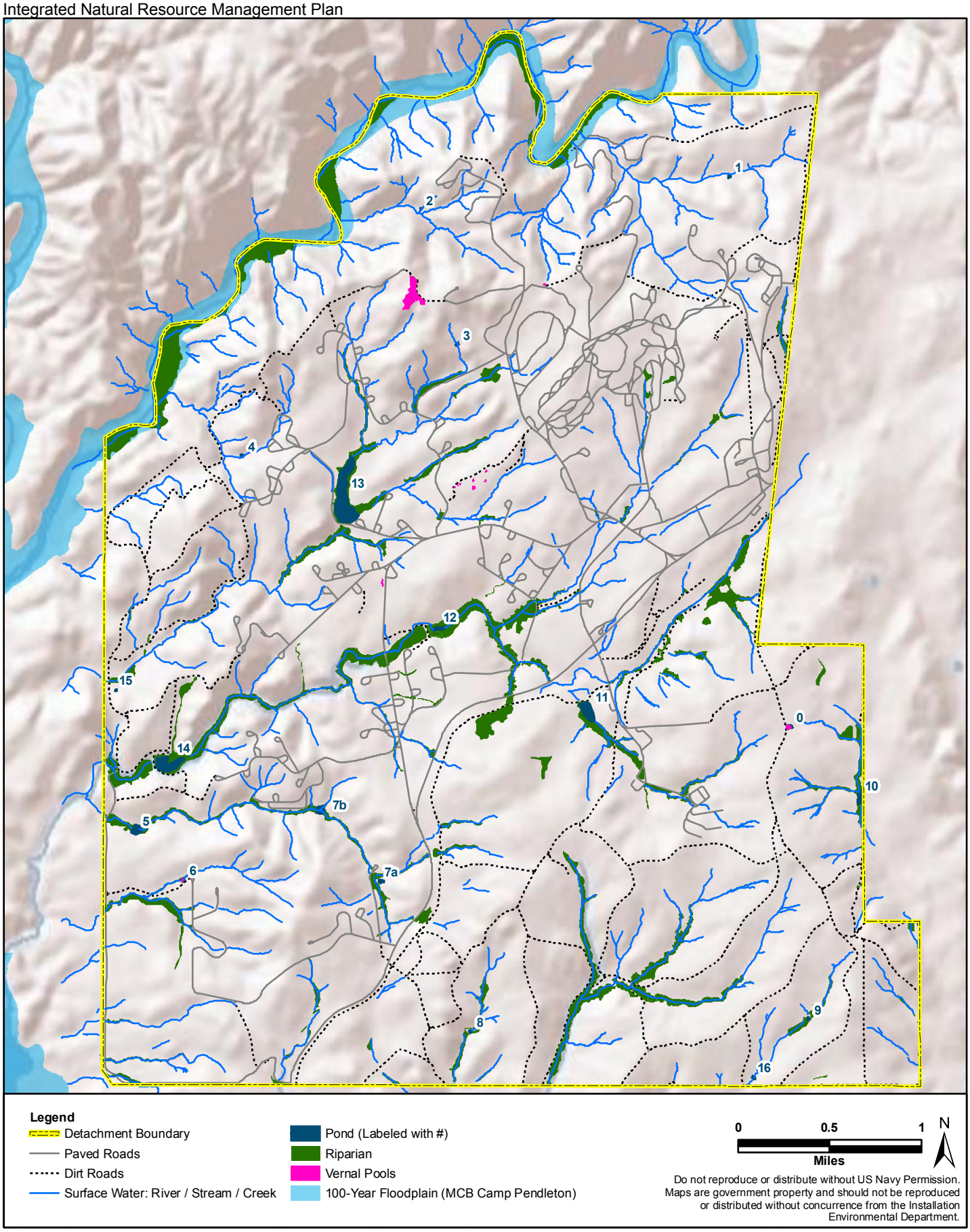

Map 3-7
Wetlands and Floodplains
Naval Weapons Stations Seal Beach Detachment Fallbrook

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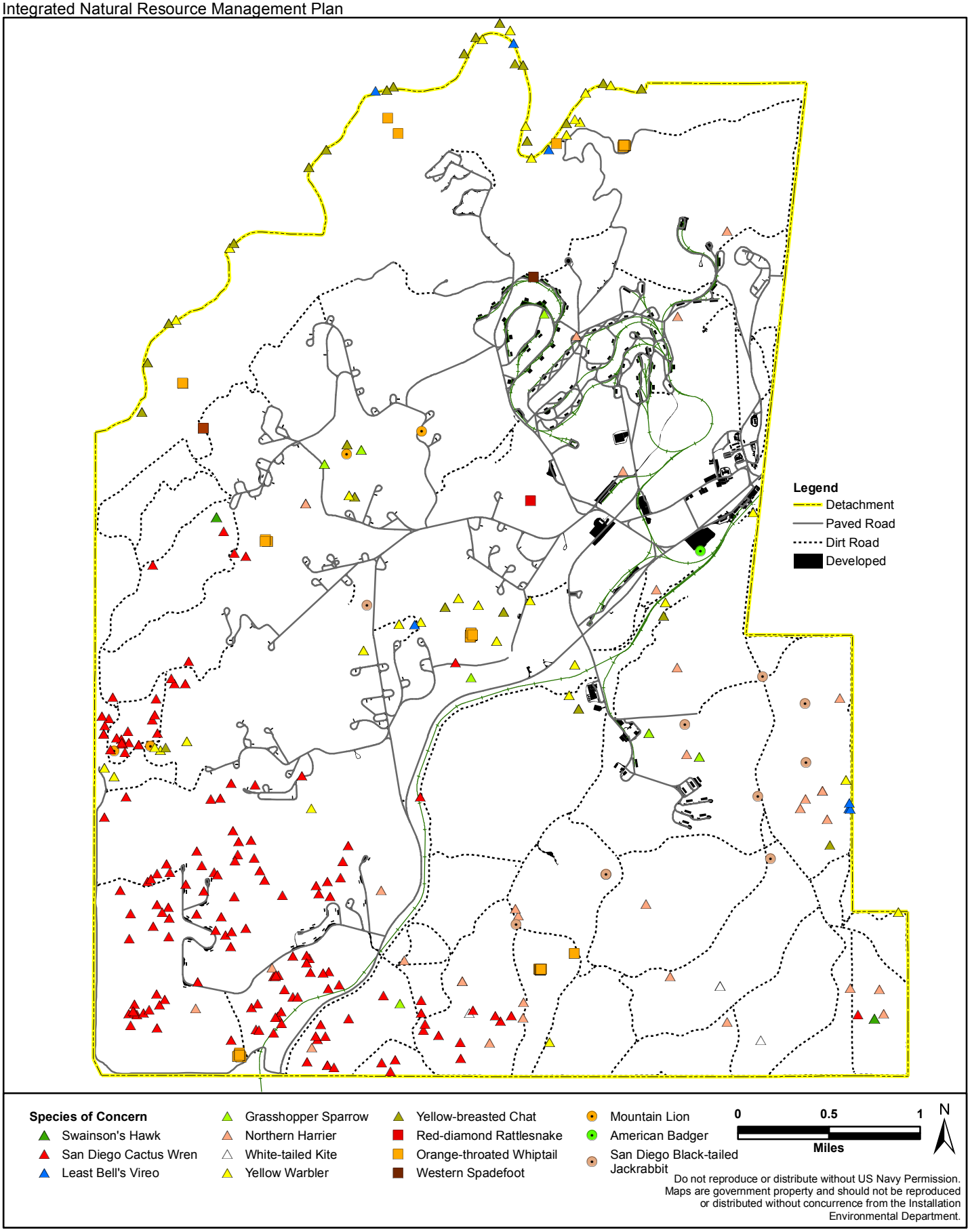

Map 3-8
Species of Concern
Naval Weapons Stations Seal Beach Detachment Fallbrook

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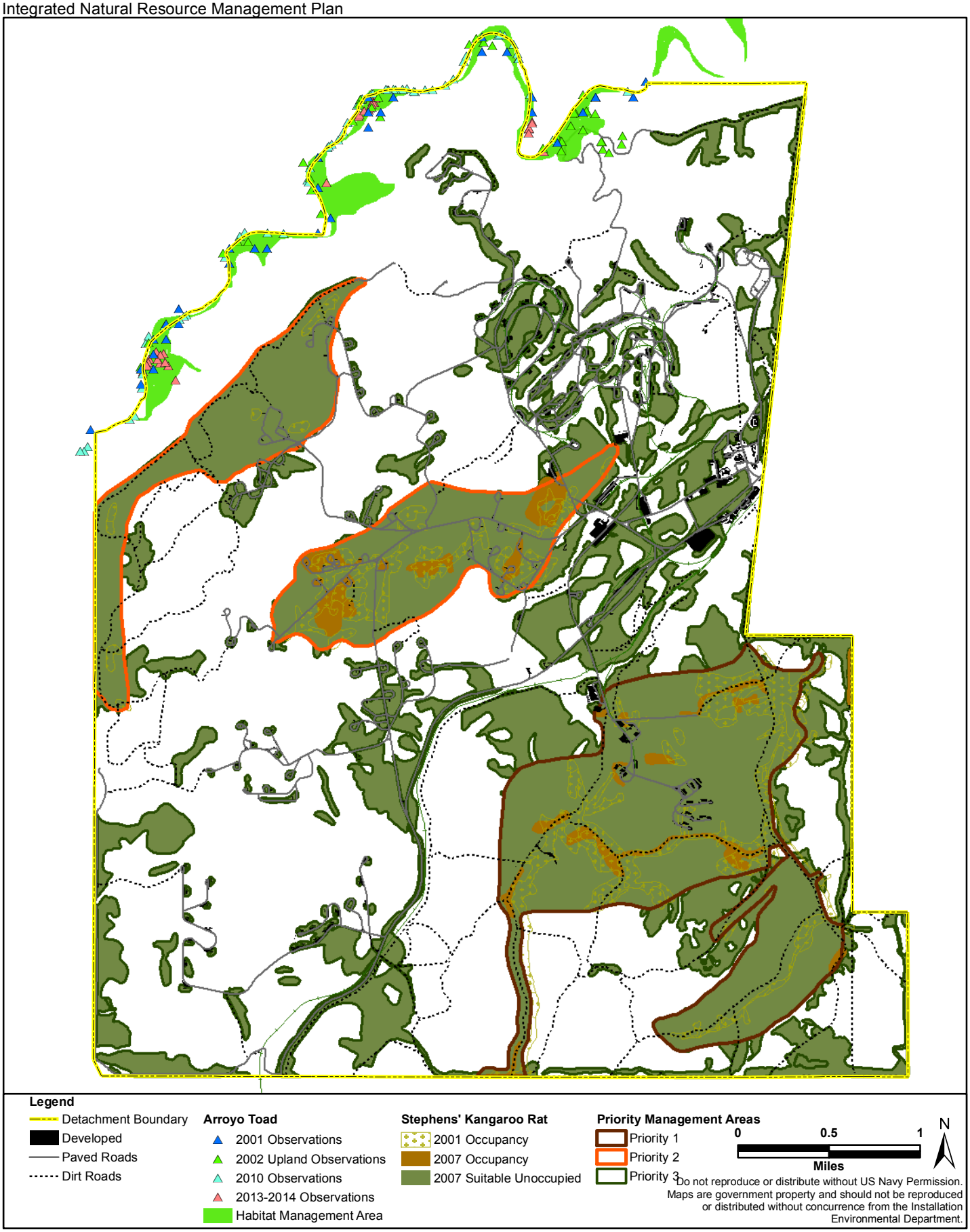

Map 3-9
Arroyo Toad and Stephens' Kangaroo Rat
Naval Weapons Stations Seal Beach Detachment Fallbrook

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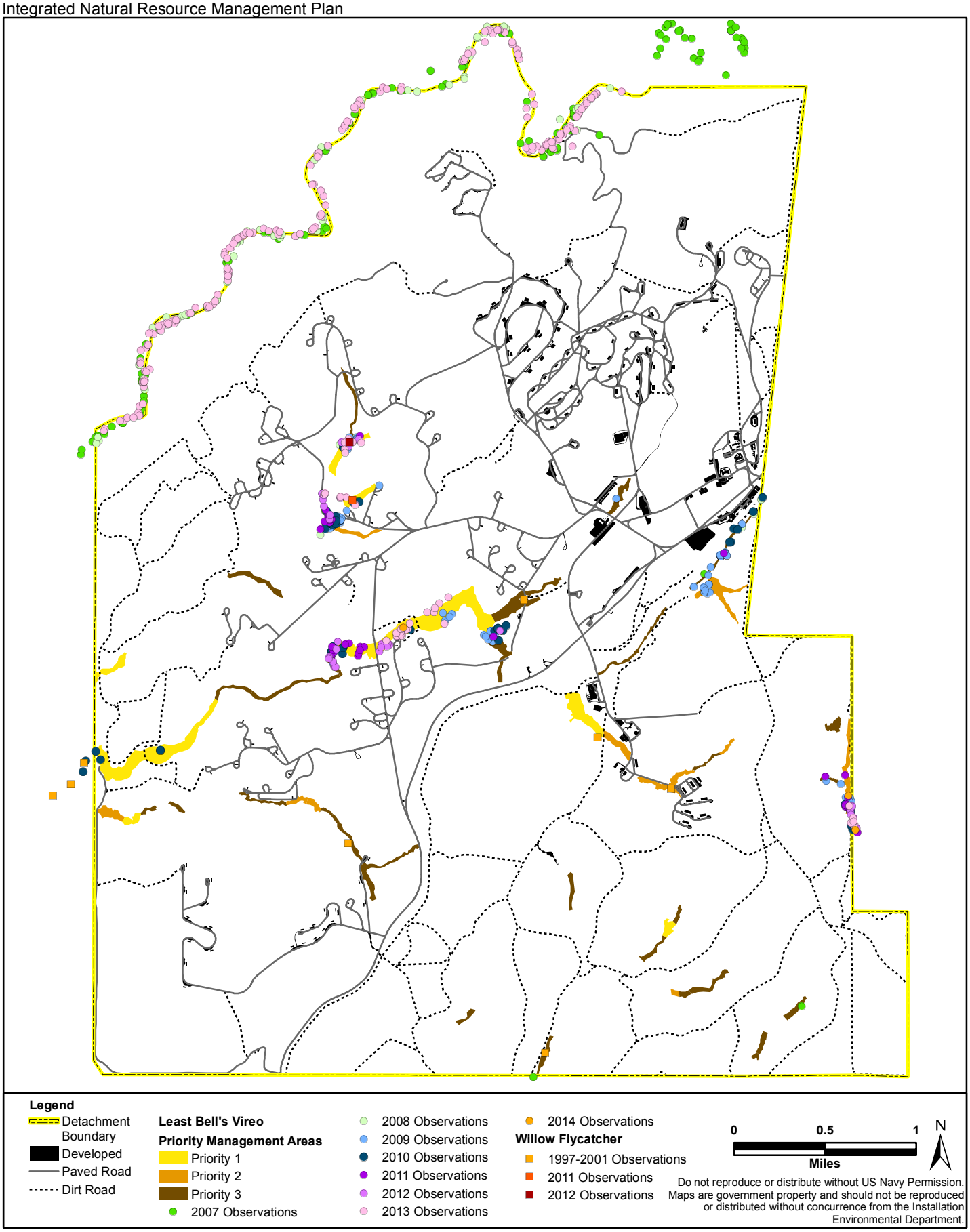

Map 3-10
Willow Flycatcher and Least Bell's Vireo
Naval Weapons Stations Seal Beach Detachment Fallbrook

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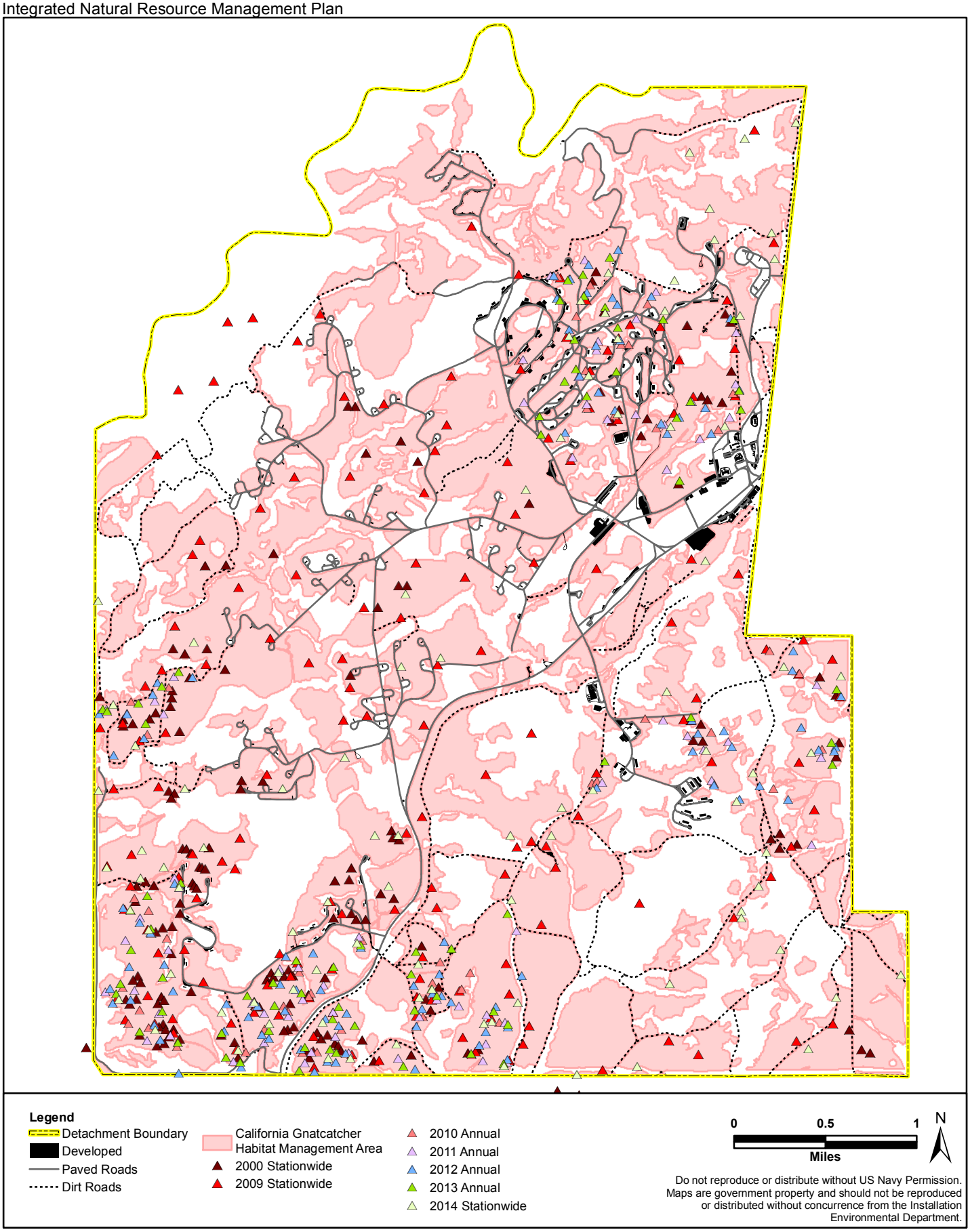

Map 3-11
California Gnatcatcher
Naval Weapons Stations Seal Beach Detachment Fallbrook

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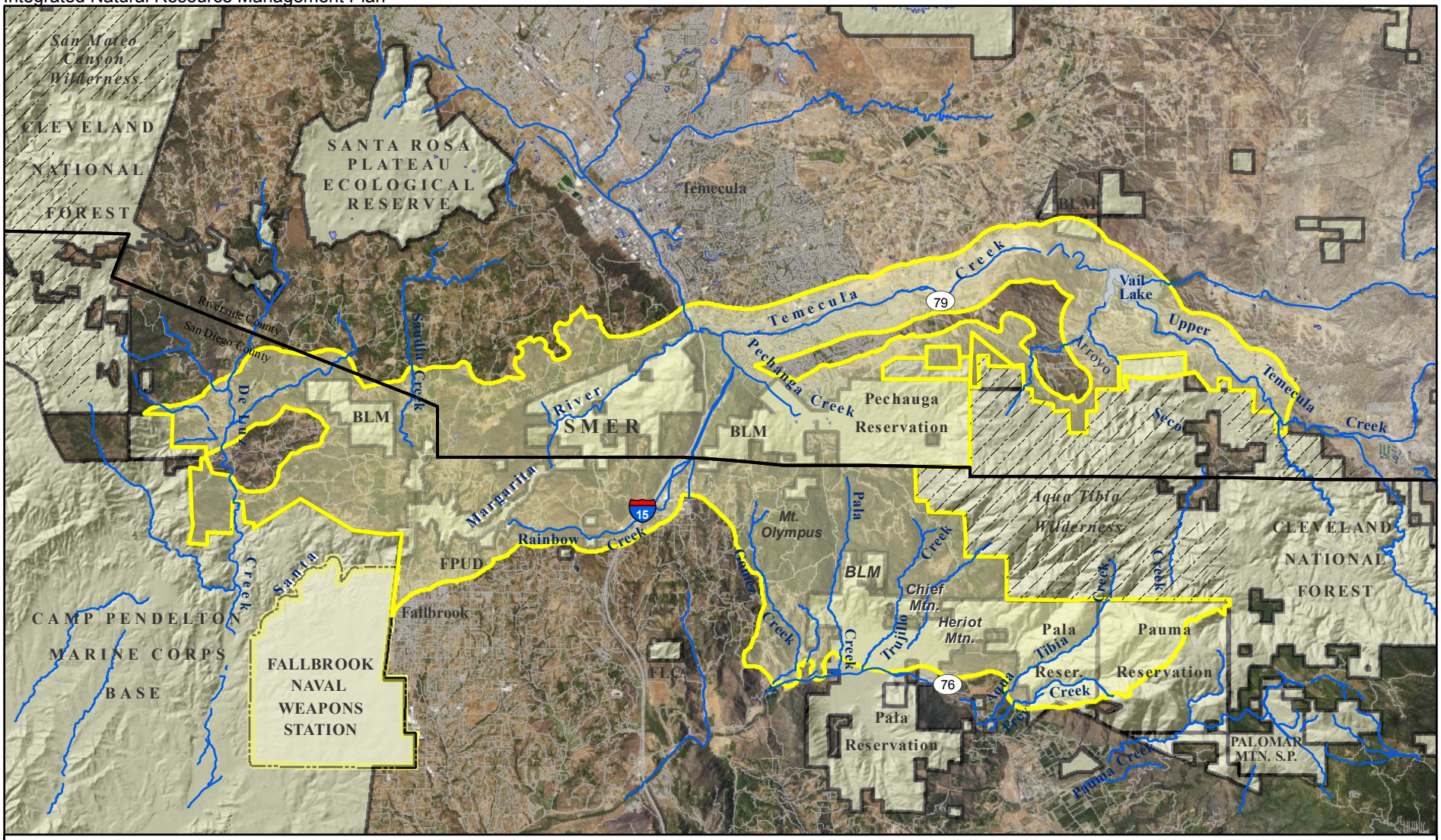

Legend

- Detachment Boundary
- Santa Ana-Palomar Corridor

N

0 1 2 Miles

Map Source; San Diego State University; BLM; NHD; Riverside County; San Diego County 2016

Map 3-12
Surrounding Open Space, Corridors, and Linkage
Naval Weapons Stations Seal Beach Detachment Fallbrook

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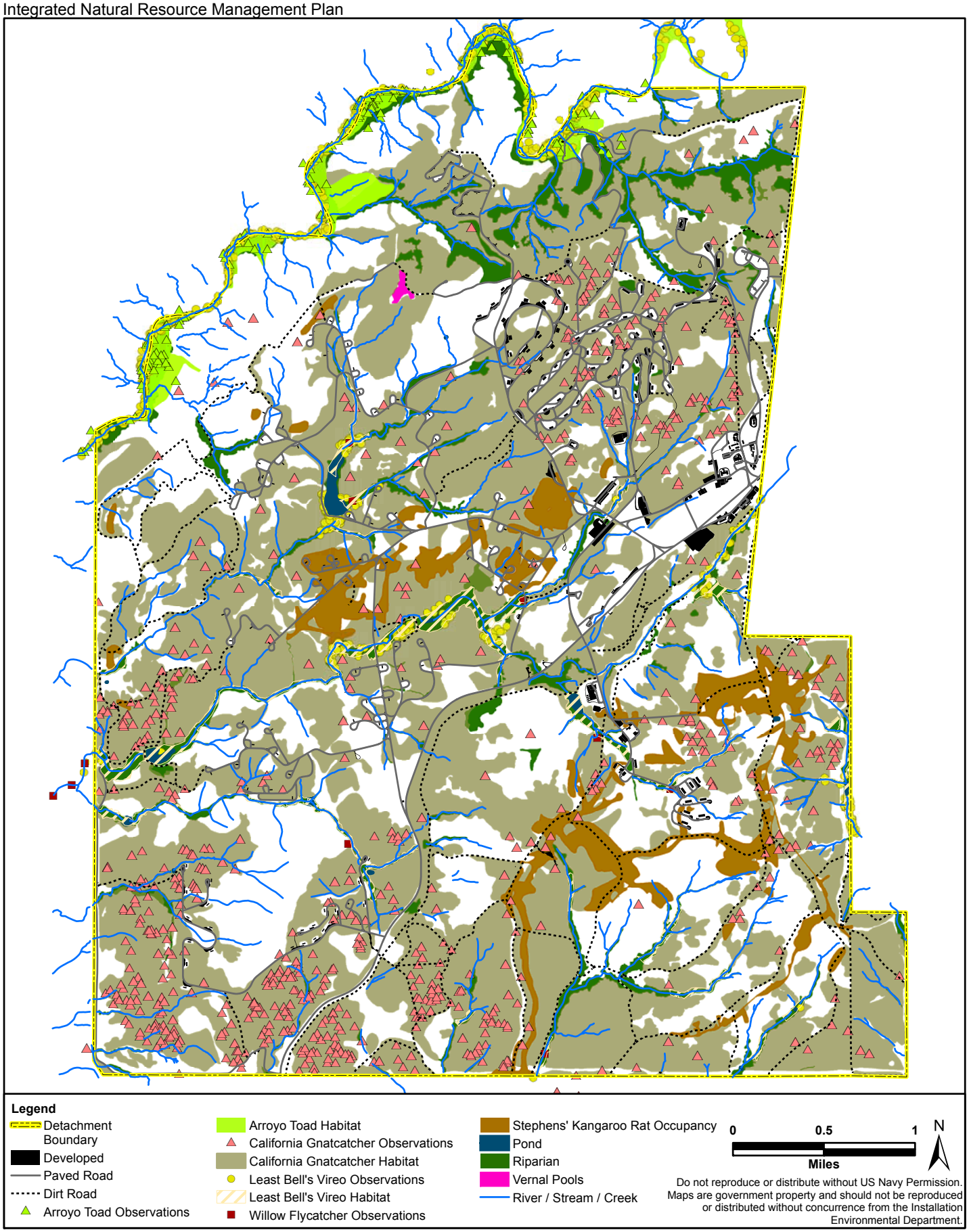

Map 5-1
Biological Constraints
Naval Weapons Stations Seal Beach Detachment Fallbrook

APPENDIX A

VERSION TRACKING AND PREPARERS

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VERSION TRACKING

In accordance with Navy guidance, this INRMP is to be reviewed annually and updated as necessary. This version tracking sheet provides a list of the changes since the 2016 publication and signature dates on this document. Citations of the INRMP shall include the version number parenthetically after the title, as applicable.

Version	Date of Revision	Summary of Changes

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APPENDIX B

LEGISLATION, REGULATIONS, INSTRUCTIONS, ORDERS, AND MEMORANDA

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B.1 LEGISLATION RELATED TO NATURAL RESOURCES

Agreements to Limit Encraochments and Other Constraints on Military Training, Testing, and Operations (10 USC §2684a)	The Agreements to Limit Encraochments and Other Constraints on Military Training, Testing, and Operations statute of 3 January 2012 allows the military to enter into agreements with adjancet proterty owners for limiting development incompatable with the mission of the installation, to preserve habitat, and to protect clear zone areas from incompatiable use.
Bald and Golden Eagle Protection Act (16 USC §§668a-c)	The Bald and Golden Eagle Protection Act (Bald and Golden Eagles Act; PL 95-616; 16 USC §§ 668 et seq.) was originally passed in 1940 for the bald eagle and was expended in 1962 to include the golden eagle. The Act provides for protection of both eagles prohibiting taking, possession, and commerce in the birds without a permit. Taking is described to include their parts, nests, or eggs, molesting or disturbing the birds. Penalties: Civil penalties for violations can result in fines up to $5,000 per 1972 amendment. Criminal penalties were increased in 1972 to a maximum of $250,000 and two years imprisonment a felony conviction of an individual (double in the case of an organization).
California Endangered Species Act (FGC §§ 86, 2050 et seq.; CCR, Title 14, §§ 783 et seq.)	The California Endangered Species Act (CESA) was enacted in 1970 and amended in subsequent years. Laws related to CESA are in Fish and Game Code (FGC), Sections 86 and 2050-2085. Regulations related to CESA are in California Code of Regulations (CCR), Title 14, Sections 783-783.8 and 786.0-786.8. For more information: https://www.wildlife.ca.gov/Conservation/CESA/Code-Regulations. CESA provides for the identification and protection of state listed threatened and endangered species of animals, plants, and their habitats. Penalties: CESA violations can result in a fine of up to $5,000 and/or one year in prison. While this law does not apply to federal actions, it does apply to state agencies and private landowners. In the spirit of the law and as a service to state agencies and private landowners, federal agencies operate under these guidelines.
Clean Air Act (42 USC §§7401-7671q)	The Clean Air Act (CAA; 42 USC §§ 7401 et seq.) mandates the prevention and control of air pollution from stationary and mobile sources. Requires the establishment of: National Ambient Air Quality Standards (NAAQS) to regulate primary and secondary concentrations for six priority air pollutants; New Source Performance Standards (NSPS) to provide ceiling emission standards for certain new industrial sources; and National Emission Standards for Hazardous Air Pollutants (NESHAP) to control pollutants, not covered under NAAQS, which may increase mortality rates or cause serious irreversible illness. Penalties: Civil penalties for CAA violations can result in fines up to $320,000 per 2013 monetary increases, FR 78(215): 66643-66648. Criminal penalties of up to 15 years in prison and/or fines up to $250,000 for an individual or $500,000 for organizations.
Clean Water Act (33 USC §§1251-1387)	The objective of the Clean Water Act (PL 92-500, as amended; 33 USC §§ 1251 et seq.) is to restore and maintain the chemical, physical, and biological integrity of the Nation's waters (Section 101a). The Clean Water Act has three major approaches to water pollution control: 1. Construction grants for reducing municipal discharges; 2. National Pollution Discharge Elimination System (NPDES) permits for control of point source (storm water and waste water) discharges; and 3. Water quality management planning for nonpoint source (NPS) control from diffuse natural origins such as sediment. In 1972 Congress adopted a "zero-discharge" goal, and a focus on "preventable causes of pollution," to emphasize the source of contamination rather than controls at the outfall or water body itself. Water quality "standards" include a legal designation of the desired use for a given body of water and the water quality criteria appropriate for that use. The "criteria" are specific levels of water quality which are expected to make a water body suitable for its desired use. "Effluent limitations" are restrictions on quantities, rates, and concentrations in wastewater discharges measured at the discharger's outfall pipe. (Goldfarb 1984) Administration of the Act is delegated to the State Water Resources Control Board (SWRCB) in California and, locally, to the San Diego Regional Water Quality

	Control Board (RWQCB). The Regional Board is responsible for setting water quality standards and criteria for water bodies in its regional plan, and for issuing and enforcing NPDES permits. Section 404 (33 USC Section 1344) deals with discharge of dredge or fill material into waters of the U.S. Regulatory authority has been delegated by the Environmental Protection Agency to the U.S. Army Corps of Engineers for Sec. 404. Discharges are any material that results in a change in the bottom elevation of a water body or wetland, including grading, road fills, stream crossings, building pads, and flood and erosion control on streambanks. Vernal pools are considered nontidal waters that are isolated wetlands under Sec. 404. There are 26 more or less generic nationwide permits that preauthorize certain minor discharges as long as they meet certain conditions–e.g., construction of outfall structures, backfill or bedding for utility lines, fill for bank stabilization, and minor road crossings. The nationwide permit system is currently being modified. If a discharge would cause the loss of or substantially modify one to 10 acres of water, including adjacent wetlands, then the nationwide permit may not apply. Work cannot begin until the Army Corps notifies the U.S. Navy that the nationwide permit applies. The individual permit process is much more complex and time-consuming. It requires consultation, an Environmental Assessment prepared by the Army Corps, Public Interest Review and a 404(b)(1) Evaluation. If significant impacts are found, then an EIS must be prepared. These regulations apply to vernal pools. Customarily, the L.A. District Engineer requires Individual Permit and an EA for fills in any vernal pool regardless of the presence or absence of endangered species. The Army Corps is attempting to formalize requirements particular to vernal pools. A Memorandum of Agreement between the Army Corps and EPA dated February 7, 1990 states that all potential impacts must first be shown to have been avoided, minimized and then compensated for. Compensation is considered a last resort only, which involves the creation of a habitat to replace a similar habitat unavoidably eliminated at a project site. The concerned agencies must be completely convinced that the proposed compensation will completely mitigate the lost habitat. Any activity in a wetland will require at least an EA. Penalties: Civil penalties for CWA violations can result in fines up to $187,500. Criminal penalties of up to 16 years in prison and/or fines up to $250,000 for EPA enforcement or $1,000,000 for Army Corps of Engineers enforcement.
Coastal Zone Management Act (33 USC §§1251-1466)	The Coastal Zone Management Act (CZMA) of 1972 requires federal permit applicants to obtain a certification that verified activities proposed within the "coastal zone" are consistent with state coastal zone management programs; e.g., federal Clean Water Act and §404 applicants. The CZMA creates a broad program based on land development controls within coastal zones, incorporating state involvement through the development of programs for comprehensive state management. The CZMA also requires federal agencies of licensees to carry out their activities in such a way that they conform to the maximum extent practicable with a state's coastal zone management program.
Community Environmental Response Facilitation Act (42 USC §§9601-9675)	The Community Environmental Response Facilitation Act (CERFA) (42 USC § 9601 note, 9620) amends CERCLA Section 120 (h) to allow expedition of reuse and redevelopment of federal facilities being closed. It was expanded to include Federal agency requirements pertaining to the disposal of real property.
Comprehensive Environmental Response, Compensation, and Liability Act (43 USC §§9601-9675)	The Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA; 43 USC §§ 9601 et seq.) establishes programs for the cleanup of hazardous waste disposal and spill sites to ensure protection of human health and the environment. Designates the President as trustee for federally protected or managed natural resources. Penalties: Civil penalties for CERCLA violations can result in fines up to $117,500 per 2013 monetary increases, FR 78(215): 66643-66648.
Conservation and Rehabilitation Program on Military and Public Lands (16 USC §§670 et seq.)	The Conservation and Rehabilitation Program on Military and Public Lands (PL 93-452; 16 USC §§ 670 et seq.) amends PL 86-797 by providing for fish and wildlife habitat improvements, range rehabilitation, and control of off-road vehicles on federal lands.

Conservation Programs on Military Installations (Sikes Act)	See Fish and Wildlife Conservation and Military Reservations Act (Sikes Act) and Sikes Act Improvement Act (SAIA), which are 1997 amendments to the Sikes Act.
Conservation Programs on Military Reservations	The Conservation Programs on Military Reservations (PL 90-465; 16 USC §§ 670 et seq.) amend PL 86-797 to include outdoor recreation programs on military lands. Data Quality Act Under the Data Quality Act (DQA), which took effect October 1, 2002, federal agencies must ensure that the information it uses and disseminates meets certain quality standards. The DQA requires federal agencies to issue guidelines ensuring the quality, utility, objectivity and integrity of information that they disseminate and provide mechanisms for affected persons to correct such information by petitioning and challenging the quality of information it has used or disseminated. Two questions that remain unanswered about the DQA is whether agency information quality guidelines apply to rule-making and whether an agency's denial of a petition to correct information is reviewable by the courts.
Defense Appropriations Act (10 USC §2301)	The Defense Appropriations Act of 1991 Legacy Program (10 USC § 2301) provides for the stewardship of biological, geophysical, cultural and historic resources on DOD lands.
Emergency Planning and Community Right-to-Know Act (42 USC §§1001-11050)	The Emergency Planning and Community Right-to Know Act of 1986 (EPCRA) (42 USC §§11001 et seq.) is also known as Title III of the Superfund Amendments and Reauthorization Act (SARA). EPCRA focuses on the hazards associated with toxic chemical releases. Most notably, specific sections of EPCRA require immediate notification of releases of oil and hazardous substances and CERCLA-defined hazardous substances to state and local emergency response planners. Requires state and local coordination in planning response actions to chemical emergencies. Requires certain industries to submit information on chemical inventories and fugitive emissions. Penalties: Civil penalties for EPCRA violations can result in fines up to $117,500 per 2013 monetary increases, FR 78(215): 66643-66648.
Endangered Species Act and Amendments (16 USC §§1531-1544)	The Endangered Species Act (PL 93-205; 16 USC §§ 1531 et seq.), ESA, of 1973 requires that all federal agencies undertake programs for the conservation of endangered and threatened species. These agencies are prohibited from authorizing, funding, or carrying out any action that would jeopardize a listed species or destroy or modify its "critical habitat" (section 7). Critical habitat is usually designated concurrently with a listing. Section 9 prohibits any person – including private or public entities – to "take" individuals of a threatened or endangered species. Take means to "harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or attempt to engage in any such conduct." Harm is further defined to include significant habitat modification or degradation which "actually kills or injures fish or wildlife by significantly impairing essential behavioral patterns, including, breeding, spawning, rearing, migrating, feeding or sheltering." "Incidental takes" are permissible only if an "incidental take statement" is issued by the Secretary of the Interior (USFWS) with a biological opinion after agency consultation. Management options will likely be limited as a requirement for minimizing the taking. For plants, collection or removal of seed material or whole plants of a threatened or endangered species, even for revegetation or monitoring purposes, requires a USFWS collection permit. There is no general taking prohibition for plants that compares to that which applies to animals. See Chapter 5 of this INRMP for greater detail on ESA consultations. Section 318 of the National Defense Authorization Act (NDAA) of 2004 amended section 4(a)(3) of the ESA to state that the Secretary of the Interior shall not designate critical habitat on lands owned or controlled by DOD that are subject to an INRMP prepared under section 101 of the Sikes Act, if the Secretary determines in writing that the INRMP provides a benefit to the species. This amendment does not affect the requirement for th DOD to consult under section 7(a)(2) of the ESA nor the obligation of the DOD to comply with section 9 of ESA. Penalties: Civil penalty of up to $25,000 per violation or criminal penalty of up to $50,000 and / or one year in prison, knowing violation for a take or damage / destruction of critical habitat of an endangered animal.

Farmlands Protection Policy Act (7 USC §4201)	The Farmlands Protection Policy Act of 1981 (7 USC §4201) considers federal activities which result in the conversion of farmlands. It requires federal agencies to identify prime and unique farmland, take into account adverse effects of federal programs on their preservation, and consider alternative actions to reduce these effects.
Federal Facilities Compliance Act (42 USC §6961)	The Federal Facilities Compliance Act (42 USC § 6961) of 1992 amends the Resource Conservation and Recovery Act. It subjects federal agencies to civil and administrative penalties for noncompliance with federal, state, interstate, or local solid and hazardous waste requirements (Subtitles C and D of RCRA).
Federal Flood Disaster Prevention Act (42 USC §§4001 et seq.)	The Federal Flood Disaster Prevention Act (PL 93-234; 42 USC §§ 4001 et seq.) established the Federal Flood Insurance Program, which has provided some incentives for construction outside flood-prone areas. To a limited degree, this has reduced destruction of riparian vegetation by developments. President Carter issued two executive orders in a related effort: E011988 (Floodplain Protection) directed federal agencies to avoid construction in flood-hazard areas and to seek restoration and preservation of the natural and beneficial values of floodplains; E011990 (Protection of Wetlands) directed federal agencies to minimize the destruction, loss, or degradation of wetlands.
Federal Insecticide, Fungicide, and Rodenticide Act (7 U.S.C. 136-136y)	The Federal Insecticide, Fungicide and Rodenticide Act of 1996 (7 U.S.C. 136) governs the use and application of pesticides in natural resource management programs. Penalties: Civil penalties for FIFRA violations can result in fines up to $7,500 per 2013 monetary increases, FR 78(215): 66643-66648.
Federal Noxious Weed Act	The Federal Noxious Weed Act of 1974 (PL 93-629; 7 USC § 2801) provides for the management of undesirable plants and their regulation in interstate and foreign commerce.
Federal Water Pollution Control Act and Amendments (33 USC §§1251 et seq.)	The Federal Water Pollution Control Act Amendments of 1972 (see Clean Water Act; PL 92-500; 33 USC §§ 1251 et seq.) sets up a federal permit and license system to carry out certain pollution discharge activities in navigable waters. Section 314 of this Act established the Clean Lakes Program (CLP). The purpose of the CLP is to develop a national program to clean up publicly owned freshwater lakes. In order to receive a grant for in-lake restoration under this Program, all point sources of pollution must be treated or have treatment planned under Section 201 and 402 of the Clean Water Act.
Fish and Wildlife Conservation Act (16 USC §§2901-2911)	The Fish and Wildlife Conservation Act of 1980 (PL 96-366; 16 USC §§ 2901 et seq.) provides for conservation, protection, restoration and propagation of certain species, including migratory birds threatened with extinction. Mandates that wildlife conservation receive equal consideration and be coordinated with other features of water resource development.
Fish and Wildlife Conservation and Military Reservations Act (Sikes Act) (16 USC §670)	The Fish and Wildlife Conservation and Military Reservations Act of 1960 (Sikes Act; 16 USC § 670) applies to any installation in the U.S. with land or water suitable for conservation of fish and wildlife. It requires that fish and wildlife be part of, and integrated into, a multiple-use program for managing natural resources. This includes a requirement to develop a cooperative management plan with state and federal fish and wildlife conservation agencies. The law sets the guidelines for charging user fees and retaining the funds to benefit the activity, such as improving habitat or restocking a fish pond. The Fish and Wildlife Conservation and Natural Resources Management Programs on Military Reservations amends the Sikes Act to require that trained professionals be used to integrate fish and wildlife into a balanced natural resource program.
Fish and Wildlife Conservation and Natural Resource Management Programs on Military Reservations	The Fish and Wildlife Conservation and Natural Resource Management Programs on Military Reservations (PL 96-561) amends the Sikes Act above to require that trained professionals be used to integrate fish and wildlife into each base's resource program.
Fish and Wildlife Coordination Act (16 USC §§661 et seq.)	The Fish and Wildlife Coordination Act of 1958 (PL 85-624; 16 USC §§ 661 et seq.) is a law which mandates that wildlife conservation receive equal consideration and be coordinated with other features of water resource development programs. The intent is to prevent loss or damage of wildlife and provide for development and improvement of wildlife in conjunction with water development projects. Federal agencies proposing to impound, divert or control surface waters are required to consult with the USFWS and CDFG, to include and give full consideration to the recommendations of these agencies, and to provide

	justifiable means and measures for benefiting wildlife in project plans. ACOE must coordinate permit applications with USFWS and CDFG. Like NEPA, implementation of this Act is essentially procedural in that no particular outcome is mandated. The Act authorizes project modification, land acquisition, and other measures necessary to protect wildlife.
Lacy Act Amendments of 1981 (16 USC §§3371-3378)	The Lacy Act Amendments, approved in 1981 with subsubsequent amendments, repealed the Black Bass Act and sections 43 and 44 of the Lacey Act of 1900 (18 USC 43- 44), replacing them with a single comprehensive statute. Under this law, it is unlawful to import, export, sell, acquire, or purchase fish, wildlife, or plants taken, possessed, transported, or sold: (1) in violation of U.S. or Indian law, or (2) in interstate or foreign commerce involving any fish, wildlife, or plants taken possessed or sold in violation of State or foreign law. The law covers all fish and wildlife and their parts or products, and plants protected by the Convention on International Trade in Endangered Species (CITES). Penalties: Lacy act violations can cost up to $10,000 in civil penalties and as much as $250,000 for felonies (double for an organization) and imprisonment up to one year.
Migratory Bird Treaty Act (16 USC §§703-712)	The Migratory Bird Treaty Act of 1918 (PL 65-186, as amended; 16 USC §§ 703 et seq.) protects migratory birds through various migratory bird conventions with other countries. Protects most birds, whether or not they migrate. Birds, their nests, eggs, parts or products may not be killed or possessed. Game birds are listed and protected except where specific seasons, bag limits, and other features govern their hunting. Exceptions are also made for some agricultural pests, which require a USFWS permit (yellow-headed, red-winged, bi-colored red-winged, tri-colored red-winged, Rusty and Brewer's blackbirds; cowbirds, all grackles, crows and magpies). Some other birds that injure crops in California may be taken under the authority of the County Agricultural Commissioner (meadowlarks, horned larks, golden-crowned sparrows, white- and other crowned sparrows, goldfinches, house finches, acorn woodpeckers, Lewis woodpeckers, and flickers). Permits may be granted for various non-commercial activities involving migratory birds and some commercial activities involving captive-bred migratory birds. Navy will consult with the USFWS informally to ensure that actions result in minimal loss (or take) of migratory birds. Penalties: MBTA violations can cost an individual or organization up to $5,000 and $10,000, respectively, and up to six months imprisonment for a misdemeanor. Felony violations may result in fines of up to $250,000 for individuals, $500,000 for organizations, and up to two years' imprisonment. Recent court decisions and DOD policy now interpret this law as not applicable to federal agencies. However, DOD does support the spirit of the law as guideline for management practices on its properties.
Migratory Bird Treaty Reform Act	The Migratory Bird Treaty Reform Act (MBTRA), which became effective on December 8, 2004, excludes non-native species from application of certain prohibitions under the MBTA. The MBTRA declares that a migratory bird species that occurs in the U.S. or its territories solely as a result of intentional or unintentional human-assisted introduction shall not be considered native for purposes of the MBTA. While this means that nuisance non-native species, such as Mute Swans, may be taken without an MBTA permit (in fact, the determination means that the Service can no longer issue permits of any kind for this species), these species might still be covered under applicable state regulations.
Military Construction Authorization Act (10 USC §2665)	The Military Construction Authorization Act of 1956 (10 USC § 2665) allows the proceeds from the sale of recyclable material be credited to the installation to cover specified costs.
Military Construction Authorization Act- Leases; Non-excess Property (10 USC §2667)	The Military Construction Authorization Act- Leases; Non-excess property of 1956 (10 USC § 2667) provides for the out-leasing of public lands.

Military Construction Authorization Act - Military Reservations and Facilities-Hunting, Fishing and Trapping (10 USC §2671)	The Military Construction Authorization Act of 1956 - Military Reservations and Facilities- Hunting, Fishing and Trapping (10 USC § 2671) requires that all hunting, fishing, and trapping on military installations follow Fish and Game laws of the state in which it is located, and be issued appropriate state licenses for these activities.
National Defense Authorization Act (10 U.S.C. §2301)	National Defense Authorization Act of 1989 Volunteer and Partnership Cost-Share Programs (P.L. 101-189) expands existing authority to use volunteers to include acceptance of voluntary services for natural resources programs at military installations.
National Environmental Policy Act (42 USC §§4321-4370h)	The National Environmental Policy Act (NEPA) of 1969 (PL 91-190; 42 USC §§ 4321 et seq.), NEPA, evolved over 10 years from the desire of Congress to have a cohesive statement of the national environmental policy. Agencies must assess, in detail, the potential environmental impact of any proposal for legislation or other major federal action that has the potential for significantly affecting the quality of the human environment. The Act is intended to help public officials and citizens make decisions that are based on understanding of environmental consequences and take action that protects, restores and enhances the environment. NEPA mandates that agencies use a "systematic, interdisciplinary approach" that integrates the natural and social sciences and environmental design. The courts have interpreted this mandate to be essentially "procedural;" that is, environmental impacts must be considered, but proposals with environmentally damaging consequences need not necessarily be rejected. The law requires a detailed statement of "significant" environmental impacts of "major" federal actions. An action may be significant in terms of geographical extent, long-term impact, potential risk, or because of its effect on heritage resources or endangered species. The process identifies reasonable alternatives to proposed actions to that might have less or no environmental effect. Individual and cumulative impacts must be considered. A three-tiered approach is used to evaluate impacts: 1) The Environmental Assessment (EA) is the analysis to be completed when the government is uncertain as to whether an action will significantly affect the environment or the action is controversial. The result of an EA is either a Finding of No Significant Impact (FONSI) or a requirement to complete an Environmental Impact Statement (EIS); 2) The EIS is a full-disclosure document that presents a full and unbiased discussion of significant impacts, informing the public and decision makers of reasonable alternatives to the proposed action; and 3) A Categorical Exclusion is used for actions which do not individually or cumulatively have a significant effect on the human environment and which have been found to have no such effect in procedures adopted by the Department of Navy in implementation of federal regulations and for which, therefore, neither an EA nor and EIS is required. (PL 91-190; 42 USC 4321-4347, January 1, 1970, as amended by PL 94-52; July 3, 1975, PL 94-83, August 9, 1975, and PL 97-258, Section 4(b), Sept. 13, 1982)
Noise Control Act (42 USC §§4901-4918)	The Noise Control Act of 1972 (42 USC § 4901 et seq.) (as amended by the Quiet Communities Act) authorizes establishment of federal noise emission standards for products distributed in commerce, and coordinates federal research efforts in noise control.
Noxious Plant Control Act (43 USC §1241)	The Noxious Plant Control Act of 1974 (PL 90-583; 43 USC § 1241) provides for the control of noxious plants on lands under control or jurisdiction of the federal government.
Oil Pollution Act (33 USC §§2701-2762)	The Oil Pollution Act of 1990 (OPA) (33 USC §§ 2701 et seq.) provides that the National Contingency Plan (NCP) include planning, rescue and minimization of damage to fish and wildlife in responding to oil pollution.

Outdoor Recreation-Federal/State Programs Act	The Outdoor Recreation-Federal/State Programs Act of 1963 (PL 88-29; 16 USC §§ 460[L] et seq.) provides for the management of lands used for outdoor recreation. Requires consultations with U.S. National Park Service regarding management.
Plant Protection Act (7 USC. §§7701-7786)	The Plant Protection Act of 2000 consolidates related responsibilities that were previously spread over various legislative statutes. It provides that the Secretary of the Department of Agriculture may issue regulations "to prevent the introduction of plant pests into the United States or the dissemination of plant pests within the United States".
Porter-Cologne Water Quality Control Act	The Porter-Cologne Water Quality Control Act of 1969 (California Water Code §§ 13000 et seq.) is the state's primary water law. It gives the State Water Resources Control Board (SWRCB) and the nine regional water quality control boards substantial authority to regulate water use.
Resource Conservation and Recovery Act (42 USC §§6901-6992k)	The Resource Conservation and Recovery Act of 1976 (RCRA; 42 USC §§ 692 et seq.) establishes a comprehensive program which manages solid and hazardous waste. Subtitle C, Hazardous Waste Management, sets up a framework for managing hazardous waste from its initial generation to its final disposal. Waste pesticides and equipment/containers contaminated by pesticides are included under hazardous waste management requirements. Penalties: Civil penalties for RCRA violations can result in fines up to $37,500 per 2013 monetary increases, FR 78(215): 66643-66648.
Rivers and Harbors Act	Rivers and Harbors Act of 1899 (Section 10) regulates work in navigable water of the United States.
Safe Drinking Water Act (42 USC §§300f et seq.)	The Safe Drinking Water Act of 1974 (SDWA; 42 USC §§ 300[f] et seq.), SDWA, prescribes treatment and distribution control strategies for abating contamination of drinking water and also requires the establishment of a permit program to regulate injection of liquids into underground strata. The SDWA provides for direct control of underground injection of fluids that may affect groundwater supplies. States may assume the predominant role in executing groundwater protection programs. The EPA has direct responsibility only if a state chooses not to participate in an underground injection control (UIC) program.
(16 U.S.C. §668a-c)	Taking and using of the bald and golden eagle for scientific, exhibition, and religious purposes
Sikes Act Improvement Act (16 USC §670a-670o)	The Sikes Act Improvement Amendments of 1997 (16 USC § 670a et seq.) (SAIA) requires military installations to prepare and implement integrated natural resource management plans (INRMPs) to provide for conservation and rehabilitation of natural resources, sustainable multipurpose uses of resources, and public access for use of natural resources, subject to safety and military security considerations.
Soil Conservation Act (16 USC §590A)	The Soil Conservation Act of 1936 (PL 74-46; 16 USC § 590A) provides for application of soil conservation practices on federal lands. Requires federal agencies to control and prevent soil erosion and preserve natural resources in managing federal lands.
Stream Alteration Controls	The Department of Fish and Game's authority over the use of suction dredges (Fish and Game Code, § 5653), alterations of fish spawning areas (Fish and Game Code, § 1505), and alterations of stream beds in general (Fish and Game Code, §§ 1601 et seq.) are all useful tools for the protection of instream resources (but generally not for riparian vegetation outside of the stream or overflow areas). The §§1601-1603 agreements (§1601 covers public projects, while §1603 addresses private work) do not have the status of state approvals under law, instead providing for a negotiation and agreement process.
Wild and Scenic River Act (16 USC §1274)	The Wild and Scenic River Act of 1968 (PL 90-542; 16 USC § 1274) requires identification and protection of any river or stream that qualifies under the Act.
Youth Conservation Corps Act (16 USC §1701)	The Youth Conservation Corps Act of 1972, amended (PL93-408 as amended; 16 USC § 1701) expands and makes permanent a Youth Conservation Corps (YCC) program and establishes objectives for youth employment and conservation work on public lands.

B.2 EXECUTIVE ORDERS RELEVANT TO NATURAL RESOURCES

EO 11514 Protection and Enhancement of Environmental Quality	Signed: 5 Mar 1970. Under this EO, the Federal Government must provide leadership in protecting and enhancing the quality of the nation's environment to sustain and enrich human life. Federal agencies must initiate measures needed to direct their policies, plans, and programs so as to meet national environmental goals. Amends: EO 11472, 29 May 1969 Amended by: EO 11541, 1 Jul 1970; EO 11991, 24 May 1977
EO 11988 Floodplain Management	Signed: 24 May 1977. Prevents Federal agencies from contributing to the "adverse impacts associated with the occupancy and modification of floodplains" and the "direct or indirect support of floodplain development." In the course of fulfilling their respective authorities, Federal agencies "shall take action to reduce the risk of flood loss, to minimize the impact of floods on human safety, health, and welfare, and to restore and preserve the natural and beneficial values served by floodplains." Before proposing, conducting, supporting, or allowing an action in a floodplain, each agency is to determine if planned activities will affect the floodplain and evaluate the potential effects of the intended actions on its functions. Agencies shall avoid siting development in a floodplain "to avoid adverse effects and incompatible development in the floodplains," This order includes wetlands that are within the 100-year floodplain and especially discourages filling. Revokes: EO 11296, 10 Aug 1966 Amended by: EO 12148 (Federal Emergency Management), 20 Jul 1979
EO 11989 Off-Road Vehicles on Public Lands	Signed: 24 May 1977. Provides for closing areas to off-road vehicle use where soil, wildlife, or other resources are adversely affected. Amends EO 11644 (Use of Off-road Vehicles on The Public Lands) of 1972 by exempting fire, military, emergency, law enforcement, or combat/combat support vehicles.
EO 11990 Protection of Wetlands	Signed: 24 May 1977. Directs all Federal agencies to "take action to minimize the destruction, loss, or degradation of wetlands, and to preserve and enhance the natural and beneficial values of wetlands". This applies to the acquisition, management, and disposal of federal lands and facilities; to construction of improvements undertaken, financed, or assisted by the federal government; and to the conduct of federal activities and programs which affect land use. Section 4 of the EO requires that when federally owned lands are leased and easement is assigned, or when disposed of to a non-federal party, a reference be included in the conveyance to identify any wetlands and indicate those uses which are restricted in such areas. Amends: EO 11644, 8 Feb 1972
EO 11991 Environmental Impact Statements	Signed: 24 May 1977. Amends EO 11514 (Protection and Enhancement of Environmental Quality) to require Council on Environmental Quality (CEQ) to issue regulations to make environmental impact statements more effective. Amends: EO 11514, 5 Mar 1970
EO 12088 Federal Compliance with Pollution Control Standards	Signed: 13 Oct 1978. Ensures that Federal agencies would comply with federal, state, and local pollution control requirements. EO 12088 requires each federal agency to take all necessary actions to ensure they meet their pollution control responsibilities with respect to federal facilities and activities under the control of the agency. "Applicable pollution control standards" are the same control standards required of private individuals in substance and procedure. EO 12088 requires each federal agency to cooperate with EPA, state, interstate, and local agencies in the prevention, control, and abatement of environmental pollution. Revokes: EO 11752, 17 Dec 1973 Amended by: EO 12580 (Superfund Implementation), 23 Jan 1987 Revoked in part by: EO 13148, 21 Apr 2000
EO 13112 Invasive Species	Signed: 3 Feb 1999. The Invasive Species Executive Order requires executive agencies to restrict the introduction of exotic organisms into natural ecosystems. Establishes federal agency responsibilities for the identification and management of invasive species. Restricts federal agencies in the use of exotic plant species in any landscape and erosion control measures. Amended by: EO 13286, 28 Feb 2003 Continued by: EO 13708 (Continuance or Reestablishment of Certain Federal

	Advisory Committees), 30 Sep 2015 Revokes: EO 11987 (Exotic Organisms), 24 May 1977
EO 13186 Responsibilities of Federal Agencies To Protect Migratory Birds	Signed: 10 Jan 2001. Directs executive departments/agencies to take certain actions regarding the protection of migratory birds. Among these actions is the development and implementation of a MOU with the USFWS within two years of the EO on the protection and conservation of migratory birds.
EO 13352 Facilitation of Cooperative Conservation	Signed: 26 Aug 2004. Ensures that the Departments of the Interior, Agriculture, Commerce, and Defense and the Environmental Protection Agency implement laws relating to the environment and natural resources in a manner that promotes cooperative conservation, with an emphasis on appropriate inclusion of local participation in Federal decisionmaking, in accordance with their respective agency missions, policies, and regulations.
EO 13653 Preparing the United States for the Impacts of Climate Change	Signed: 1 Nov 2013. Directs Federal agencies to take steps that will make it easier for American communities to strengthen their resilience to extreme weather and to prepare for other impacts of climate change. Focus areas: Modernizing Federal Programs to Support Climate-Resilient Investments; Managing Lands and Waters for Climate Preparedness and Resilience; Providing Information, Data, and Tools for Climate Change Preparedness and Resilience; and Planing for Climate Change-related Risk.
EO 13693 Planning for Federal Sustainability in the Next Decade	Signed: 19 Mar 2015. The goal of EO 13693 is to maintain Federal leadership in sustainability and greenhouse gas emission reductions. Federal Agencies shall, where life-cycle cost-effective, beginning in fiscal year 2016, unless otherwise specified, promote building energy conservation, efficiency, and management. This EO seeks to cut the federal government's greenhouse gas emissions 40% over the next decade (from 2008 levels) and increase the share of electricity the federal government consumes from renewable sources to 30%. In addition, the EO directs federal agencies to ensure 25% of their total energy (electric and thermal) consumption is from clean energy sources by 2025; reduce energy use in federal buildings by 2.5% per year between 2015 and 2025; reduce per-mile greenhouse gas emissions from federal fleets by 30% (from 2014 levels) by 2025 and increase the percentage of zero-emission and plug-in hybrid vehicles in federal fleets; and reduce water intensity in federal buildings by 2% per year through 2025. Amends: EO 13327, 4 Feb 2004; EO 13432, 14 May 2007; EO 13653, 1 Nov 2013; EO 13677, 23 Sep 2014. Revokes (directly or indirectly): EO 12780 (Federal Agency Recycling and the Council on Federal Agency Recycling and Procurement Policy), 31 Oct 1991; EO 12856 (Federal Compliance with Right-to-Know Laws and Pollution Prevention Requirements), 3 Aug 1993; EO 12873 (Federal acquisition, recycling, and waste prevention), 20 Oct 1993; EO 13101 (Greening the Government through Waste Prevention, Recycling, and Federal Acquisition), 14 Sep 1998; EO 13123 (Greening the Government Through Efficient Energy Management), 3 Jun 1999; EO 13134 (Developing and Promoting Biobased Products and Bioenergy), 12 Aug 1999; EO 13148 (Greening the Government Through Leadership in Environmental Management), 21 Apr 2000; EO 13149 (Greening the Government Through Federal Fleet and Transportation Efficiency), 21 Apr 2000; EO 13423 (Strengthening Federal Environmental, Energy, and Transportation Management), 24 Jan 2007; EO 13514 (Federal Leadership in Environmental, Energy, and Economic Performance), 5 Oct 2009.

B.3 FEDERAL REGULATIONS, DIRECTIVES, AND INSTRUCTIONS

Code of Federal Regulations (CFR)	
15 CFR 990	5 Jan 1996. NOAA Regulations on Natural Resource Damage Assessments.
32 CFR 172	28 Aug 1989. Disposition of Proceeds from Sales of Surplus Property.
32 CFR 188	1 Jul 2011. Environmental Effects in the United States of DOD Actions.
32 CFR 190	1 Jul 2000. Natural Resources Management Program.
32 CFR 775	1 Jul 1999. Procedures for Implementing the National Environmental Policy Act. Dept. of Navy policy to supplement DOD regulations (32 CFR 214) by providing policy and assigning responsibilities to the Navy and Marine Corps for implementing CEQ regulations and implementing NEPA.
33 CFR 156	4 Sep 1990. Coast Guard Regulations for Universal Waste Management Standards.
33 CFR 320-330	13 Nov 1986. Navigation and Navigable Waters
33 CFR 330	22 Nov 1991. Dredge & Fill Nationwide Permit Program.
33 CFR 332	1 Jul 2012. Compensatory Mitigation for Losses of Aquatic Resources
40 CFR 6	19 Sep 2007. EPA Regulations on Implementation of NEPA Procedures.
40 CFR 50	25 Nov 1971. Environmental Protection Agency (EPA) Regulations on National Primary and Secondary Ambient Air Quality Standards.
40 CFR 122	1 Apr 1983. EPA National Pollutant Discharge Elimination System Permit Regulations.
40 CFR 125	7 Jun 1979. EPA Regulations on Criteria and Standards for the National Pollutant Discharge Elimination System.
40 CFR 130	11 Jan 1985. EPA Requirements for Water Quality Planning and Management.
40 CFR 141-143	24 Dec 1975. EPA National Drinking Water Regulations.
40 CFR 150-186	1 Jul 2010. EPA Regulations for Pesticide Programs.
40 CFR 230	24 Dec 1980. EPA Interim Regulations on Discharge of Dredged or Fill Material into Navigable Waters.
40 CFR 273	11 May 1995. EPA Regulations for Universal Waste Management Standards.
40 CFR 279	10 Sep 1992. Used Oil Management Standards.
40 CFR 1500	1 Jul 2011. Council on Environmental Quality Regulations. Defines the methods of implementing the National Environmental Policy Act (NEPA).
43 CFR 11	1 Aug 1986. Department of the Interior (DOI) Regulations on Natural Resource Damage Assessments.
50 CFR 10	15 Aug 1973. Regulations Concerning Marine Mammals.
50 CFR 10.13	1 Nov 2013. List of Migratory Birds.
50 CFR 13	4 Jan 1974. General Permit Procedures.
50 CFR 17.11 and 17.12	26 Sep 1975. Fish and Wildlife Service List of Endangered and Threatened Wildlife.
50 CFR 21	28 Feb 2007. Migratory Bird Permits; Take of Migratory Birds by the Armed Foreces (aka “Migratory Bird Rule”)
50 CFR 402	3 Jun 1986. Interagency Cooperation - Endangered Species Act of 1973.
65 CFR 8834	22 Feb 2000. Unified Federal Policy for a Watershed Approach to Federal Land and Resource Management
73 CFR 44761	31 Jul 2008. Endangered and Threatened Wildlife and Plants, Recovery Credit Guiidance

Department of Defense (DOD) Directives, Instructions, and Manuals	
DOD Directive 3210.06	6 Feb 2014. Defense Grant and Agreement Regulatory System (DGARS)
DOD Directive 4150.07	29 May 2008. DoD Pest Management Program.
DOD Directive 4700.4	24 Jan 1989. Natural Resources Management Program.
DOD Directive 4705.01E	3 Jun 2015. Management of Land-Based Water Resources in Support of Contingency Operations
DOD Directive 4715.1E	19 Mar 2005. Environment, Safety, and Occupational Health (ESOH)

DOD Directive 4715.7	22 Apr 1996. Environmental Restoration Program
DOD Directive 4715.11	10 May 2004. Environmental and Explosive Safety Management on Operational Ranges Within the United States. Certified current as of April 24, 2007.
DOD Directive 4715.20	9 Mar 2012. Defense Environmental Restoration Program (DERP) Management.
DOD Directive 4715.21	14 Jan. 2016. Climate Change Adaptation and Resilience
DOD Directive 5100.76	17 Apr 2012. Physical Security of Sensitive conventional Arms, Ammunition, and Explosives. Reissues COC Directive 5143.01 and DOD Instruction 5100.76
DOD Instruction 1100.21	3 Mar 2002. Voluntary Services in the Department of Defense. Incorporating Change 1, December 26, 2002
DOD Instruction 4140.01	14 Dec 2011. DoD Supply Chain Materiel Management Policy.
DOD Instruction 4150.07	27 May 2008. DoD Pest Management Program.
DOD Instruction 4715.02	28 Aug 2009. Regional Environmental Coordination.
DOD Instruction 4715.03	18 Mar 2011. Environmental Conservation Program.
DOD Instruction 4715.06	4 May 2015. Environmental Compliance in the United States.
DOD Instruction 4715.4	18 Jun 1996. Pollution Prevention. Administrative Reissuance Incorporating Change 1, July 6, 1998
DOD Instruction 5100.76	28 Feb 2014. Safeguarding Sensitive Conventional Arms, Ammunition, and Explosives (AA&E)
DOD Instruction 6055.06	21 Dec 2006. DoD Fire and Emergency Services (F&ES) Program
DOD Instruction 8130.01	9 Apr 2015. Installation Geospatial Information and Services (IGI&S)
DOD Manual 4150.07, vol 3	23 May 2013. DoD Pest Management Training and Certification Program: The DoD Plan for the Federal Insecticide, Fungicide, and Rodenticide Act Pesticide Applicators
DOD Manual 4715.03	25 Nov 2013. Integrated Natural Resources Management Plan (INRMP) Implementation Manual.
DOD Manual 4715.20	9 Mar 2012. Defense Environmental Restoration Program (DERP) Management
DOD Manual 5100.76	17 Apr 2012. Physical Security of Sensitive Conventional Arms, Ammunition, and Explosives (AA&E)
DOD Manual 6055.06-M	16 Sep 2010. DoD Fire and Emergency Services (F&ES) Program. Incorporating Change 1, 16 Sep 2010.
DOD Manual 6055.09-M	Revised 12 Mar 2012. DoD Ammunition and Explosives Safety Standards: General Explosives Safety Information and Requirements
DOD Draft Guide	Apr 2016. Readiness and Environmental Protection Integration (REPI) Program Guide for Buffer Partnerships.

Department of the Navy Manuals and Instructions	
NAVFAC P-73	Real Estate Manual P-73. This manual sets forth the authority of the Commander, Naval Facilities Engineering Command (NAVFACENGCOM), for outgrant of Navy controlled real property. Responsibility for administration, management, and utilization of Navy real property lies with the Commanding Officer, and his superiors, of the installation to whose plant account the property belongs. NAVFACENGCOM does not have general responsibility for management of Navy real property, except for lands of installations under its command. However, NAVFACENGCOM has a technical responsibility for real estate action on lands which have been determined temporarily or partially excess.
NAVFACINST 6250.3H	Applied Biology Program Services and Training. Requires the use of an integrated pest management approach to minimize the use of herbicides.
NAVFACINST 11012.111A	Land Use Conservation Planning.
NAVFACINST MO-100.4	Guidance on Special Interest Areas.
OPNAVINST 11010.40	Encroachment Management Program
OPNAVINST 3710.7U	1 Mar 2004. NATOPS General Flight and Operating Instructions

OPNAVINST 5090.1D	10 Jan 2014. Chief of Naval Operations Instruction, Environmental Readiness Program, updates OPNAVINST 5090.1C
OPNAV M-5090.1	10 Jan 2014. Chief of Naval Operations, Environmental Readiness Program Manual.
OPNAVINST 5380.1C	7 Jan 2013. Acceptance and Use of Voluntary Services in the Navy
OPNAVINST 5530.13C	26 Sep 2003. Department of the Navy Physical Security Instruction for Conventional Arms, Ammunition, and Explosives (AA&E).
OPNAVINST 5530.14E CH-2	23 Sep 2014. Change Transmittal 2.Navy Physical Security and Law Enforcement Program.
OPNAVINST 6250.4C	11 Apr 2012. Navy Pest Management Programs. Requires Navy and Marine Corps to have a comprehensive Pest Management Plan. Discusses the need to control pest outbreaks which affect the military mission, damage property, or impact the welfare of people.
SECNAVINST 5090.8A	30 Jan 2006. Policy for Environmental Protection, Natural Resources, and Cultural Resources.
SECNAVINST 6240.6E	1977. Implementation of DOD directives under DOD Instruction 4700.4.
SECNAVINST 11011.47C	26 Aug 2013. Acquisition, Management, and Disposal of Real Property and Real Property Interests by the Department of the Navy
Navy Comptroller (NAVCOMPT) Manual Volume 3	This manual provides policy, regulation, and procedures within the area of primary support responsibility and technical guidance of the Comptroller of the Navy. Volume 3 focuses on Appropriation, Cost, and Property Accounting
Navy Tactics, Techniques, and Procedures (NTTP) 3-07.2.3	August 2011 edition. Law Enforcement and Physical Security NTTP 3-07.2.3. Guidance from CNO; Letter of Approval from CNIC.

B.4 MEMORANDA AND OTHER AGREEMENTS

Policy Memoranda	
President	Presidential Memorandum of 16 Apr 2010, A 21st Strategy for America's Great Outdoors
President	Presidential Memorandum of 20 Jun 2014, Creating a Federal Strategy to Promote the Health of Honey Bees and Other Pollinators
President	Presidential Memorandum of 03 Nov 2015, Mitigating Impacts on Natural Resources from Development and Encouraging Related Private Investment.
Secretary of the Navy	SECNAV Memorandum of 19 Jan 2001, Implementation Guidance for Executive Order on Protection of Migratory Birds
Secretary of the Navy	SECNAV Memorandum of 15 Aug 2002, Access to Outdoor Recreation Programs on Military Installations for Persons with Disabilities
Secretary of the Navy	SECNAV Memorandum of 25 Nov 2002, Policy Guidance for Endangered Species Actions
Office of the Assistant Secretary of Defense	OASD Memorandum of 20 Jul 2015, Guidelines for Streamlined INRMP Review. Attachment: Mutual Department of Defense & U.S. Fish and Wildlife Service Guidelines for Streamlined Review of Integrated Natural Resources Management Plan Updates.
Office of the Assistant Secretary of Defense	OASD Memorandum of 31 Jul 2015, Reporting Environmental Program Management Information for Fiscal Year 2015.
Office of Under Secretary of Defense	OUSD Memorandum of 3 Apr 2007, Guidance to Implement the Memorandum of Understanding to Promote the Conservation of Migratory Birds
Office of Under Secretary of Defense	OUSD Memorandum of 7 Apr 2014, Strategic Plan for Bird Conservation and Management on Department of Defense Lands.
Office of Under Secretary of Defense	OUSD Memorandum of 20 Jun 2014, Sikes Act Implementing Procedures – Clarifying the Role of the U.S. Fish and Wildlife Service and State Agencies.
Office of Under Secretary of Defense	OUSD Memorandum of 5 Sep 2014, Department of Defense Policy to Use Pollinator Friendly Management Perscriptions
DON OGC	DON OGC Memorandum of 28 Jul 2010
Chief of Naval Operations	CNO Memorandum of 10 Jan 2002, Policy Letter Preventing Feral Cat and Dog Populations on Navy Property
Chief of Naval Operations	CNO Memorandum of 25 Jul 2003, Section 7 Consultation Procedures Under the Endangered Species Act
Chief of Naval Operations	CNO Memorandum of 9 Sep 2008, Policy Guidance for Compliance with the Bald and Golden Eagle Protection Act
COMNAVFACENGCOM	COMNAVFACENGCOM Memorandum of 2 Jul 1996, Guidelines for Establishment of Ecological Areas
COMNAVFACENGCOM	COMNAVFACENGCOM, Real Estate Operations and Natural Resources Management Procedural Manual NAVFAC P-73 Volume II
Commander, Naval Installations Command	Integrated Natural Resources Management Plan Guidance for Navy Installations of 10 Apr 2006
Fire Executive Council	13 February 2009. Guidance for Implementation of Federal Wildland Fire Policy Memorandum to USDA Forest Service, Bureau of Indian Affairs, Bureau of Land Management, Fish and Wildlife Service, and National Park Service.
U.S. Fish and Wildlife Service	USFWS Memorandum of 15 Apr 2003, Migratory Bird Permit Memorandum (Subject: Nest Destruction)
U.S. Fish and Wildlife Service	USFWS Memorandum of 2 May 2003, Guidance for the Establishment, Use, and Operation of Conservation Banks

Memoranda of Agreement (MOA)	
Conduct of Forest Insect and Disease Suppression on Lands Administered by the	MOA between the United States Department of Agriculture and the United States Department of Defense for the Conduct of Forest Insect and Disease Suppression on Lands Administered by the U.S. Department of Defense, 11

U.S. DOD	Dec 1990

Memoranda of Understanding (MOU)	
Cooperative Integrated Natural Resource Management Program on Military Installations	MOU among DOD, USFWS, and International Association of Fish and Wildlife Agencies for Cooperative Integrated Natural Resource Management Program on Military Installations. (Last signature date: July 2013; Expires: ten years)
Pollinator Partnership	MOU between DOD and the Pollinator Partnership (Last signature date: February 2015; Expiration: none)
Promote the Conservation of Migratory Birds	MOU between DOD and USFWS to promote the conservation of migratory birds (Last signature date: September 2014; Expires: five years)
Continuation of the Cooperative Ecosystem Studies Units (CESU) Network	MOU among multiple Federal Agencies for the Continuation of the Cooperative Ecosystem Studies Units (CESU) Network (Last signature date: October 2012; Expires: 2017)
Bat Conservation	MOU between the DoD and Bat Conservation International (Last signature date: October 2006; Expires: 2011); MOU extension (Expires: 2019)
Achieving Objectives of Partners in Amphibian and Reptile Conservation	MOU among multiple Federal Agencies for Achieving Objectives of Partners in Amphibian and Reptile Conservation (PARC) (Last signature date: March 2012; Expiration: none)

Cooperative Agreements	
Cooperative Agreement to establish a policy of cooperation and coordination to identify, document, and maintain biological diversity on DOD installations	Cooperative Agreement between the DOD and The Nature Conservancy to establish a policy of cooperation and coordination to identify, document, and maintain biological diversity on DOD installations (Signed: December 1988; Expiration: none)

B.5 NAVWPNSTA SEAL BEACH AND DETACHMENT FALLBROOK INSTRUCTIONS AND NOTES

The following are selected Naval Weapons Station (NAVWPNSTA) Seal Beach (SB) and Detachment Fallbrook (DF) Instructions and Notes.

NAVWPNSTA	
SBINST 5040.1D Zone Inspection Program	10 Nov 2015. Provides guidance and establishes procedures for conducting zone inspections in all spaces and areas (excluding earth-covered magazines). Zone inspections provide an opportunity for the early detection of potential environmental and other compliance discrepancies to facilitate timely corrections.
SBINST 5090.5A Environmental Requirements Review and NEPA Documentation Procedures for Projects, Business Practices, and Land Use	01 Nov 2007. This Seal Beach Instruction outlines the responsibilities and actions for the Environmental Requirements Review (ERR) process and integrates consideration of environmental impacts into all business and project planning processes as part of the command's overall Environmental Management System (EMS).
SBINST 5090.5B Environmental Aspects and Requirements Review (EARR) Procedures for Actions, Projects, Business Practices, and Land Use	28 Mar 2012. This Seal Beach Instruction describes the process and roles and responsibilities for incorporating environmental review into all projects and actions that occur at the Installation or its Detachments. It provides site specific implementation policy to uphold the letter and intent of the National Environmental Policy Act.
SBINST 5090.6C Environmental Readiness Program and Environmental Management System (EMS)	19 Mar 2015. Provides guidance, procedures, and assigns roles and responsibilities to implement the Navy's environmental policies.
SBINST 5090.7 Hazardous Materials Control and Management (HMC&M) Program	11 Jun 2009. This Seal Beach To implement a Hazardous Materials Control and Management (HMC&M) Program at Naval Weapons Station (NAVWPNSTA) Seal Beach, per references (a) through (c) and applicable DoD and Navy guidance. The purpose of the HMC&M Program is to ensure worker safety, and comply with all applicable laws and regulations governing the use of hazardous materials. The HMC&M Program is also a fundamental element of the command Occupational Safety and Health (OSH) Voluntary Protection program (VPP) and the Environmental Management System (EMS), reference (d). The HMC&M Program provides crucial support to emergency planning and response per references (e) and (f).
SBINST 8020.6A Ammunition and Explosives Operations Safety Policy	12 Nov 2015. Provides guidance and direction in implementing the Explosives Safety Program. Implementation ensures the safety of personnel and facilities and enhances operational readiness by minimizing the possibility of injury, loss of life and property damage.
SBNOTE 1301* Assignment of Personnel to Primary and Collateral Duties	15 Dec 2014. Publishes the assignment of Naval Weapons Station Seal Beach personnel primary and collateral duties.
SBDFINST 6100.1, Change Transmittal 1 Walking, Jogging , Bicycling Policy	5 Feb 2015. This Detachment Fallbrook Instruction modifies NAVWPNSTASBDETFBINST 6100.1 (12 July 2012), which establishes the policy and guidelines for outdoor activities to include walking, jogging and bicycling aboard Naval Weapons Station Seal Beach Detachment Fallbrook.
* Copy of NAVWPNSTASBNOTE 1301 is provided at the end of this Appendix with pages relevant to the assignment of Installation Environmental Program Director and Natural Resources Management duties at Detachment Fallbrook.	

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B.6 ASSIGNMENT OF PERSONNEL TO PRIMARY COLLATERAL DUTIES

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DEPARTMENT OF THE NAVY
NAVAL WEAPONS STATION SEAL BEACH
800 SEAL BEACH BOULEVARD
SEAL BEACH, CA 90740-5000

CANC FRP: Sep 15
IN REPLY REFER TO:
NAVWPNSTASBNOTE 1301
N00
15 Dec 2014

NAVWPNSTA SEAL BEACH CA NOTICE 1301

Subj: ASSIGNMENT OF PERSONNEL TO PRIMARY AND COLLATERAL DUTIES

Ref: (a) OPNAVINST 3120.32D
(b) U. S. Navy Regulations, 1990

Encl: (1) List of Primary Duty Assignments
(2) Collateral Duty Assignments

1. Purpose. To publish the assignment of Naval Weapons Station Seal Beach personnel primary and collateral duties.

2. Cancellation. NAVWPNSTASBNOTE 1301 of 15 Nov 14.

3. Background. Reference (a) is the basis for assignments of primary and collateral duties. Reference (b) vests in the Commanding Officer (CO) the authority to assign personnel under his or her command primary duties based on the individual's capabilities and command manpower requirements. For positions requiring designation in writing, this notice fulfills that requirement. Enclosures (1) and (2) constitute official notification of primary duties, collateral duties, and assignments to boards, councils, and committees.

4. Responsibility. All initial assignments and subsequent changes must originate from the Executive Officer (XO) in consonance with the desires of the CO. Installation Program Directors (IPDs) submit recommended changes to enclosures (1) and (2) to the Command Admin IPD. IPDs will review turnover files in instances where officers in their departments are relieved. The Executive Officer will review the files for relief's involving IPDs or senior board members.

5. Action. The primary and collateral duties contained in enclosures (1) and (2) are effective this date. No additional directives will be issued unless specifically required for the duty assigned. It is the responsibility of each person assigned duties by this notice to review applicable references, maintain required records, files, and submit required reports to the CO and XO. Periodic review (i.e., quarterly collateral duty programs) of collateral duties will be conducted and an internal

command self-assessment audit will be completed. A memorandum of internal audit completion will be routed to the CO via the XO and Command Admin IPD for review.

6. Cancellation Contingency. This notice will remain in effect until superseded by another notice of the same subject matter.

M. H. HARDY

Distribution:
Electronic only, via NAVWPNSTA Seal Beach Web site

LIST OF PRIMARY DUTY ASSIGNMENTS

Billet Title	Org	Rank/Name	Telephone (DSN)
Commanding Officer	N00	CAPT Martin H. Hardy	873-7901
Executive Officer	N01	CDR Erik Franzen	873-7902
Director Det Fallbrook & NORCO	N01	Mr. Anthony Winicki	873-3609
Officer In Charge Det Norco	N01	CDR Wayne Goveia	873-7392
Command Senior Chief	N00F	ADCS Jeff Reeder	873-7687
Command Admin IPD	N04C2	Mr. Drew Martinez	873-7519
Inspector General IPD	N00G	Ms. Karen Burrows	873-7194
Public Affairs IPD	N00P	Mr. Gregg Smith	873-7215
Security Det Norco	N3AT	Mr. Anthony Herrera	933-4335
Security Det Fallbrook	N3AT	Major Chuepheng Lo	873-3748
Security IPD	N3AT	CW03 Roderick Harris	873-7625
Anti-Terrorism Officer	N3AT	MAC Henry Alderete	873-7415
Fire Chief Seal Beach	N30	Mr. Danny Parks	873-7005
Port Operations IPD	N31	Mr. Albert Rosales	873-7206
NAVOSH IPD	N35C	Mr. James Olinger	873-7390
Training and Readiness IPD	N36	Mr. Patrick Harding	873-7209
Emergency Management IPD	N37C	Mr. Dave Yeager	873-7872
Explosives Safety IPD	N39	Mr. Anthony Kennedy	873-7009
Facilities IPD	N44	LCDR Ray Oviedo	873-7291
Environmental IPD	N45WS	Mr. David Baillie	873-6068
Information Technology IPD	N6	Dr. Sang Nguyen	873-7100
MWR IPD	N92	Mr. John Clingan	873-7615
BQ Housing IPD	N931A	Mr. Keith Perry	873-7227

COLLATERAL DUTY ASSIGNMENTS

Collateral Duty Governing Instruction	Name	PRD	Loc
Air Program Media Manager	Mr. Julian Ibarra		SB/FB/NOR
OPNAVINST 5090.1D			
Agricultural & Rancher Out Lease Media Coordinator			
OPNAVINST 5090.1D	Mr. Robert Schallmann		SB
	Ms. Christy Wolf		FB
***Apprenticeship Program Coordinator**			
OPNAVINST 1560.10C	MA1 Purcell Tabron	Jun-16	SB
Asbestos Control Program			
OPNAVINST 5100.23G	Mr. Leon Williams		SB/FB/NOR
Auxiliary Security Force Coordinator			
NAVPERSCOMINST 5530.4A	MAC Ronnie Ray	Apr-16	
Base Clean-up/Material Condition			
COMNAVREGSWINST 3120.3A	VACANT		SB
	VACANT		
***Base/Region Indoctrination**			
COMNAVREGSWINST 3120.3A	ADCS Jeff Reeder	Jan-17	SB
Beneficial Suggestion Awards Program			
DOD 1400.25M	Ms. Tara Banks		SB
***UH Advisory Board**			
COMNAVREGSWINST 11103.1B	CDR Erik Franzen	Sep-17	SB
Bachelor Housing Ref Guide Series	ADCS Jeff Reeder	Jan-17	SB
	Mr. Keith Perry		
	BQ Residence Rep		
***Career Development Board**			
BUPERSINST 1040.5A	ADCS Jeff Reeder	Jan-17	SB
	NC1 Chanitra Mitchell	Apr-18	SB

COLLATERAL DUTY ASSIGNMENTS

Collateral Duty Governing Instruction	Name	PRD	Loc
National Environmental Policy Act Program			
OPNAVINST 5090.1D	Ms. Lisa Bosalet		SB/FB/NOR/SP
Natural Resources Manager			
OPNAVINST 5090.1C	Mr. Robert Schallmann		SB/NOR/SP
	Ms. Christy Wolf		FB
NAVOSH Councils and Committees Programs			
OPNAVINST 5100.23G	Mr. James Olinger		SB/FB/NOR
***Navy Family Ombudsman**			
OPNAVINST 1750.1G OPNAVINST 1740.4D	Mrs. Lynette Deleon		SB
***Navy Pride & Professionalism Coordinator**			
LOCAL REQUIREMENT	ADCS Jeff Reeder	Jan-17	SB
	NC1 Chanitra Mitchell	Nov-17	
Navy-Marine Corps Relief Officer			
SECNAVINST 5760.14D SECNAVINST 5340.7	MA1 Jarvis Battle	Dec-16	SB
Officer Candidate Programs			
OPNAVINST 1530	CAPT Martin Hardy	Jun-16	SB
OPNAVINST 1500 MILPERSMAN	CDR Erik Franzen	Sep-17	SB
OPSEC Coordinator			
OPNAVINST 3432.1A	MA1 Jonathan Prichard	Jul-15	SB/FB/NOR
Quality of Life Advisory Board			
OPNAVINST 1700.7E	ADCS Jeff Reeder	Jan-17	SB

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APPENDIX C

NEPA

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02 May 2016

MEMORANDUM FOR THE RECORD

TO: Administrative Record

Subj: IN SUPPORT OF 2006 ENVIRONMENTAL ASSESSMENT (EA) FOR REVISED INTEGRATED NATURAL RESOURCES MANAGEMENT PLAN FOR NAVAL WEAPONS STATION SEAL BEACH DETACHMENT FALLBROOK

1. **Determination:** It has been determined that the Environmental Assessment (EA) and Finding of No Significant Impact (FONSI) completed for the 2006 Integrated Natural Resources Plan (INRMP) for Naval Weapons Station (NAVWPNSTA) Seal Beach Detachment Fallbrook (Detachment Fallbrook) sufficiently meets the National Environmental Policy Act (NEPA) requirements for the 2016 revised INRMP. The likely and occurring effects of the revised INRMP would not be significantly different or qualitatively more severe than what was documented in the 2006 INRMP EA and FONSI. Therefore, no additional NEPA documentation is required for the 2016 revised INRMP for Detachment Fallbrook.

2. **History:** Detachment Fallbrook's current INRMP was completed in 2006. That same year, an EA was prepared and a FONSI was signed by Vice Commander Navy Region Southwest. Since that time, a revision to the INRMP has been initiated and the existing EA for the original 2006 INRMP has been reviewed for adequacy.

3. **Changes in the 2016 Revised INRMP from the Original 2006 INRMP:** Revisions to the 2006 INRMP were driven by the 2006 Navy Guidance on preparing INRMPs and the need to: incorporate updated guidance and regulatory documents; update environmental data and references; reduce redundancies; and streamline document structure for ease of use and future updates. Although extensive organizational and structural changes were made to the revised INRMP, only minor revisions and updates have been made to the management of the natural resources at Detachment Fallbrook.

There is no increase in potential environmental impacts, and revisions from the 2006 INRMP to the revised INRMP are not expected to result in biophysical consequences materially different from those anticipated in the 2006 INRMP and analyzed in existing NEPA documentation.

a. **Updated Guidance and Management Resources:** Additional guidance on management strategies and methodology has been included in the revised INRMP. This includes, for example, consideration of potential future climate scenarios as additional stressors to the environment during adaptive management planning. The revised INRMP includes references to updated studies, such as the soil erosion inventory, and planning documents, such as the Grazing Management Plan. These management resources aid the Navy in managing natural resources at Detachment Fallbrook in a sustainable manner and do not add to impacts from military activities. Guidance modifications or clarifications do not change the overall intent of management actions, nor do they increase project impacts. Instead, they allow for more consistency in scientific data collection to support the INRMP.

b. **Habitat Proposals and Designations:** The revised INRMP includes management strategies such as ongoing avoidance and minimization, survey and data collection, conservation measures, and site approval through the NEPA process that have provided for sufficient special management or protection benefits that preclude the need for designation of critical habitat for federally listed threatened or endangered species. In addition to the five federally listed threatened or endangered species addressed in the 2006 INRMP, the revised INRMP addresses the potential benefits of existing activities for two federally listed endangered species that may, on a rare or incidental occasion, temporarily forage on or transit through the property.

c. **Base Operations and Natural Resources:** The revised INRMP clarifies roles and responsibilities and how the overall base operators and the natural resources program are integrated. This provides a broader framework for identifying mutual mission and natural resources opportunities.

d. **Current Conditions Updates:** The revised INRMP includes updates to baseline and trend data collection for Detachment Fallbrook. Ongoing activities such as species specific annual surveys, population and density calculations, invasive species management, and adaptive species management are included in the revised INRMP. Updates to the installation's official flora and fauna species inventories, with improved citation documentation, are provided as appendices. The project list in Appendix L, which provides the nexus with management actions and budget planning, was updated to reflect a more complete budgetary implementation of the INRMP since the 2006 document.

e. **Document Structure Updates:** The revised INRMP conforms to the current guidance for preparation of INRMPs, consolidates the presentation of natural resources management activities and projects, and moves much of the information that would require annual updating to appendices. This will make the required annual updates easier to complete. The structure changes did not change proposed military activities or increase potentially adverse effects on the natural resources.

4. **Conclusion:** The existing EA and FONSI for the INRMP (2006) sufficiently meets the NEPA requirements for the 2016 revised INRMP, including:

a. The likely and occurring effects of the revised INRMP would not be significantly different or qualitatively more severe than what was analyzed in the 2006 INRMP EA and FONSI.

b. In light of the relatively minor changes associated with potential implementation of the revised INRMP, the Navy has concluded that there is no potential for significant impacts beyond the scope of what was addressed in the 2006 EA and FONSI.

c. The revised INRMP uses the same ecosystem approach to management as the original INRMP and EA. However, individual management strategies have been more clearly defined. The updated information will further enhance the sustainability of the resources on Detachment Fallbrook.

Subj: IN SUPPORT OF 2006 EA FOR REVISED INTEGRATED NATURAL RESOURCES MANAGEMENT PLAN FOR NAVAL WEAPONS STATION SEAL BEACH DETACHMENT FALLBROOK

Therefore, neither additional NEPA analysis nor an opportunity for public comment is deemed warranted for Detachment Fallbrook's 2016 revised INRMP.

5. The INRMP will continue to be reviewed and updated in the future, as needed, to accurately reflect the mission and management of natural resources on Detachment Fallbrook. As the INRMP is revised, the existing NEPA documents would also be reviewed to ensure adequacy.

Connie Moen

CONNIE MOEN
N45 NEPA Coordinator

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APPENDIX D

REAL ESTATE AND OTHER AGREEMENTS

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D.1 REAL ESTATE AGREEMENTS

For a current list of real estate agreements at Detachment Fallbrook, see Table 2-3 in Chapter 2.

Based on the Real Estate Summary Map from August 2012 (NAVFAC DWG NO. 18137943), which is provided in this appendix, the Navy owns in fee the 8,852.267 acres that comprise Detachment Fallbrook. This total acreage is based on the 9,147.55 acres from when the Navy originally acquired the land on 28 January 1942, less a disposal of 294.37 acres to the County of San Diego on 25 October 1962 for the purpose of an airport and the transfer of a small triangular section (0.913 acres) in the southwest corner of the installation to MCB Camp Pendleton in November 1973. Although there were originally conditions on the deed to the County of San Diego that specified the land must be used solely for the purpose of the airport, a later amendment allowed for other revenue generating activities (e.g., Colorspot nursery today).

The real estate agreements pertaining to land use at Detachment Fallbrook are also listed in Table 2-3. The largest of Detachment Fallbrook's real estate agreements is the agricultural lease of a majority of the acreage for livestock grazing, which serves to manage fuel loads to control wildfire.

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ESTATES ACQUIRED BY U.S.A.

ITEM NO.	ESTATE	ACRES	*	GRANTOR & RECORD DOCUMENT	DATE ACQUIRED	AFFECTED BY ITEMS	PROPERTY RECORD NO.	LEGISLATIVE JURISDICTION	ACTIVITY
(1)	FEE	9147.55	F	DECLARATION OF TAKING, CIVIL ACTION NO. 139, RECORDED 01/28/42 IN BOOK 1311, PAGE 1 O.R.	01/28/42				

DISPOSALS VIA FORM DD-1354 "TRANSFER AND ACCEPTANCE OF MILITARY REAL PROPERTY"

ITEM	ESTATE	ACRES	*	INSTALLATION/ACTIVITY/SERVICE	TRANSFER DATE	DOCUMENT	PROPERTY RECORD NO.	AFFECTED ITEMS	ACTIVITY
1	FEE	0.913	F	FROM: NAVAL WEAPON STATION SEAL BEACH TO: MARINE CORPS BASE, CAMP PENDLETON	11/26/73			(1)	

ENCUMBRANCES AND OUTGRANTS

ITEM	ESTATE	ACRES	*	GRANTEE & RECORD DOCUMENT	DATE GRANTED	AFFECTS ITEMS	PROPERTY RECORD NO.
1	EASEMENT (Flood Zone)	284.5	C	THE RIGHT FOR RANCHO SANTA MARGARITA TO FLOOD, AND STORE WATERS OF THE SANTA MARGARITA RIVER AND ITS TRIBUTARIES UP TO THE ELEVATION OF 300' ABOVE SEA LEVEL	01/28/42		
2	EASEMENT (Electrical)	0.988	D	SAN DIEGO GAS & ELECTRIC STIPULATION AND ORDER OF EXCLUSION PROPERTY MAY 8TH, 1944 WIDTH NOT SHOWN IN DOCUMENT	05/08/44		
3	PERMIT (Electrical)	3.417	D	SAN DIEGO GAS & ELECTRIC DOC NO. 090151-0456 NOV(R) 46450	01/25/52		
4	EASEMENT (Electrical)	3.714	F	SAN DIEGO GAS & ELECTRIC FILE/PAGE NO. 75-093067 NF(R) 23664 EXPIRES 0/20/2025	03/20/75		
5	EASEMENT (Drainage)	0.03	D	FALLBROOK MANOR APARTMENTS DOC NO. 5625 N6247481RP00P03 EXPIRES 07/10/2031	07/10/81		
6	EASEMENT (Sewer)	13.672	A	FALLBROOK SANITARY DISTRICT DOC NO. 82-073633 N6247482RP00P73	03/08/82		
7	EASEMENT (Reclaimed Water)	0.91	D	FALLBROOK PUBLIC UTILITY DISTRICT DOC NO. 1992-0616490, AMENDED BY DOC NO. 1998-0829280 RECORDED 12/18/1998 N6871192RP02P98	09/17/92		

ESTATES DISPOSED OF BY U.S.A.

ITEM	ESTATE	ACRES	*	GRANTEE & RECORD DOCUMENT	DATE DISPOSED	RESERVED EASEMENTS	DISPOSAL ITEM
(1)	FEE	294.37	F	COUNTY OF SAN DIEGO FILE NO. 64058, PAGES 617-619, SERIES 4, BOOK 1963	04/15/63		

REAL ESTATE ACREAGE SUMMARY

ESTATE	ACQUISITIONS							ENCUMBRANCES AND OUTGRANTS	
	PURCHASE	CONDEMNATION	CEDED	TRANSFER	EXCHANGE	RESERVATION	TOTAL		
FEE	8852.27 AC*1						8852.27 AC*1		
EASEMENTS								EASEMENTS	18.33 AC*2
LEASE								LEASES	
OTHER								OTHER	3.42 AC
TOTAL	8852.27 AC						8852.27 AC*1	TOTAL	21.75 AC

REAL ESTATE SUMMARY NOTES:

*1) TOTAL COMPRISED OF ITEMS: (1) (1) (1)

*2) TOTAL COMPRISED OF ITEMS: (4) (5) (6) (7)

*ACREAGE NOTES:

A) ACREAGE TAKEN FROM PREVIOUS RESM.

B) ACREAGE CANNOT BE DETERMINED DUE TO UNSPECIFIED OR INSUFFICIENT DIMENSIONS.

C) ACREAGE CALCULATED FROM DEED DESCRIPTION.

D) ACREAGE CALCULATED FROM DEED DIMENSIONS.

F) ACREAGE FROM DEED OR SUPPORTING DOCUMENTS.

LEGEND:

- INDICATES BASE BOUNDARY.
- INDICATES TRACT LINE.
- INDICATES TOWNSHIP AND RANGE LINE.
- INDICATES SECTION LINE.
- INDICATES INGRANT EASEMENT.
- INDICATES OUTGRANT EASEMENT.

BASIS OF BEARINGS & COORDINATES:

THE BASIS OF BEARING FOR THIS SURVEY IS THE CALIFORNIA COORDINATE SYSTEM OF 1983, (EPOCH 1991.35), ZONE 6, AS DETERMINED LOCALLY FROM THE FOLLOWING GEODETIC CONTROL STATIONS FROM THE INTEGRATED GEOSPATIAL INFORMATION SYSTEM FOR MCB CAMP PENDELTON DATED DECEMBER 29, 1999:

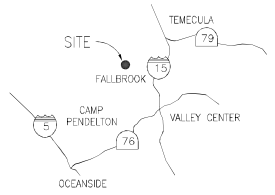
STATION	NORTHING	EASTING	COMBINATION FACTOR
8	2072551.81	6241520.41	0.99993668
17	2064905.91	6246156.92	0.99993739
447	2072183.22	6249926.70	0.99993097

DATUM STATEMENT:

ALL MEASURED DISTANCES SHOWN ARE GRID. APPROXIMATE GROUND DISTANCES MAY BE OBTAINED BY DIVIDING GRID BY AN AVERAGE COMBINATION FACTOR 0.99993097.

SURVEY NOTE:

1. PERIMETER PROPERTY LINE DIMENSIONS ARE BASED UPON RECORD OF SURVEY 21303, FILE NO. 2012-0453923, FILED IN THE OFFICE OF THE COUNTY RECORDER OF SAN DIEGO COUNTY, RECORDED ON AUGUST 2, 2012.
2. THIS REAL ESTATE SUMMARY MAP (RESM) WAS BASED UPON A REVIEW OF U.S. NAVY MONUMENT DOCUMENTS.



VICINITY MAP

GREGORY HELMER P.L.S. 5134

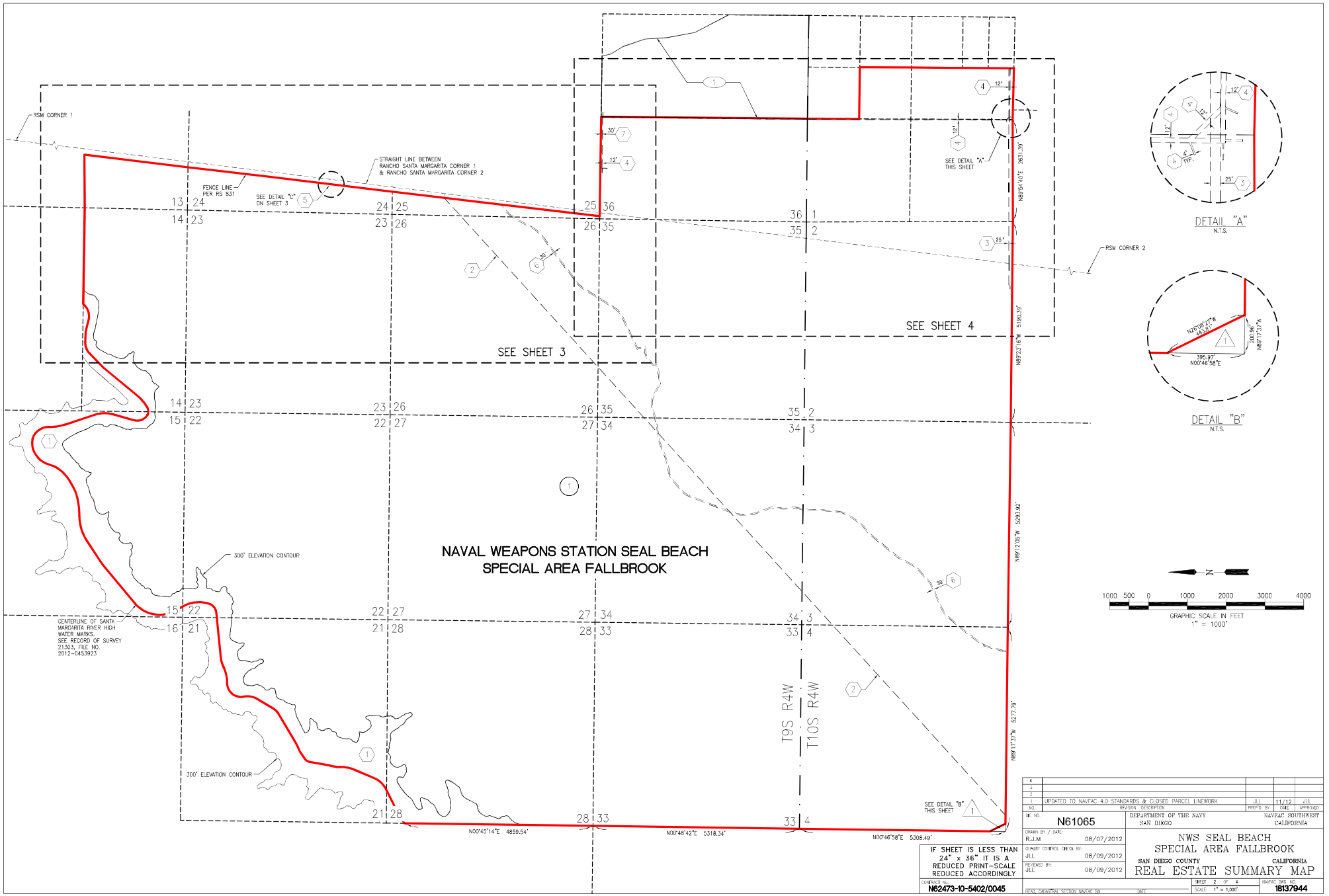
PROFESSIONAL LAND SURVEYOR GREGORY HELMER NO. 5134 STATE OF CALIFORNIA

IF SHEET IS LESS THAN 24" x 36" IT IS A REDUCED PRINT-SCALE REDUCED ACCORDINGLY

NO.	REVISION DESCRIPTION	PREP'D. BY	DATE	APPROVED
4				
3				
2				
1	UPDATED TO NAVFAC 4.0 STANDARDS & CLOSED PARCEL LINEWORK	JLL	11/12	JLL

DRAWN BY / DATE:	R.J.M 08/07/2012
QUALITY CONTROL CHECK BY:	J.L. 08/09/2012
REVIEWED BY:	JLL 08/09/2012
CONTRACT NO.:	N62473-10-5402/0045
FIELD CADASTRAL SECTION NAVFAC SW	DATE

UIC NO.	N61065
	DEPARTMENT OF THE NAVY NAVFAC SOUTHWEST SAN DIEGO CALIFORNIA
	NWS SEAL BEACH SPECIAL AREA FALLBROOK
	SAN DIEGO COUNTY CALIFORNIA
	REAL ESTATE SUMMARY MAP
SHEET	1 OF 4
SCALE:	NO SCALE
NAVFAC DWG NO.	18137943



NO.	REVISION DESCRIPTION	PREP'D. BY	DATE	APPROVED
1	UPDATED TO NAVFAC 4.0 STANDARDS & CLOSED PARCEL LINEWORK	JLL	11/12	JLL

IF SHEET IS LESS THAN 24" x 36" IT IS A REDUCED PRINT—SCALE REDUCED ACCORDINGLY

DRAWN BY / DATE: R.J.M 08/07/2012
QUALITY CONTROL CHECK BY: JLL 08/09/2012
REVIEWED BY: JLL 08/09/2012

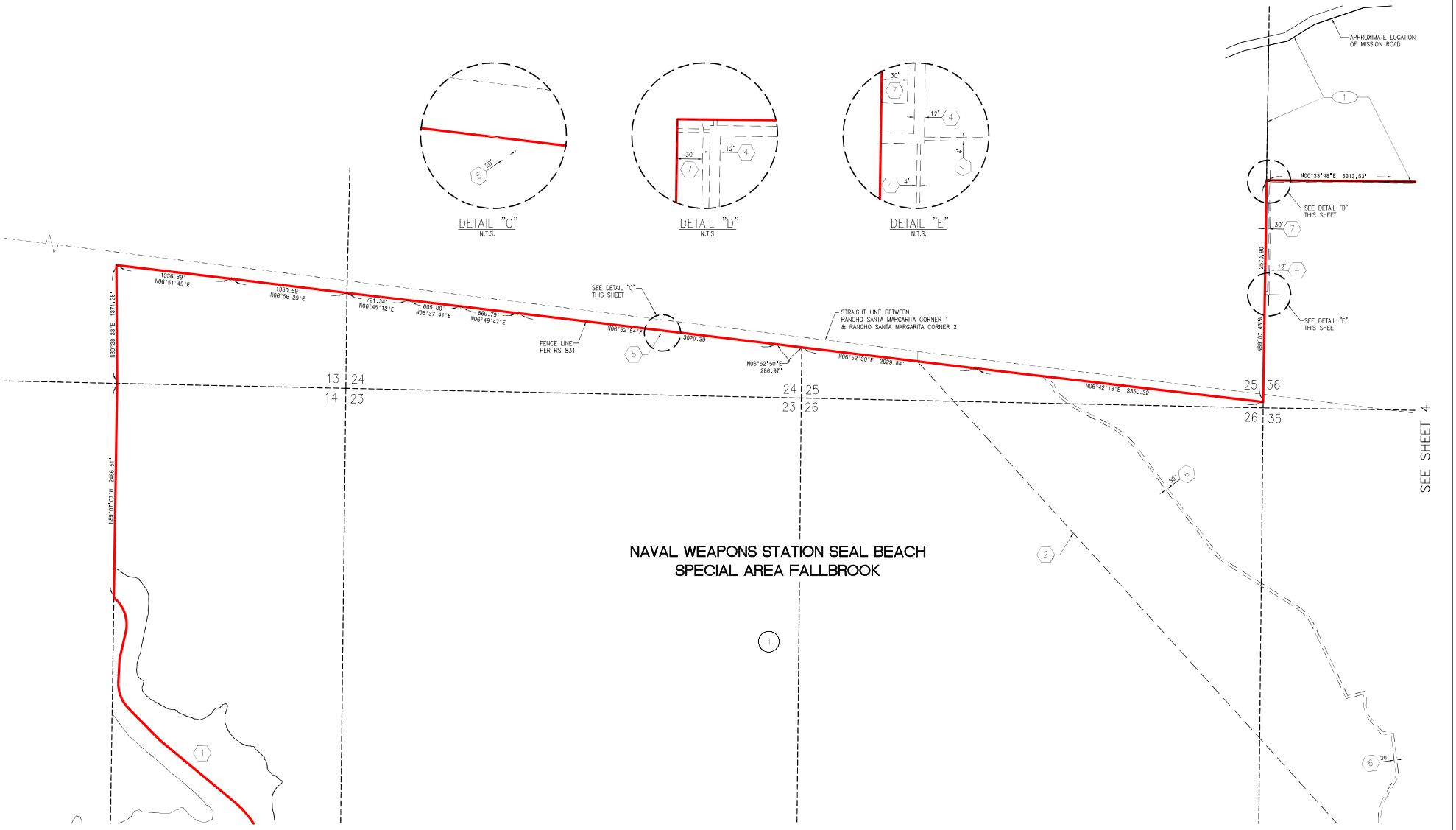
CONTRACT NO. N62473-10-5402/0045

DEPARTMENT OF THE NAVY
SAN DIEGO
NAVFAC SOUTHWEST
CALIFORNIA

NWS SEAL BEACH
SPECIAL AREA FALLBROOK
SAN DIEGO COUNTY CALIFORNIA
REAL ESTATE SUMMARY MAP

DWG NO. N61065
SHEET 2 OF 4
SCALE 1" = 1,000'
NAVFAC DWG NO. 1813744

READ, CADASTRAL SECTION NAVFAC SW DATE



NO.	REVISION DESCRIPTION	PREP'D. BY	DATE	APPROVED
4				
3				
2				
1	UPDATED TO NAVFAC 4.0 STANDARDS & CLOSED PARCEL LINEWORK	JLL	11/12	JLL

IF SHEET IS LESS THAN 24" x 36" IT IS A REDUCED PRINT—SCALE REDUCED ACCORDINGLY

DWG NO. N61065

DEPARTMENT OF THE NAVY
SAN DIEGO

NAVFAC SOUTHWEST
CALIFORNIA

DRAWN BY / DATE: R.J.M 08/07/2012

QUALITY CONTROL CHECK BY: JLL 08/09/2012

REVIEWED BY: JLL 08/09/2012

NWS SEAL BEACH
SPECIAL AREA FALLBROOK

SAN DIEGO COUNTY CALIFORNIA

REAL ESTATE SUMMARY MAP

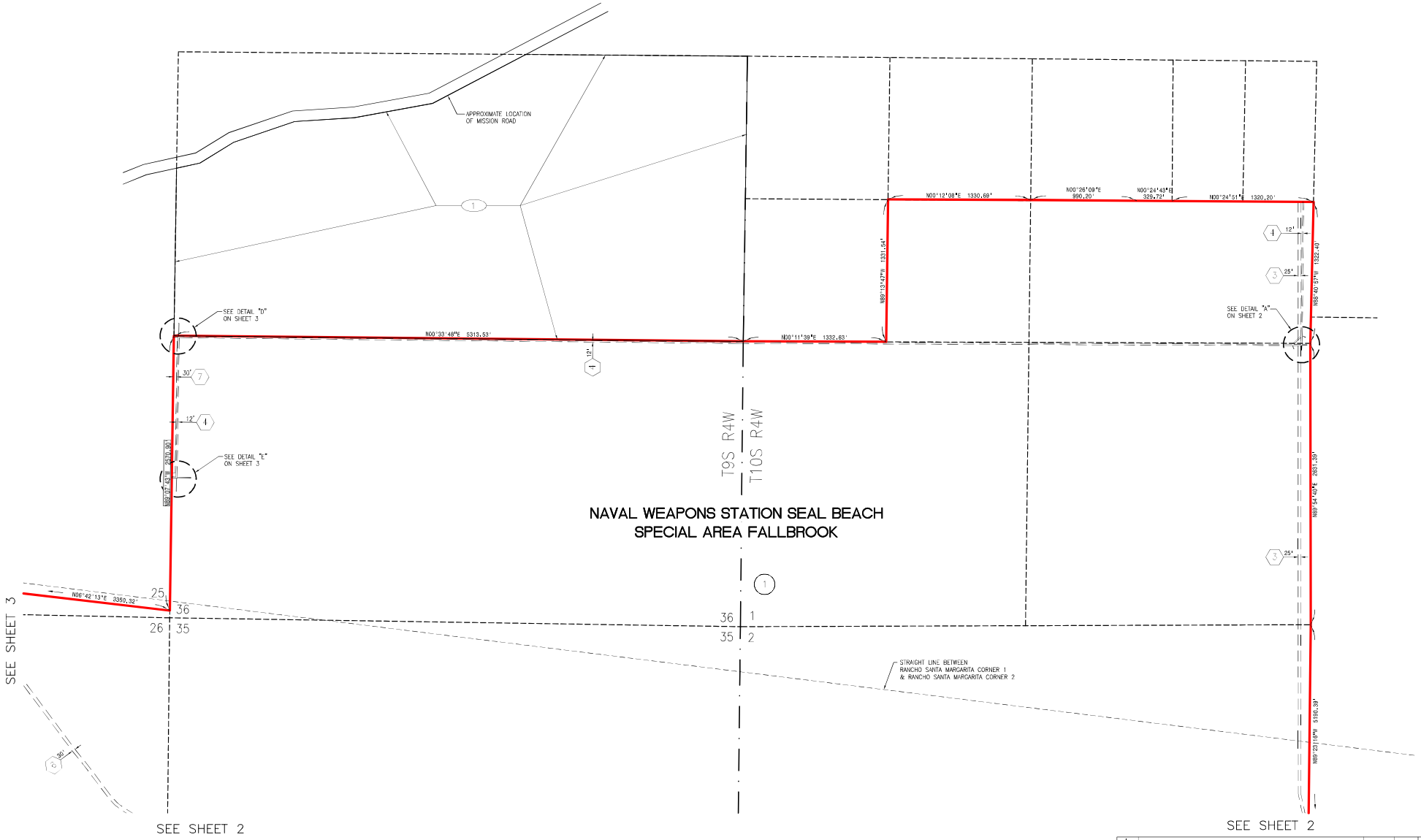
CONTRACT NO. N62473-10-5402/0045

SHEET 3 OF 4

NAVFAC DWG NO. 18137945

REAL ESTATE CADASTRAL SECTION NAVFAC SW DATE

SCALE: 1" = 500'



NO.	REVISION DESCRIPTION	PREP'D. BY	DATE	APPROVED
1	UPDATED TO NAVFAC 4.0 STANDARDS & CLOSED PARCEL LINEWORK	JLL	11/12	JLL

IF SHEET IS LESS THAN 24" x 36" IT IS A REDUCED PRINT—SCALE REDUCED ACCORDINGLY

CONTRACT NO. N62473-10-5402/0045

UIC NO. N61065

DRAWN BY / DATE: R.J.M 08/07/2012

QUALITY CONTROL CHECK BY: JLL 08/09/2012

REVIEWED BY: JLL 08/09/2012

HEAD, CADASTRAL SECTION NAVFAC SW — DATE

DEPARTMENT OF THE NAVY
SAN DIEGO
NAVFAC SOUTHWEST
CALIFORNIA

NWS SEAL BEACH
SPECIAL AREA FALLBROOK
SAN DIEGO COUNTY CALIFORNIA
REAL ESTATE SUMMARY MAP

SHEET 4 OF 4
SCALE: 1" = 400'

NAVFAC DWG NO. 18137946

APPENDIX E

BASE OPERATION CONTROLS

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Contents

Page

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E.1 GENERAL ENVIRONMENTAL RULES FOR DETACHMENT FALLBROOK

E.1.1 Environmental Rules Applicable to All Personnel

Land use management decisions shall be guided by the installation's Integrated Cultural Resources Management Plan and Integrated Natural Resources Management Plan (NAVWPNSTASBINST 5090.6C).

All personnel shall receive environmental awareness training and an appropriate level of job-specific environmental training.

All practice owners are responsible for understanding and documenting compliance with environmental requirements within their area of responsibility.

Any potential action that may have a significant environmental effect must be authorized by the EPSO via the NEPA review process (see Section 5.4). Additional avoidance/minimization measures and permitting may be required.

No off-road vehicle travel is permitted without prior authorization from be authorized by the Environmental Programs and Services Office (EPSO), with exception for emergency-response situations.

All vegetation disturbance, ground disturbance, and ground disturbing activities must be authorized by the EPSO via the NEPA review process.

Do not disturb, harm, harass, collect, or possess wildlife. Many species are protected or regulated by one or more state or federal laws and violations may incur personal liability to include fines or imprisonment.

Possession or feeding of wildlife, including feral domestic animals, regardless of docility or tameness, is prohibited.

Personnel who encounter potential conflicts with nesting birds or other wildlife in the work place or within a project area shall refer to the EPSO for guidance.

There is no hunting or fishing on Detachment Fallbrook.

Do not litter.

Hazardous waste shall be disposed of in authorized containers and following official procedures.

Use of hazardous chemicals must be pre-approved by EPSO and on the Authorized Use List.

Obey posted speed limits.

No smoking outside of designated areas.

Pets shall be kept on a leash or in owner's control at all times. No domestic animal or exotic pet shall be released onto Detachment property.

Movement of firewood onto Detachment Fallbrook from off-installation sources is prohibited (see Sections 4.14 and 4.15).

E.1.3 Environmental Rules Applicable Public Works (N4)

Any construction activities that create holes or trenches that may present a pitfall hazard to wildlife shall be covered daily, without gaps, when not in use or include a sloped side or other ramp to allow for exit.

Minimize fugitive dust during construction activities. Water conservation during dust control shall be exercised.

All construction equipment and vehicles shall be power washed and free of soil prior to entering the Detachment.

No nighttime construction work is permitted without prior authorization from EPSO.

Perform maintenance tree/brush trimming or clearing outside of the peak nesting season for migratory birds (see Section E.2.1).

If a bird if flushed from a nest or a nest with eggs or chicks is found, stop work immediately and contact the Conservation Program Manager (760-731-3425) or EPSO Service Desk (562-626-6676).

Raptor nests are often used for many years and, even when not actively in use, they shall be left in place and intact to the greatest extent practicable.

Tree trimming equipment shall operate from the roads as much as possible.

Landscape maintenance shall minimize the use of water, use native species to the greatest extent feasible, and follow the plant lists provided in Appendix G.

All project activities including staging and laydown must be confined to pavement or areas pre-approved by EPSO.

All wildlife-related service calls or issues shall be communicated to the EPSO for review.

Pest management shall follow the Integrated Pest Management Plan, emphasize prevention, minimize the use of pesticides, and avoid potential effects to non-target species to the greatest extent feasible.

The importation of soil or other potential substrate such as gravel from non-installation sources requires approval from the EPSO and shall be avoided to the greatest extent feasible. If importing such materials is approved, they must be certified as clean from both a hazardous waste consideration and for potential organic material (e.g. invasive species such as red imported fire ants).

Best management practices that facilitate pollution prevention and minimize stormwater should be considered for all activities and implemented where feasible and appropriate (see Section E.2.9). Construction projects with more than 1-acre of ground disturbance are required to develop and implement a construction stormwater pollution prevention plan.

E.2 GENERAL STANDARD OPERATING PROCEDURES (SOPS) FOR DETACHMENT FALLBROOK

E.2.1 Nesting Birds

For a brief description of avian diversity, ecology, and management on Detachment Fallbrook, see Sections 3.9 and 4.11. As the majority of bird species on the installation are legally protected by one or more federal laws, it is important that base operations avoid and minimize potential adverse impacts to these animals.

Birds are especially vulnerable during the breeding season when they are nesting. Contact EPSO if nesting birds are identified in a structure or in a location that presents a potential conflict with mission operations. Perform maintenance tree trimming outside of the peak nesting season for migratory birds (tree trimming should be performed from 1 September – 1 March in any given year). Brush trimming within coastal sage scrub (e.g., for roadside maintenance) shall be performed between 1 September – 15 February, which is outside of the peak nesting season for the coastal California gnatcatcher.

Raptor nests are often used for many years and, even when not actively in use, shall be left in place and intact to the greatest extent practicable.

If a project has the potential to affect nesting birds or nesting substrate (including annually recurring nesting trees), the Conservation Program Manager should be contacted to determine if there will be any violations of the MBTA.

All projects, scopes of works, contracts, and agreements that involve vegetation manipulations or outdoor construction or demolition should have the following language: “If a contractor identifies any bird within the contract area that appears to be attempting to build a nest, utilizing a nest, or laying eggs, the contractor must immediately notify the Conservation Program Manager. If nesting birds or eggs are encountered, the contractor must phase the work to avoid disturbing the birds so the contract can be completed within stated time scheduled and within the contract price. The contractor cannot take action to remove the bird or the nest from the area which is being used. This action must be conducted or authorized by a qualified biologist of the federal government.”

Discourage habitation of buildings and facilities by birds. Discourage birds from occupying buildings through appropriate and biologically acceptable measures. Implement measures to seal openings in buildings where birds may enter. Use Nixalite®, owl decoys, and signs prohibiting the feeding of birds where appropriate to discourage birds from inhabiting Detachment Fallbrook facilities.

E.2.2 Vegetation/Landscaping Maintenance

Any vegetation alteration or disturbance must be authorized by EPSO. Clear zones identified in the Wildland Fire Management Plan and/or the INRMP (e.g. along fencelines, around magazines) should be maintained to their specifications. If maintenance lapses and vegetation grows to an extent where removal of whole trees or shrubs will be required, contact EPSO for project review.

Vegetation maintenance shall comply with the procedures identified in Section E.2.1 regarding nesting birds.

Landscaping designs shall use plant species that are native to the region to the greatest extent feasible (see Section 4.15). Native species pose little to no risk for becoming invasive and tend to

be naturally more drought tolerant. Some ornamental landscaping species, on the other hand, can become very invasive on the natural landscape. See Appendix G for a list of plant species that are acceptable for planning on Detachment Fallbrook and a list of species that shall not be planted under any circumstances. The use of pollinator-friendly plants in landscaping is encouraged.

The importation of soil, substrate, and plant materials shall be from local nurseries that are certified to have been inspected and free of especially injurious plant pests and diseases. See Sections 4.14 (Pest Management and Animal Control) and 4.15 (Invasive Species).

Landscape maintenance shall minimize the use of water (see Section E.2.10, Water Conservation), fertilizers, and pesticides (see Sections 4.14, 4.15, and E.2.5, Pesticide Usage).

E.2.3 Presence of Bats

For a description of bat diversity, ecology, and management on Detachment Fallbrook, see Sections 3.9, 4.12, and 4.14. Although bats are an important part of the ecosystem and several species on Detachment Fallbrook are California species of special concern, bats can become a nuisance with the accumulation of their guano and the potential for health risks in magazines and occupied buildings.

Bats shall be discouraged from entering buildings by the sealing of holes and cracks. Prior to the sealing of a building, and prior to building demolition and renovation projects, buildings shall be inspected to ensure no bats are roosting. When situations dictate the exclusion of bats that have already begun roosting from magazines, buildings, or other manmade structures, every effort shall be made to conduct the operation in a humane manner.

Exclude access to bat roosting sites after maternity season and before winter hibernation (dates will depend on which species are present, exclusion typically should be performed from 15 October – 15 March of any given year. No attempt to remove animals shall be made during these vulnerable periods of seasonal occupancy.

Provide alternate bat roost locations (e.g., bat houses) to the extent feasible. Bat boxes or bat houses shall be installed by, or under the supervision of, EPSO to ensure appropriate design features and locations are considered. Bats are long-lived species and the provision of supplementary roost locations should be considered permanent to the greatest extent feasible.

E.2.4 Feral Domestic Animals

Feral animals (domestic breeds that are now free ranging), such as dogs and cats, are not native to the natural environment and can present a threat to human health and native wildlife populations. Possession or feeding of feral animals, regardless of docility or tameness, is prohibited. Feral animals are not native to the environment and, where feasible and appropriate, are live-trapped and removed. The Navy does not endorse Trap Neuter Release (TNR) or similar programs (OPNAV M-5090.1) (see Section 4.14).

Report observations of free-roaming feral animals to the EPSO. EPSO may call the Camp Pendleton Game Warden Office at (760) 725-3360 for assistance; direct calls to the Game Wardens from non-EPSO personnel are appropriate if EPSO personnel are not available.

E.2.5 Pesticide Usage

The Integrated Pest Management Plan (USDON 2011) identifies overall regulations and pest management objectives for Detachment Fallbrook. See also Section 4.14, Pest Management and

Animal Control. Pest management has both beneficial and detrimental impacts on natural resources. Pesticide applications, even non-chemical control practices, can have detrimental effects on non-target native flora and fauna.

Pest management shall reflect an integrated approach that includes an emphasis on pest prevention, pest surveys and monitoring, treatment on an as-needed basis, and tiered treatment methods that employ non-chemical or less toxic approaches to the greatest extent possible. All pest management record keeping shall be maintained via the Navy Online Pesticide Reporting System (NOPRS).

E.2.6 Rodent Control and Hantavirus

Rodents in general can be destructive to infrastructure and pose health hazards (e.g., hantavirus) especially when they co-inhabit spaces with humans.

Rodenticide use is to be limited on Detachment Fallbrook, and avoided altogether where possible, as native species can be poisoned directly and indirectly (through eating poisoned prey species). Rodenticide use must be approved by the Conservation Program Manager on a case-by-case basis.

Integrated pest management for rodent control shall emphasize prevention. Attractants for pest species shall be reduced near facilities. Habitat management is the preferred method of control. Ensure all outdoor trash containers are covered and that a sufficient number of them are located around Detachment Fallbrook facilities to discourage littering.

Mice and rats shall be discouraged from entering buildings using barriers. Seal all openings larger than 1/2 inch across with rodent proof materials such as cement or metal. Use metal flashing around the base of wooden structures to provide a strong metal barrier. Install so that the flashing reaches 12 inches above the ground and six inches down into the ground.

It is important to keep a clean work environment, especially kitchen facilities. Keep food covered in rodent-proof containers. Keep a tight-fitting lid on garbage. Set and keep spring-loaded rodent traps. Set traps near baseboards because rodents tend to run along walls and in tight spaces rather than out in the open. Locate garbage cans 100 feet or more from buildings and elevate to eliminate possible nesting sites. Where there are no Endangered Species Act concerns, encourage the presence of natural predators, such as non-venomous snakes, owls, and hawks.

Deer mice and harvest mice are the main carriers of hantavirus in the western United States. The prevention of Hantavirus infection is facilitated by implementing approved rodent prevention measures described above, such as keeping a clean work environment and the sealing of entry holes within buildings. Hantavirus is an airborn disease and occurs when particles from rodent droppings are inhaled. Hantavirus infection is an occupational hazard for personnel that enter enclosed spaces, such as ordnance magazines and utility boxes that are infested with deer mice and contain rodent droppings. Disturbing the droppings by sweeping increases the risk of inhaling dust containing the virus. Personal protection measures, such as using wet cleaning methods and wearing rubber gloves, will help lower exposure risk to airborne particles when cleaning rodent droppings. For additional information about rodent borne diseases and prevention measures, see the Center for Disease Control (http://www.cdc.gov/rodents/index.html) and County of San Diego Department of Environmental Health (http://www.sandiegocounty.gov/content/sdc/deh/pests/hantavirus.html) websites.

E.2.7 Power Line Maintenance

Vegetation falling on or blowing into power lines during windstorms can be a source of wildfire ignition and can disrupt electrical service. Facilitate vegetation maintenance along power lines

owned by San Diego Gas and Electric by providing station access and timely NEPA reviews of proposed actions. Vegetation around Navy-owned power lines should be trimmed so that it is not closer than 50-feet from the line. Trimming shall comply with the procedures identified in Section E.2.1 regarding nesting birds.

Installation of newer, avian friendly power poles or the retrofitting of older, existing poles with insulators will help avoid and minimize the mortality of birds from electrocutions, and minimize the potential fire hazard of such electrocutions.

E.2.8 Open Pipes and Pitfall Traps

Open pipes and other strutures that wildlife can fall into but not get back out of become death traps. Such traps can be of varying size (e.g., uncapped top of a chain link fence post, magazine vents, or monitoring wells).

To the greatest extent feasible, efforts should be made to avoid the creation of wildlife death traps with open pipes and other structures that birds may fall into and not be able to get out of. Where such features may be existing, efforts should be made to permanently screen or seal off the opening.

E.2.9 Soil Erosion Abatement and Conservation

OPNAVINST 5090.1D (Section 12-3.8.f), 10 January 2014 states: “Development and implementation of non-point source pollution management programs must ensure water quality protection and place special emphasis on preventing non-point source pollution from naturally-occurring or ground-disturbing actions (e.g., construction, farming, timber harvesting activities) in shoreline and streamside and near shore areas. Non-point source problem areas in undeveloped areas of installations should be identified, and INRMPs should be used to specify corrective measures, ensuring proper coordination with state coastal and non-point source programs.”

Projects with ground disturbance greater than 1 acre that discharges to any waterway require a Stormwater Pollution Prevention Plan.

Use the specific guidance for selecting Best Management Practices (BMPs) as presented in the California Storm Water Best Management Practices Handbook, including project planning and design guides, Storm Water Pollution Prevention Plans (SWPPP), Water Pollution Control Programs (WPCPs) preparation manuals, Construction Site BMPs Manual (State of California Department of Transportation 2003), other specifications in use on San Diego County projects, and other proven techniques, with the following strategy:

a) Minimize site disturbance;

b) Stabilize site disturbance;

c) Protect slopes and channels;

d) Control site perimeter;

e) Control internal erosion; and

f) After construction, add source-control BMPs and treatment control BMPs.

The selected construction contractor shall prepare and submit a SWPPP that shall be reviewed and approved by the Conservation Program Manager. This erosion and sediment control plan shall identify the types of BMPs used to control sediment and their appropriateness for the site conditions, identify specifications for the installation of each type of BMP, and specify the successful outcome criteria for each practice.

Minimize disturbance by locating staging areas in disturbed areas only. Staging areas shall be prohibited within sensitive habitat areas. Staging areas shall be delineated on the grading plans and reviewed by the resource agencies and project biological monitors prior to start of construction.

Enforce road building standards that minimize erosion (1990 Soil Erosion Inventory recommendation).

a) Periodic broad dips along permanent access roads will allow drainage to flow towards a dispersion area.

b) Only use culverts as a last resort and ensure they are stabilized with vegetation or sandbags.

Keep a record of the most effective BMPs for use in NEPA planning and mitigations.

Incorporate responsibilities for BMPs and sensitive resource protection in all real estate agreements (leases and easements) when they come up for renewal.

Continue to ensure that NEPA planners require that construction and road maintenance projects employ BMPs to minimize soil erosion.

Coordinate with other organizations when erosion concerns cross jurisdictional boundaries.

Provide guidance for routine maintenance activities while preventing erosion and protecting sensitive natural and cultural resources.

a) The first priority shall be to prevent, through proper planning, losses of environmental values due to impacts to soils, watersheds, habitats or species.

b) Compensate for unavoidable impacts to sensitive species.

c) When repair work becomes necessary, environmental staff will be notified early enough so the needed review, surveys, and documentation may be prepared without project delay.

d) When repair work becomes necessary, it should be prioritized according to its seriousness and potential impact to the natural resources based on the following criteria:

   (1) Safety or security, as for emergency or military vehicle access on secondary roads;

   (2) Potential for affecting high-value facilities or areas crucial to the military mission;

   (3) Likelihood of affecting a federally listed species (beneficially or otherwise), a jurisdictional wetland, or significant cultural resource;

   (4) Volume of potential soil or habitat loss due to environmental conditions such as rain or wind; and

   (5) Cost-effectiveness of the repair or control measure.

e) Continue to incorporate fuelbreak maintenance recommendations developed in the Detachment Fallbrook Wildland Fire Management Plan.

Stabilize disturbed sites with appropriate native erosion control plants or protective materials.

a) Plant disturbed sites with appropriate erosion control or landscape plants. Adopt locally-proven revegetation practices with standards for:

   (1) ground preparation

   (2) types of plants (native species when possible)

(3) seed mixtures of native species collected from the Detachment; if native seeds are not available on the Detachment, seeds should be collected locally. The contractor should contact the Conservation Program Manager for permission to collect seeds on the installation.

(4) fertilizing

(5) mulching

(6) irrigation

(7) timing of planting and irrigation

(8) maintenance

(9) cut/fill slope maximums

(10) success criteria or standards for compliance

b) Install water bars, retaining walls, or diversion culverts in areas of high runoff.

(1) Water bars or dips should be constructed on dirt roads located on slopes.

(2) Retaining walls should be erected along the uphill edges of roads where the road has created a significant cut bank.

(3) A system of cement diversion culverts or rock lined channels are appropriate for vegetated slopes.

Protect natural watersheds by minimizing the runoff of pollutants; at the same time, support operational requirements.

E.2.10 Water Conservation

Use low water use landscaping around administrative areas. New lawns are discouraged except where functionally essential. Lawns require frequent watering and should be restricted to formal areas such as for ceremonies or recreation fields. Replacing turf with native and drought tolerant plants in combination with rocks or gravel over bare areas will save large amounts of water. Turf replacement can also be done in a very aesthetically pleasing manner and can equal turf in terms of dust control.

Use automatic timers to water between midnight and 7 a.m. Set runtimes during periods of less wind velocity, usually dusk until dawn.

Lengthen the interval between irrigation events and increase the amount of water during each irrigation event to promote deep rooted turf. Deep watering once a week is preferable to more frequent, shallow watering which promotes surface rooting. In periods of drought, only deep soak shrubs and trees infrequently, and after they begin to show signs of water stress.

E.2.11 NAVSEA OP-5 Volume 1: Fire Prevention

Summary of some of many fire prevention requirements for explosives safety in NAVSEA OP-5 Volume 1, 7th Rev., Sect 4-1.

REQUIREMENT
PERSONNEL INDOCTRINATION: All personnel, supervisory or otherwise, shall be knowledgeable of the fire hazards, firefighting equipment, and safety practices of operations for which they are responsible. Each person shall be knowledgeable of the provisions in fire bills, both general and local, applicable to their operation so that each person knows the appropriate action to take if a fire emergency develops. FIRE WATCH: A qualified, adequately equipped fire watch shall be posted when maintenance and repair work, involving open flames and heat-producing devices is being conducted near or within an area or building where ammunition or explosives are processed, stored, or handled. The fire watch shall be within sight of, but no further than 20 feet from, the work being performed. The fire watch shall stand by and remain on station a minimum of 30 minutes after the operation is complete to ensure no future fire develops. At the end of the 30-minute standby period before departure, the fire watch will check the work site to ensure the site has cooled and no longer presents a hazard. FIRE AND FIRE PROTECTION EQUIPMENT INSPECTIONS: All areas and buildings of an ammunition activity shall be inspected to identify and correct any conditions likely to cause fire. All fire extinguishing and firefighting equipment shall be regularly (monthly or weekly in certain cases) inspected and properly maintained in accordance with approved written procedures. SMOKING REGULATIONS: Smoking shall be prohibited in magazines, buildings on piers or wharves, and any other Potential Explosion Site (PES); conveyance where ammunition, explosives, and related hazards are present, or areas restricted by the commanding officer. Exceptions may be authorized by the commanding officer for designated locations, at specified times and under specified conditions in accordance with SECNAVINST 5100.13 (series). SMOKING AREAS: Smoking areas should be located outside the fenced boundary of restricted areas and as far possible from any PES. Signs with “Designated Smoking Areas” shall be prominently posted at approved smoking areas. Necessary approved firefighting equipment shall be available. A 2½-gallon stored pressure water or equivalent type extinguisher shall be furnished in each approved smoking area. Exterior windows and doors of buildings designated as smoking areas shall be equipped with standard window and door screens that shall be kept in good repair. Screens are not required on exterior windows that cannot be opened or on doors with automatic closure devices. The door between an approved smoking room and the explosive area of an operating building must be Class B fire rated and equipped with a shatterproof window, adequate in size to observe personnel within the smoking room, and an automatic closure device. This door shall not be left open. HOUSEKEEPING: An essential element of any fire prevention effort is good housekeeping. Accumulations of combustible scrap, flammable residue, and explosive dust are primary sources of fires. Working surfaces, processing lines, storage and repair areas, supply and support activities, and transfer and shipping areas shall be kept clean and orderly to minimize fire hazards. Operating areas and spaces between buildings shall be kept clear of any combustible material. Rubbish and trash such as empty boxes, scrap lumber, nails, and strapping materials shall not be permitted to accumulate in these areas. GRASS OR BRUSH FIRES: When a grass or brush fire is discovered within a magazine area, the alarm shall be given immediately and the fire attacked at once if it is considered reasonable and safe to do so. Firefighting in grass or brush shall be conducted vigorously even though the fire may be immediately adjacent to or over a magazine. Local, state, or federal forest service officials should be consulted regarding the most dangerous period for forest and grass fires in the vicinity. During these periods, additional fire protective measures such as expanding the fire watch, securing extra equipment, and repairing or establishing firebreaks should be taken if necessary. FIREBREAKS: Vegetation, trees, grass, leaves, undergrowth, and weeds can become a serious fire hazard to structures and facilities. Vegetation may be ignited by sparks from locomotives or the exhaust of motor

vehicles; by personnel who are smoking; by careless and unauthorized use of matches, cigarette lighters, and similar flame-producing devices; by lightning; and by the sun reflecting on broken glass. Therefore, vegetation within 50 feet of any PES shall be maintained at a height of no more than 18 inches to create a firebreak, except where topography or other physical characteristics make this impossible. Vegetation should be controlled by chemical weed killer, cutting, plowing, or controlled burning, as necessary or appropriate.

TREES: All trees shall be removed from firebreaks. Trees outside firebreaks need only be removed if they present an immediate hazard to the PES, such as a dead or damaged tree. Trees alongside revetments or ground barriers need not be removed unless there is danger of the tree falling over the barrier and affecting operations inside the enclosed area. All trees within lightning protection zones of protection (mast and catenary) must be removed.

CHEMICAL WEED KILLING AGENTS: Chemical weed killing agents that contain large amounts of strong oxidizing compounds like chlorates that will increase the combustibility of other vegetation and could ignite spontaneously under hot, dry conditions, should not be used.

CUTTING: Wheeled gasoline-powered grass cutters may be used on top of earth covered magazines, but should be kept at least 5 feet from ventilators and head walls to prevent damage to the lightning protection system. The remaining 5 feet around the ventilator should be cut by hand-held powered equipment.

PLOWING: Plowing or blading of the earth cover to control vegetation is not recommended unless exceptional fire hazards exist.

BURNING: During calm weather, when adequate precautions are taken to prevent the spread of fire, supervised burning may be employed to control vegetation. The fire department, and when appropriate, a natural resources representative shall supervise burning within 200 feet of any aboveground magazine, explosives operating facility, or outdoor storage pad that contains ammunition or explosives, or within 50 feet of any earth-covered magazine that contains ammunition or explosives. During burning operations, all windows, doors, and ventilators of nearby magazines shall be closed. All railcars and vehicles that contain hazardous materials shall be removed from the area.

MAGAZINES: The earth cover adjacent to and extending over magazines shall be free of debris and brush, including accumulated grass clippings that could create a fire hazard. Vegetation around magazine ventilators is of particular concern since the ventilator provides a path for fire to enter the magazine.

RUBBISH: Rubbish shall not be permitted to accumulate within the firebreak of any PES.

OPEN BURN/OPEN DETONATION TREATMENT OPERATIONS: Open burn/open detonation (OB/OD) operations present fire hazards that require rigid controls. The requirements for fire prevention and protection during explosives treatment operations, as well as regulations as to the location, condition, and preparation of the OB/OD area and the conduct of the actual treatment operations shall be strictly enforced. Standby firefighting forces shall be present during OB/OD treatment operations.

APPENDIX F

ESA CONSULTATIONS AND MITIGATION TRACKING

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Table F-1. Endangered Species Act (ESA) Consultation and Mitigation Log for Detachment Fallbrook

Date	Project	Project Status	Compen./ Mitigation Status	Compensation/ Mitigation Type	Species	Document #	Document Type	Notes
27-Aug-1992	Fifteen Military Construction Projects (focus: P-151, B366)	Completed	Completed	Creation/enhancement/ maintenance of habitat in vicinity at 1:1 ratio prior to construction (2 yr monitoring). SKR relocation. Avoidance/min during project. Lighting restrictions.	LBVI, SKR	1-6-92-F-36	Biological Opinion	Navy submitted BA (April 1992) for 15 Milcon projects. In letter (8/27/1992), USFWS expressed concerns about SKR. Since P-151 is most imminent project and other projects were still in preliminary planning stages, USFWS recommended BO for only P-151 and pursuing informal consultations for other projects.
30-Jul-1993	Fifteen Military Construction Projects - Mod1 (focus: P-151, B366)	Completed	Completed	Developed 6.8 acres of habitat, relocated 20-50 SKR, monitored site for 2 years, external lighting limited and shielded	SKR	1-6-92-F-36	BO Amendment	
1-Sep-1993	Twelve Military Construction Projects (focus: P-143, missile mag)	Completed	Completed	Unable to locate original BO (see notes), but included relocation of SKR	SKR	1-6-93-F-27	Biological Opinion	Existence of this BO is inferred from copy of BO Amendment, dated 2/15/1994, and 1-6-93-F-27R1, dated 8/2/1998. P-143 was described in original BA for the 15 MILCON projects as the magazines within Study Area 6 (location of present day 500-series mags). See Montgomery (1997) for SKR relocation study.
c. Oct 1993	Fifteen Military Construction Projects - Mod2 (focus: P-151, B366)	Completed	Completed	Unable to locate records (see notes)	SKR	1-6-92-F-36	BO Amendment	Records on file at this time are only from Navy correspondence, not USFWS. On 3 Sep 1993, Navy requested mod for B366 parking lot due to explosives distance requirements. The project was completed and the USFWS concurrence and mitigation completion is inferred/assumed at this time given age of project.

Table F-1. Endangered Species Act (ESA) Consultation and Mitigation Log for Detachment Fallbrook

Date	Project	Project Status	Compen./ Mitigation Status	Compensation/ Mitigation Type	Species	Document #	Document Type	Notes
15-Feb-1994	Twelve Military Construction Projects (focus: P-143, missile mag)	Completed	Completed	SKR relocation	SKR	1-6-93-F-27	BO Amendment	Amendment for incidental take concerning trapping and relocation of SKR, increased from 5 to 40. See Montgomery (1997) for SKR relocation study.
8-Feb-1995	Fire Management Plan (= 1994 Fire Management Program BA)	Superseded	Completed	Avoidance during implementation; grazing in riparian areas limited; cowbirds monitored; firebreak/burning activities restricted	CAGN, LBVI, SKR	1-6-94-F-27	Biological Opinion	Note: We have the 2/17/1994 BA for the "Fire Management Program" (109pp), but there is not a separate Fire Management Plan even though BO refers to "Fire Management Plan". Navy cover letter apparently dated 2/28/1994 (per USFWS BO, we don't have copy). There is an apparent DRAFT BO (8/12/1994) on file, even though it does not say "Draft". Subsequent Navy correspondence and the 2/8/1995 BO suggest that the 8/12/1994 was a draft.
12-Feb-1998	Ammo Handling Pad on CPEN (Det FB Vertical Replenishment (VERTREP) mission nexus)	Completed	Completed	Avoidance during implementation.	Vernal Pools, PPM	1-6-98-F-30	Biological Opinion	Camp Pendleton (CPEN)-based Consultation. Copy of BO is not on record at Det FB. It is not clear what the difference is with BO (1-6-99-F-30); however, the species evaluated are different so it appears to be a different project.
6-Aug-1998	Twelve Military Construction Projects (focus: Explosives Holding Yard (= "Lower" HY))	Completed	Completed	2:1 creation of gnatcatcher habitat in offset, 5 yr monitoring	CAGN	1-6-93-F-27R	BO Amendment	Orginally part of 15 MilCons BA, then 12 MilCons BA...; however, BO title refers to "Construction of 12 Weapons Storage and Testing Facilitie". Nonetheless, the BO focuses on the Explosives Holding Yard (today= Lower HY). BO refers to Navy's 27 July 1998 request.

Table F-1. Endangered Species Act (ESA) Consultation and Mitigation Log for Detachment Fallbrook

Date	Project	Project Status	Compen./ Mitigation Status	Compensation/ Mitigation Type	Species	Document #	Document Type	Notes
4-Sep-1998	Phoenix Road Improvement	Completed	Completed	Avoidance during project; Trapping and moving SKR to artificial burrows	SKR	1-6-98-F-47	Biological Opinion	
23-Nov-1998	De Luz Housing on CPEN (Det FB boundary)	Completed	Completed	Avoidance during project	CAGN, SKR	1-6-98-F-38	Biological Opinion	Camp Pendleton (CPEN)-based Consultation.
19-Apr-1999	Ammunition Handling Facility on CPEN (Det FB Vertical Replenishment (VERTREP) mission nexus)	Completed	Completed	Avoidance during project	CAGN	1-6-99-F-30	Biological Opinion	Camp Pendleton (CPEN)-based Consultation.
28-Jun-1999	SDGE P-046 Northern Power Distribution Line on CPEN (Det FB boundary)	Completed	Ongoing	Avoidance during project; Use of MCBCP Mitigation bank for SKR	CAGN, SKR	1-6-99-F-45	Biological Opinion	Camp Pendleton (CPEN)-based Consultation. Note: mitigation bank is a USMC project on CPEN.
5-Aug-1999	14-inch Sewerline Construction	Completed	Completed	Avoidance during project	SKR	1-6-99-I-67	Concurrence Letter	
20-Apr-1999	Demilitarization and removal, Vietnam War-era Napalm	Completed	Completed	Avoidance during project	CAGN, SKR	1-6-99-I-40	Concurrence Letter	Although this project was delayed, and re-consulted on (see 2002 and 2008), it was eventually completed and closed out.
17-May-2001	SDGE P-046 Northern Power Distribution Line on CPEN (Det FB boundary)	Completed	Ongoing	Avoidance during project; Use of MCBCP Mitigation bank for SKR	CAGN, SKR	FWS-MCBCP-1018.1	BO Amendment	USFWS re-assigned the log number for this project. Note: mitigation bank is a USMC project on CPEN.

Table F-1. Endangered Species Act (ESA) Consultation and Mitigation Log for Detachment Fallbrook

Date	Project	Project Status	Compen./ Mitigation Status	Compensation/ Mitigation Type	Species	Document #	Document Type	Notes
1-Aug-2001	Closure of Palm Enterprises Treatment Facility	Completed	Completed	Avoidance during project	CAGN, SKR	FWS-SD-2064.1	Concurrence Letter	The Palm Enterprises Treatment Facility was authorized to demilitarize and recycle the napalm canisters. Site was within designated CH for CAGN at the time, but there was no habitat present.
22-May-2002	De Luz Bridge Rehabilitation	Completed	Completed	Avoidance during project	ARTO, LBVI	FWS-MCBCP-2859.1	Concurrence Letter	DeLuz Bridge repairs resulting from Gavilan fire. Project was partly on Det FB and partly on Camp Pendleton. Det FB was lead Federal agency for the consultation.
24-Aug-2002	De Luz Bridge Rehabilitation	Completed	Completed	Avoidance during project		1-6-98-F-37	Biological Opinion	San Diego County Flood Control; Not station project though station supported. We no longer appear to have this document on file.
20-Sep-2002	Conversion of Former Napalm Site (52A) to Ordnance Holding Yard ("Upper" HY)	Completed	Completed	Avoidance during project; SKR habitat restoration at 1:1 ratio.	CAGN, SKR	FWS-SD-3052.1	Concurrence Letter	The Navy proposed to do more SKR habitat restoration and to manage it as mitigation "bank" (USFWS referred to as a "management area") to offset future impacts to SKR habitat. Soon after this project the SKR population severely declined on the installation and it became untenable to maintain "occupancy" criteria for such a "bank".
8-Oct-2002	SDGE Pole Replacements along Ammunition Road	Completed	Completed	Avoidance during project. Deduction from SDG&E mitigation bank	CAGN, SKR	FWS-SD-3132.1	Concurrence Letter	SDGE replaced 19 power distribution poles adjacent to Ammunition Rd.
18-Apr-2003	Perimeter Road Paving and Fence Replacement	Completed	Completed	Avoidance during project	CAGN, CH, LBVI, SKR, SWFL	FWS-SD-3409.1	Biological Opinion	Project occurred within then-designated CAGN CH.

Table F-1. Endangered Species Act (ESA) Consultation and Mitigation Log for Detachment Fallbrook

Date	Project	Project Status	Compen./ Mitigation Status	Compensation/ Mitigation Type	Species	Document #	Document Type	Notes
11-Dec-2003	Wildland Fire Management Plan (2003)	Ongoing	Ongoing	Maintain min 2,000 acres of CSS, 5 yr surveys	ARTO, CAGN, CH, LBVI, SKR	FWS-SD-3506.3 (New #: FWS-SDG-04B0004-04F0005-003)	Biological Opinion	Previous plan 1-6-94-F-27. Note: USFWS provided a new, updated Tracking Number for the BO: FWS-SDG-04B0004-04F0005-003.
2-Jun-2004	IRP Site 33 (UXO5), Investigative Work	Completed	Completed	Avoidance during project	CAGN, CH, SKR	FWS-SD-4030.1	Concurrence Letter	Installation Restoration Program (IRP) Site 33 was burned in 2002, exposing potential UXO; CSS still low, mowing will promote SKR.
10-Oct-2006	IRP and MRP Sites, Fencing	Completed	Completed	Avoidance during project	CAGN, CH, SKR	FWS-SD-4030.2	Concurrence Letter	Clarify grazing program.
15-Dec-2006	MRP Site UX05 (IRP 33), Site Inspection Work Plan	Completed	Completed	Avoidance during project	CAGN, SKR	FWS-SD-4030.3	Concurrence Letter	Munitions Response Program (MRP) Site UXO5 is also IRP Site 33.
23-Apr-2007	Fallbrook Crk Culvert #415, Erosion Repairs	Completed	Completed	Avoidance during project	CAGN, CH, LBVI, SKR	5298.1, 7NE, J. Terp, 4/23/07	Concurrence Letter	USFWS concurrence (email) on No Effect (NE) determination to support 404/ACOE permit application, especially because Det FB had designated CAGN critical habitat (CH) at the time. End of USFWS email: "ESA Log close out: 5298.1, 7NE, J. Terp, 4/23/07"
3-Jul-2007	Magazine Dock Extension	Completed	Completed	Avoidance during project; Road not expanded into existing native habitat, 2:1 removal of exotic plants for CSS impacted	CAGN	FWS-SD-5360.1	Concurrence Letter	This project had a very delayed implementation and had to be re-consulted on in 2015. New USFWS correspondence log # FWS-SDG-15B0226-15I0446.

Table F-1. Endangered Species Act (ESA) Consultation and Mitigation Log for Detachment Fallbrook

Date	Project	Project Status	Compen./ Mitigation Status	Compensation/ Mitigation Type	Species	Document #	Document Type	Notes
19-Feb-2008	Fire Dept Chainsaw Training, Firebreak Scrub Clearing	Completed	Completed	Avoidance during project	CAGN	N/A	Other	Requested (via email, 12 Feb 2008) permission to conduct Fire Department chainsaw training in firebreaks. Peter Beck emailed agreement (19 Feb 2008). This was not done as a BO mod, rather it was a slight variation of WFMP firebreak maintenance implementation.
9-Apr-2008	Ammunition Road Gate Relocation & Fence Installation	Pending	Pending	Avoidance during project	CAGN, LBVI, SKR, SWFL	FWS-SDG-08B0227-08I0454	Concurrence Letter	The Navy originally initiated formal consultation for this project, which was acknowledged by USFWS in a letter dated 7 Jan 2008 (FWS-SDG-08B0227-08TA0223). Following additional survey information and avoidance/minimization, the USFWS determined that the project was not likely to reach a take threshold and issued this letter of concurrence.
26-Jun-2008	SKR Habitat Rx - at former napalm sites	Completed	Completed	Avoidance during project	CAGN, SKR	FWS-SD-99B0003/ 08I0664	Concurrence Letter	USFWS "We also concur that execution of the proposed restoration activities will fulfill the Navy's commitments to restoring SKR habitat as described within preceding consultations associated with napalm removal from Detachment Fallbrook (FWS-1-6-99-I-40; FWS-SD-2064.1; FWS-SD-3052.1)"

Table F-1. Endangered Species Act (ESA) Consultation and Mitigation Log for Detachment Fallbrook

Date	Project	Project Status	Compen./ Mitigation Status	Compensation/ Mitigation Type	Species	Document #	Document Type	Notes
22-Jul-2008	SKR Habitat Rx - at former perscribed burn sites	Completed	Completed	Avoidance during project	CAGN, SKR	FWS-SD-04B0004/08I0728	Concurrence Letter	Requested (via email, 23 June 2008) permission to conduct Habitat Treatment (Rx) for SKR at 6 proposed enhancement sites in lieu of cattle grazing and perscribed burns. Peter Beck emailed agreement (22 July 2008), although expressed concerns about future of grazing program. This was not a WFMP BO mod, rather it was a variation of WFMP implementation for fuels reduction.
30-Jan-2009	Wildland Fire Management Plan Amendment (R1): Grazing Infrastructure Maint. & Improvements	Ongoing	Completed	Avoidance during project	ARTO, CAGN, LBVI, SKR	FWS-SDG-04B0004-04F0005R001	BO Amendment	Re: cattle grazing- fencing, gates, water troughs, temp corrals, food supplement areas
1-Sep-2009	Demolition & Conversion of Building 366	Completed	Completed	Avoidance during project, trap-and-hold SKR; No artificial lighting added to Holding yard, mowing footprint will not expand	SKR	FWS-SDG-09B0335-09F0950	Biological Opinion	
24-Nov-2009	Demolition & Conversion of Building 366 (R1)	Completed	Completed	Tagging and re-capture/monitoring of 6 SKR from site 30-40 days after release	SKR	FWS-SDG-09B0335-09F0950R001	BO Amendment	Includes SKR Trap-and-Hold
6-Jan-2010	Demolition & Conversion of Building 366 (R2)	Completed	Completed	Increased allowed take to 10 captured, unmarked SKR	SKR	FWS-SDG-09B0335-09F0950R002	BO Amendment	Increased allowed take to 10 captured, unmarked SKR
1-Sep-2010	Demolition of Five Buildings (356, 364, 365, 433, 439)	Completed	Completed	Avoidance during project	CAGN, SKR	FWS-SD-10B0662-10I0926	Concurrence Letter	

Table F-1. Endangered Species Act (ESA) Consultation and Mitigation Log for Detachment Fallbrook

Date	Project	Project Status	Compen./ Mitigation Status	Compensation/ Mitigation Type	Species	Document #	Document Type	Notes
5-Apr-2011	Demolition of Five Buildings- B365 Mod1	Completed	Completed	Avoidance during project	CAGN, SKR	FWS-SDG-10B0662-11I0351	Concurrence Letter	Revision based on delay in demolition of B365 (explosives residue testing) and pushed project into CAGN breeding season. The USFWS assigned a different tracking number (FWS-SDG-10B0662-11I0351) to this concurrence on the revised demolition of Building 365.
20-Dec-2010	Waterline Infrastructure Modifications	Completed	Completed	Avoidance during project. Weed management program will target areas where CSS vegetation was removed/impacted.	CAGN	FWS-SD-11B0091-11I0144	Concurrence Letter	
2-Jul-2010	Wildland Fire Management Plan Amendment (R2): Grazing Season Extension, Troughs #s 1 & 2, & Fencing	Completed	Completed	Avoidance during project; Covered under WFMP BO; This was Mod	ARTO, CAGN, LBVI, SKR	FWS-SDG-04B0004-04F0005R002	BO Amendment	Follow up concurrence in 2011; USFWS wrote (7/18/2011): "When referencing FWS-SDG-04B0004-04F0005R002 in the future, we will be referring to the grazing extensions for both 2010 and 2011."
25-Aug-2010	Wildland Fire Management Plan Amendment (R3): Trough #4	Completed	Completed	Avoidance during projectl; Covered under WFMP BO; This was Mod	CAGN, SKR	FWS-SDG-04B0004-04F0005R003	BO Amendment	Trough #4 is the 3rd trough installed ("Trough #3" was not installed)
2-Sep-2010	SKR Habitat Rx-re-treatments	Completed	Completed	Avoidance during project	CAGN, SKR	FWS-SDG-04B0004-10I0945	Concurrence Letter	
6-Jan-2012	Magazine Mowing (564, 565, 566) for UXO5 TCRA	Completed	Completed	Avoidance during project	CAGN	FWS-SDG-04B0004-12TA0115	Concurrence Letter	Although in support of the IRP/MRP program, the USFWS concurred that this CSS vegetation removal was within the scope of the actions/effects consulted on for the WFMP BO.

Table F-1. Endangered Species Act (ESA) Consultation and Mitigation Log for Detachment Fallbrook

Date	Project	Project Status	Compen./ Mitigation Status	Compensation/ Mitigation Type	Species	Document #	Document Type	Notes
29-Feb-2012	Barbed Goatgrass Eradication Project	Active	Ongoing	Avoidance during project	CAGN, SKR	FWS-SDG-04B0004-12TA0217	Concurrence Letter	USFWS concurred that actions associated with the Barbed Goatgrass Eradication project were consistent with actions described within the WFMP BO for invasive plant control.
24-Sep-2013	Fallbrook Crk Culvert #415, Erosion Repairs	Completed	Completed	Avoidance during project. Replanting post-construction.	LBVI	FWS-SDG-13B0450-13I0459	Concurrence Letter	Note: this is the 2nd restoration effort conducted at the same Culvert #415 location (first fix: see 23 April 2007 entry); this 2013 "fix" is more aggressive and will hopefully last a long time.
10-Jan-2014	MRP UXO1, Remedial Investigation	Completed	Completed	Avoidance during project; seasonal avoidance, pre-monitoring and biomonitornig; trap-&-hold for SKR	CAGN, LBVI, SKR, SWFL	FWS-SDG-13B0463-13F0483	Biological Opinion	Although in support of the IRP/MRP (CERCLA) program, the incidental take for this project was authorized via a BO. Incidental take reached if: (1) SKR - no more than 8 SKR trapped, 1 SKR killed/injured during trapping/holding, 1 SKR killed/injured in field; (2) CAGN - removal of more than 15 ac of CSS or more than 1 CAGN pair is impacted from the habitat removal.
4-Sep-2014	Sewer Lift Stations: B350 & 352	Completed	Ongoing	Avoidance during project; Weed control for 3 yrs at B352 sewer lift site; plus the post-Tomahawk fire CSS enhancement w/ prickly pear	CAGN, LBVI	FWS-SDG-14B0373-14I0513	Concurrence Letter	Project had permanent impact to an estimated 0.033 ac of CSS (was occupied by CAGN before the Tomahawk fire). USFWS agreed to letting Navy consider the permanent impact sufficiently offset with 3 yrs of targeted weed control in the area and the planned prickly pear enhancement of CSS in the CACW restoration area.

Table F-1. Endangered Species Act (ESA) Consultation and Mitigation Log for Detachment Fallbrook

Date	Project	Project Status	Compen./ Mitigation Status	Compensation/ Mitigation Type	Species	Document #	Document Type	Notes
16-Jan-2015	Upper HY Clear Zone	Completed	Completed	Avoidance during project	CAGN, SKR	FWS-SDG-04B0004-15TA0139	Concurrence Letter	Navy submitted as notification for implementation of WFMP BO; however, HY fuelbreak was NOT actually part of original BO as it turned out. Nonetheless, the USFWS concured that the project was generally consistent with the spirit of WFMP BO, and provided additional accounting description for the record.
26-Jan-2015	MRP UXO4, Remedial Investigation	Completed	Completed	Avoidance during project	CAGN, SKR	FWS-SDG-15B0089-15I0127	Concurrence Letter	Note: USFWS concurrence ltrs for both UXO4 and UXO4 Remedial Investigations are dated same (1/26/2015)
26-Jan-2015	MRP UXO5, Remedial Investigation	Completed	Completed	Avoidance during project	CAGN, SKR	FWS-SDG-15B0093-15I0141	Concurrence Letter	Note: USFWS concurrence ltrs for both UXO4 and UXO4 Remedial Investigations are dated same (1/26/2015)
18-Feb-2015	IRP Sites 34b and 34d, Remedial Investigation	Completed	Completed	Avoidance during project	SKR	FWS-SDG-15B0126-15I0206	Concurrence Letter	Navy submitted Biological Avoidance and Minimization Plan (BAMP) to USFWS on 14 Oct 2014 to coordinate on ESA concerns.
2-Jun-2015	Magazine Dock Extension, Updated	Completed	Completed	Avoidance during project; Road not expanded into existing native habitat, 2:1 removal of exotic plants for CSS impacted	CAGN	FWS-SDG-15B0226-15I0446	Concurrence Letter	Originally consulted on in 2007, but never implemented. Project proponent seeking to implement in 2015.

Table F-1. Endangered Species Act (ESA) Consultation and Mitigation Log for Detachment Fallbrook

Date	Project	Project Status	Compen./ Mitigation Status	Compensation/ Mitigation Type	Species	Document #	Document Type	Notes
7-Jun-2016	SDGE Geotechnical Investigations	Pending	Pending	Avoidance during project; SDGE is covered by HCP/NCCP	CAGN, SKR	FWS-SDG-16B0275-16I0671	Concurrence Letter	This is the first section 7 ESA consultation whereby the Navy specifically requests that the prposed SDGE activities are consistent with and covered under SDGE's NCCP/HCP. The USFWS concurrence letter provides precidence-setting language for future SDGE proejcts on Det Fallbrook that may involve incidental take.

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APPENDIX G

LANDSCAPING PLANT LIST

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Contents

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G.1 ACCEPTED PLANT LIST

Table G-1. List of Accepted Plants for Landscaping at Detachment Fallbrook

Botanical Name	Common Name	Pollinator Sp.		Native	
		NRCS 2014	NRCS 2009	San Diego County	California
Large Trees (40 feet +)					
Acer macrophyllum	Big-leaf Maple			X	X
Acer negundo californicum	Box Elder				X
Acer negundo interius	Box Elder				X
Alnus rhombifolia	White Alder			X	X
Brachychiton acerifolius	Flame Tree				
Brachychiton populneus	Bottle Tree				
Calocedrus decurrens	Incense Cedar				X
Cupressus stephensonii	Cuyamaca Cypress				X
Fraxinus angustifolia	Raywood Ash				
Fraxinus latifolia	Oregon Ash				X
Fraxinus uhdei	Evergreen Ash				
Jubaea chilensis	Chilean Wine Palm				
Pinus canariensis	Canary Island Pine				
Pinus halepensis	Aleppo pine				
Pinus eldarica	Afghan Pine				
Pinus torreyana	Torrey Pine			X	X
Platanus racemosa	California Sycamore			X	X
Podocarpus macrophyllus	Yew Pine				
Populus fremontii	Fremont's Cottonwood			X	X
Pseudotsuga macrocarpa	Big Cone Douglas Fir				X
Quercus agrifolia	Coast Live Oak			X	X
Quercus chrysolepis	Canyon Live Oak				
Quercus engelmannii	Mesa Oak			X	X
Quercus kelloggii	California Black Oak				X
Quercus lobata	California White Oak				X
Quercus wislizeni	Interior Live Oak			X	X
Syagrus romanzoffianum	Queen Palm				
Umbellularia californica	California Bay Laurel			X	X
Medium Trees (25 feet - 40 feet)					
Archontophoenix cunninghamiana	King Palm				
Brahea armata	Blue Hesper Palm				
Brahea edulis	Guadalupe Palm				
Butia capitata	Pindo Palm				
Celtis reticulata	Netleaf Hackberry				X
Cercis canadensis	Eastern Redbud				
Fraxinus velutina	Modesto Ash, Velvet Ash			X	X
Geijera parvifolia	Australian Willow				
Juglans californica ssp. californica	California Black Walnut			X	X
Myrica californica	Pacific Wax Myrtle				X
Podocarpus gracilior	Fern Pine				
Chitalpa tashkentensis	Chitalpa				
Small/Patio Tree (15 feet – 25 feet)					
Aesculus californica	California Buckeye			X	X

Botanical Name	Common Name	Pollinator Sp.		Native	
		NRCS 2014	NRCS 2009	San Diego County	California
Agonis flexuosa	Peppermint Tree				
Arbutus menziesii	Madrone				X
Arbutus unedo	Strawberry Tree				
Arctostaphylos glauca	Blue Manzanita		X	X	X
Cercidium floridum	Blue Palo Verde				X
Cercis occidentalis	Western Redbud		X		X
Chamaerops humilis	Mediterranean Fan Palm				
Chilopsis linearis	Desert Willow				X
Crataegus douglasii	Western Thorn Apple, Hawthorn				
Fraxinus dipetala	Flowering Ash				X
Lagerstroemia indica (Mildew resistant varieties)	Crape Myrtle				
Lavatera assurgentiflora	California Tree Mallow			X	X
Lyonothamnus floribundus ssp. asplenifolius	Catalina/Santa Cruz Ironwood				X
Metrosideros excelsus	New Zealand Christmas Tree				
Quercus dumosa	Scrub Oak			X	X
Salix gooddingii	Black Willow		X	X	X
Salix lasiolepis	Arroyo Willow		X	X	X
Sambucus mexicana	Mexican Elderberry			X	X
Vitex agnus-castus	Vitex				
Large Shrubs (10 feet - 18 feet)					
Adenostoma sparsifolium	Red Shank			X	X
Ceanothus spp.	California Lilac		X	X	X
Cercocarpus betuloides	Western Mountain Mahogany			X	X
Cercocarpus ledifolius	Curl-Leaf Mountain Mahogany				X
Comarostaphylos diversifolia	Summer Holly			X	X
Fremontodendron hybrids	Flannel Bush		X	X	X
Heteromeles arbutifolia	Toyon		X	X	X
Juniperus spp.	Juniper				
Lavatera assurgentiflora	Island Mallow				X
Malosma (Rhus) laurina	Laurel Sumac			X	X
Myrica californica	Pacific Wax Myrtle				X
Phormium tenax	New Zealand Flax				
Prunus ilicifolia	Hollyleaf Cherry		X	X	X
Rhamnus californica	California Coffeeberry		X	X	X
Rhamnus ilicifolia	Hollyleaf Redberry			X	X
Rhus integrifolia	Lemonadeberry			X	X
Rhus lancea	African sumac				
Rhus laurina	Laurel Sumac			X	X
Rhus ovata	Sugarbush			X	X
Medium Shrubs (5 feet - 10 feet)					
Adenostoma fasciculatum	Chamise		X	X	X
Amelanchier alnifolia	Western Service Berry				X
Arctostaphylos spp.	Manzanita		X	X	X
Atriplex canescens	Fourwing Saltbush			X	X

Botanical Name	Common Name	Pollinator Sp.		Native	
		NRCS 2014	NRCS 2009	San Diego County	California
Atriplex lentiformis spp. breweri	Quail Bush			X	X
Baccharis pilularis	Coyote Brush		X	X	X
Dendromecon harfordii	Island Bush Poppy				
Dendromecon rigida	Bush Poppy			X	X
Fallugia paradoxa	Apache Plume			X	X
Galvezia speciosa	Island Bush Snapdragon				X
Garrya elliptica	Coast Silktassel				X
Grevillea spp.	Grevillea			X	X
Isomeris arborea	Bladderpod				
Juniperus spp.	Juniper				
Leucophyllum spp.	Texas Ranger				
Philadelphus lewisii	Mock Orange		X		X
Nandina domestica	Heavenly Bamboo				
Rhamnus crocea	Redberry			X	X
Salix exigua	Sandbar Willow		X	X	X
Salix laevigata	Red Willow		X	X	X
Simmondsia chinensis	Jojoba			X	X
Viguiera laciniata	San Diego Sun Flower			X	X
Small Shrubs (3 feet - 5 feet)					
Arctostaphylos spp.	Manzanita		X	X	X
Artemisia spp.	Sage species			X	X
Baccharis pilularis	Coyote Brush		X	X	X
Bougainvillea	Shrub Bougainvillea				
Calliandra eriophylla	Fairy Duster				X
Carpenteria californica	Bush Anemone				X
Ceanothus spp.	California Lilac		X	X	X
Cistus hybridus	Rockrose				
Cornus glabrata	Brown Dogwood				X
Dietes bicolor	Fortnight Lily				
Ephedra californica	Mormon Tea				X
Ephedra nevadensis	Mormon Tea				X
Eriogonum umbellatum	Sulphur Buckwheat		X		X
Galvezia speciosa	Snapdragon				
Helianthemum scoparium	Sun Rose				X
Lantana montevidensis	Trailing Lantana				
Lonicera hispidula	California Honeysuckle				X
Penstemon spp.	Penstemon species	X	X		X
Phormium spp.	New Zealand Flax				
Pteridium aquilinum pubescens	Western Bracken Fern				X
Ribes speciosum	Fuchsia Flowering Currant				X
Ribes viburnifolium	Evergreen Currant				X
Rosa californica	California Wild Rose		X	X	X
Rosa minutifolia	Small-Leaved Rose				X
Rosmarinus officinalis 'Prostratus'	Prostrate Rosemary				
Salvia spp.	Sage species	X	X		X
Salvia apiana	White Sage		X	X	X
Salvia clevelandii	Cleveland Sage	X	X	X	X

Botanical Name	Common Name	Pollinator Sp.		Native	
		NRCS 2014	NRCS 2009	San Diego County	California
Salvia mellifera	Black Sage	X	X	X	X
Salvia spathacea	Hummingbird Sage		X	X	X
Symphoricarpos mollis	Creeping Snowberry			X	X
Trichostema lanatum	Wooly Blue-Curls			X	X
Zauschneria californica	California Fuschia			X	X
Succulents					
Agave shawii	Shaw's Century Plant			X	X
Agave spp.	Agave				
Aloe spp.	Aloe				
Dudleya spp.	Dudleya			X	X
Echeveria sp.	Hens and Chickens				X
Ferocactus viridescens	San Diego Barrel Cactus			X	X
Hesperaloe spp.	Yucca				
Hesperoycca whipplei	Our Lord's Candle			X	X
Nolina bigelovii	Bigelow's Bear grass				
Opuntia littoralis	Coast Prickly Pear			X	X
Sedum spp.	Sedum				
Senecio mandraliscae	Kleinia				
Yucca baccata	Banana Yucca				X
Yucca shidigera	Mojave Yucca			X	X
Large Perennials (5 feet - 10 feet)					
Lilium humboldtii	Humboldt Lily			X	X
Lilium pardalinum	Leopard Lily				X
Lupinus albifrons	Silverbush Lupine		X	X	X
Lupinus arboreus	Evergreen Lupine		X	X	X
Romneya coulteri	Matilija Poppy			X	X
Romneya trichocalyx	Matilija Poppy			X	X
Medium Perennials (3 feet - 5 feet)					
Delphinium cardinale	Scarlet Larkspur			X	X
Encelia californica	Coast Sunflower	X		X	X
Encelia farinosa	Brittlebush			X	X
Eriogonum fasciculatum	California Buckwheat	X	X	X	X
Iva hayesiana	San Diego Marsh Elder			X	X
Keckiella antirrhinoides	Yellow Penstemon		X	X	X
Limonium californicum	Coastal Statice			X	X
Mimulus aurantiacus	Monkeyflower			X	X
Penstemon spp.	Penstemon	X	X	X	X
Thalictrum fendleri var. *polycarpon*	Meadow-Rue			X	X
Groundcover Perennials (Less than 3 feet)					
Achillea millefolium	Common Yarrow		X	X	X
Anemopsis californica	Yerba mansa			X	X
Aquilegia formosa	Western Columbine				X
Armeria maritima	Common Thrift				X
Camissonia cheiranthifolia	Beach Evening Primrose			X	X
Coreopsis maritima	Sea Dahlia			X	X
Dichondra occidentalis	Western Dichondra			X	X
Dodecatheon clevelandii	Shooting Star			X	X
Epilobium canum	California Fuschia	X	X	X	X

Botanical Name	Common Name	Pollinator Sp.		Native	
		NRCS 2014	NRCS 2009	San Diego County	California
Eriogeron glaucus	Beach Aster				X
Eriogonum parvifolium	Coastal Buckwheat		X		X
Eriophyllum confertiflorum	Golden Yarrow			X	X
Heuchera spp.	Coral Bells				X
Iris douglasiana	Douglas Iris			X	X
Iris longipetula	Coast Iris				X
Iva hayesiana	Poverty Weed			X	X
Corethrogyne (Lessingia) filaginifolia	California Aster				X
Lilium humboldtii	Humboldt lily			X	
Penstemon spp	Penstemon	X	X	X	X
Potentilla gracilis	Cinquefoil			X	X
Salvia sonomensis x mellifera	'Dara's Choice' Creeping Sage		X	X	X
Satureja douglasii	Yerba Buena				X
Solanum xantii	Purple Nightshade			X	X
Solidago californica	California Goldenrod	X	X	X	X
Thymus praecox (Thymus serphyllum)	Mother-of-thyme		X		
Thymus spp.	Creeping Thyme		X		
Trichostema lanatum	Woolly Bluecurls			X	X
Verbena lilacina	Lilac Verbena				
Ornamental Grasses					
Achnatherum coronatum	Stipa Coronata			X	X
Agrostis diegoensis	Bentgrass				X
Bouteloua curtipendula	Side-Oats Grama				X
Bouteloua gracilis	Blue Gramma				X
Calamagrostis x acutiflora 'Karl Foerster'	Feather Reed Grass				
Elymus glaucus	Blue Wild Rye		X	X	X
Festuca californica	California fescue		X		X
Festuca ovina glauca	Blue Fescue				
Leymus triticoides	Alkali Rye			X	X
Melica imperfecta	Oniongrass			X	X
Muhlenbergia emersleyi	Bull Grass				
Muhlenbergia rigens	Deergrass		X	X	X
Stipa (=Nassella) cernua	Nodding Needlegrass			X	X
Stipa (=Nassella) lepida	Foothill Needlegrass			X	X
Stipa (=Nassella) pulchra	Purple Needlegrass		X	X	X
Sisyrinchium bellum	Blue-Eyed Grass			X	X
Sporobolus heterolepis	Prairie Dropseed				
Annuals					
Clarkia amoena	Farewell to Spring	X			X
Clarkia unguiculata	Elegant Clarkia		X		X
Eschscholzia californica	California Poppy	X	X	X	X
Nemophila menziesii	Baby Blue-Eyes	X		X	X

Natural Resource Conservation Service (NRCS). 2014. Conservation Practice Specification. 327A Conservation Cover, Pollinators: Central Valley, Central Coast, Southern California. August 2014

Natural Resource Conservation Service (NRCS). 2009. Biology Technical Notes CA – 19. Pollinator Biology and Habitat in California. 30 April 2009.

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G.2 PLANTS UNACCEPTABLE FOR LANDSCAPING UNDER ANY CIRCUMSTANCES

Table G-2. List of Plants That Are Not to be Installed at Detachment Fallbrook.

Scientific Name	Common Name
Acacia species	Acacia
Ailanthus altissima	Tree of Heaven
Anthemis cotula	Mayweed, Stinking Chamomile
Aptenia cordifolia	Red Apple Ice Plant
Arctotheca calendula	Cape Weed
Arundo donax	Giant Reed
Asparagus asparagoides	Florist's-smilax, Bridal creeper, Smilax, African Asparagus Fern
Asparagus densiflorus	Asparagus fern
Asphodelus fistulosus	Onionweed
Asparagus setaceus (A. plumosus)	Common Asparagus Fern
Atriplex semibaccata	Australian Saltbush
Bamboo species	Bamboo (all species and varieties of bamboo)
Carpobrotus edulus	Hottentot Fig
Carpobrotus chilensis	Hottentot Fig, Highway Iceplant, Sea Fig
Callistemon viminalis	Weeping Bottlebrush
Calycanthus occidentalis	Spicebush
Catalpa bignonioides	Common Catalpa, Indian Bean
Chasmanthe floribunda	African Cornflag, Chasmanthe
Centranthus ruber	Red Valerian, Jupiter's Beard
Chrysanthemum coronarium	Garland Chrysanthemum
Cistus creticus	Purple Rock-Rose, Pink RockRose
Cistus ladanifer	Rock-Rose
Cortaderia jubata	Pampas Grass
Cortaderia selloana	Pampas Grass
Cotoneaster species	Cotoneaster
Crassula ovata (C. argentea, C. portulacea)	Jade Plant, Money Tree
Cupaniopsis anacardioides	Carrot Wood
Cynara cardunculus	Artichoke Thistle
Cynodon dactylon	Bermuda Grass
Cyperus alternifolia	Umbrella Plant
Cyperus involucratus (Cyperus alternifolius)	African Umbrella Plant
Cyperus rotundus	Nutgrass
Cytisus scoparius	Broom
Cytisus striatus	Scotch Broom
Delairea odorata (Senecio mikanioides)	German Ivy, Cape Ivy
Dimorphotheca sinuate (Dimorphotheca aurantiaca)	Blue-Eye Cape Marigold, African Daisy, Cape Marigold
Dracaena australis (Cordyline australis)	Giant Dracaena
Drosanthemum hispidium	Rosea Ice Plant
Echium candicans	Pride of Madeira
Echium pininana	Pride of Madeira
Ehrharta erecta	Panic Veldt Grass
Eragrostis lehmanniana	Lehmann Lovegrass
Ehrharta calycina	Veld Grass

Scientific Name	Common Name
Ehrharta longiflora	Long-Flowered Veldt Grass
Eucalyptus species	Gum Species
Foeniculum vulgare	Fennel, Anise
Gazania species	Gazania
Genista species	Brooms (all species and varieties of Genista or broom species)
Hedera canariensis	Algerian Ivy
Hedera helix	English Ivy
Ipomoea purpurea	Common Morning-Glory
Iris pseudacorus	Yellow Flag Iris, Pale Yellow Iris
Koelreuteria paniculata	Golden Rain Tree
Lantana camara	Lantana
Ligustrum lucidum	Glossy Privet
Limonium perezii	Sea Lavender
Limonium sinuatum	Notch-Leaf Marsh-Rosemary, Statice
Linaria maroccana	Baby Snapdragon, Toadflax
Lippia nodiflora	Mat Grass
Lobelia laxifolia	Loose Flowered Lobelia
Lobularia maritime	Sweet Alyssum
Lonicera japonica	Japanese Honeysuckle
Lythrum salicaria	Purple Lossestrife
Malephora crocea (Mesembryanthemum crocea)	Red-flowered Iceplant, Croceum Iceplant
Melaleuca species	Melaleuca (all species and varieties)
Melinis repens (Rhynchelytrum repens)	Natal Grass, Natal Ruby, Grass, Red Top
Mentha spicata	Spearmint
Mesembryant hemumcrystallinum	Crystalline Iceplant
Mirabilis jalapa	Four O'Clock, Marvel of Peru
Myoporum laetum (Myoporum perforatum)	Ngaio tree, Myoporum, Mousehole Tree
Nassella tenuissima	Mexican Feather Grass
Nerium oleander	Oleander
Oenothera speciosa (Oenothera berlandieri)	Pink Evening Primrose, Showy Evening Primrose, Mexican Evening Primrose
Olea europaea	Olive Tree
Opuntia ficus-indica	Indian Fig, Tuna Cactus, Mission Prickly Pear
Osteospermum fruticosum (Dimorphotheca fruticose)	Shrubby Daisybush
Oxalis pes-caprae	Bermuda Buttercup
Passiflora caerulea	Blue Crown Passion Flower, Blue Passion Flower
Parkinsonia aculeate	Mexican Palo Verde, Jerusalem Thorn
Pelargoni umxhortorum	Common Geranium, Garden Geranium
Pennisetum clandestinum	Kikuyu Grass
Pennisetum setaceum	Fountain Grass
*Pennisetum villosum (*Sometimes listed as genus *Cenchrus)*	African Feathertop, Showy Feathertop
Phalaris aquatic	Garding Grass
Phoenix canariensis	Canary Island Date Palm
Phoenix dactylifera	Date Palm
Pinus coulteri	Coulter Pine
Pistacia atlantica	Mount Atlas Pistache
Pittosporum undulatum	Victorian Box, Sweet Pittosporum, Australian Daphne, Cheesewood

Scientific Name	Common Name
Platanus x acerifolia	London Plane Tree
Prunus ilicifolia ssp. lyonii, (P. lyonii, P. integrifolia, Cerasus lyonii)	Catalina Cherry
Pteridium aquilinum pubescens	Braken Fern
Pyracantha angustifolia	Pyracantha
Retama monosperma	Bridal Broom
Ricinus comminis	Castorbean
Robinia pseudoacacia	Black Locust
Rubus discolor	Himalaya Berry
Schinus molle	California Pepper Tree
Schinus terebinthifolius	Brazilian Pepper Tree
Senecio lineariflolius	Fireweed Groundsel , Fireweed
Senecio mikaniodes	German Ivy /Cape Ivy
Senna didymobotrya (Cassia didymobotrya)	Popcorn Senna
Sorghum halepense	Johnson Grass
Spartium junceum	Spanish Broom
Tamarix species	Tamarisk
Tecomaria capensis	Cape Honeysuckle
Tropaeolum majus	Garden Nasturtium
Ulmus parvifolia	Chinese Elm Tree
Ulmus pumila	Siberian Elm Tree
Washingtonia robusta	Mexican Fan Palm
Verbascum blattaria	Moth Mullein
Vinca major	Periwinkle and other species and varieties of Vinca
Zantedeschia aethiopica	Calla Lily, Common Calla

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APPENDIX H

LIST OF NATURAL RESOURCES SURVEYS AND STUDIES

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LIST OF NATURAL RESOURCES SURVEYS AND STUDIES

Table H-1 in this appendix contains a consolidated list of natural resources surveys and studies conducted at Naval Weapons Station Seal Beach Detachment Fallbrook in order of general subject and taxonomic grouping followed by the chronolical order of the survey or study. Although there are some exceptions, this list does not generally include: (1) smaller, project-level surveys; (2) ESA biological assessments or opinions (see Appendix F), (3) NEPA documents, or (4) regional surveys that only have a broad nexus with the installation. Regional surveys or studies that have a specific nexus with Detachment Fallbrook (e.g., data collected on the installation) are included. This list is subject to change with the addition of new surveys and studies, as well as with the potential discovery of historical records.

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Table H-1 Consolidated list of natural resources surveys and studies conducted at Naval Weapons Station Seal Beach Detachment Fallbrook

Taxon Focus	Survey Year(s)	CITATION	Survey Focus
PLANTS			
Plants & Vegetation	1993-1995	Dudek and Associates, Inc. 1995. Report on the Plant Collections and Vegetation Surveys for Naval Weapons Station, Fallbrook Annex, San Diego County, California (1993-1995 Seasons). Prepared for the Nature Conservancy (contract M67004-91-D-0010, N68711, EJ01) by Dudek and Associates, Inc. (PI: John W. Brown), Encinitas, California.	No acreage defined
Wetland Delineation	1996	Tierra Data Systems (TDS). 1996. Integrated Wetlands Delineation, Naval Ordnance Center Pacific Division Fallbrook Detachment (1996 season). Prepared for U.S. Department of the Navy Southwest Division Naval Facilities Engineering Command, San Diego, CA under contract N68711-D-7605/005.	Stationwide
CSS Restoration	1998-2003	Soil Ecology and Restoration Group (SERG). 2004. Coastal sage scrub site restoration for the ordnance truck class holding yard, Naval Weapons Station Seal Beach, Detachment Fallbrook: Final Report 1998-2003. Final report prepared for Naval Weapons Station Seal Beach, Detachment Fallbrook and Southwest Division, Naval Facilities Engineering Command. Cooperative Agreement: N68711-98-Lt-80049.	1.2 ac site
Oaks	2001-2002	Lawson, D.M. 2016. Oak (Quercus agrifolia) recruitment along Fallbrook Creek tributary under exotic pepper trees (Schinus molle) at Naval Weapons Station Seal Beach Detachment Fallbrook: 2001-2002 Seasons. Project report provided to the Conservation Program Manager at Detachment Fallbrook, San Diego County, CA.	Fallbrook Creek tributary
Culvert Vegetation	2006	Dungan, M.,R. Kinmont and A. Raff. 2006. Culvert Vegetation Management Plan. Prepared by TEC Inc. Prepared for Naval Weapons Station Seal Beach, Detachment Fallbrook	Planning document
Veg Mapping	2000	Tierra Data, Inc. (TDI). 2002. Distribution and age structure of coastal sage scrub and other plant communities on Naval Weapons Station Seal Beach, Detachment Fallbrook, CA. Unpublished report prepared by Tierra Data, Inc. with support from Varanus Biological Services, Inc. for Southwest Division Naval Facilities Engineering Command, San Diego, California, under contract N68711-95-D-7605/0063. Note: This report has previously been cited as Varanus Biological Services (2000) or (2002).	Stationwide (CSS)
Veg Mapping	2007-2008	Tierra Data, Inc. (TDI). 2011. 2007-2008 California Gnatcatcher Habitat Mapping at Naval Weapons Station Seal Beach Detachment Fallbrook. Final (29 July 2011). Submitted to Naval Weapons Station Seal Beach Detachment Fallbrook, Fallbrook, California.	Stationwide (CSS)
Veg Mapping	2015	AECOM. In prep. Stationwide vegetation mapping for Naval Weapons Station Seal Beach Detachment Fallbrook: 2015 season. Unpublished report prepared by AECOM for Detachment Fallbrook, under contract with Naval Facilities Engineering Command Southwest, San Diego, California.	Stationwide
Veg Mapping	2015	U.S. Department of the Navy (USDON). In prep. Vegetation Mapping Protocol for Naval Weapons Station Seal Beach Detachment Fallbrook, California. Prepared with contracted support from AECOM. Version date: May 2016	Planning document
Rare Plants	2005-2006	Tierra Data, Inc. (TDI). 2007. Rare Plant Surveys on Naval Weapons Station Seal Beach Detachment Fallbrook Fallbrook, California: Project Report 2005-2006. Unpublished report submitted by Tierra Data, Inc. to the Naval Weapons Station Seal Beach Detachment Fallbrook Environmental Programs and Services Office.	4,000 acres
Rare Plants	2010-2011	Tierra Data, Inc. (TDI). 2013. 2010-2011 Rare Plant Surveys on Naval Weapons Station Seal Beach Detachment Fallbrook, Fallbrook, California. Unpublished report submitted by Tierra Data, Inc. to the Naval Weapons Station Seal Beach Detachment Fallbrook Environmental Programs and Services Office.	2,000 acres
Rare Plants	2015	NOREAS, Inc. 2016. Rare Plant Species Survey at Naval Weapons Station Seal Beach Detachment Fallbrook, California: 2015 Season. Unpublished but submitted by NOREAS, Inc. to Naval Weapons Station Seal Beach Detachment Fallbrook under contract with Naval Facilities Engineering Command (contract # N62473-13-D-4812 Delivery Order No. 0005), San Diego, California.	4,000 acres
Rare Plants	2015	HDR. 2015. 2015 Brodiaea filifolia Protocol Survey Report for Four Projects: Potable Water Distribution Improvements (P-079, PE20140143), Improvements to Range 213 (PE-14036R, PE20080364R), Conjunctive Use Project (P-1220, PE19971002), & Wildland Fire Prevention Plan: November Training Area for Marine Corps Base Camp Pendleton, California. Prepared for Marine Corps Base Camp Pendleton and Naval Facilities Engineering Command Southwest.	Project-level
Weed Control	1995	Regional Environmental Consultants (RECON). 1996. Noxious Weed Management Plan for the Naval Ordnance Center, Pacific Division Fallbrook Detachment. Draft report (April 1996) serving as final; prepared under Contract No. N67811-94-D-1657/0004 for Southwest Division, NAVFACENGCOM, San Diego, California.	Planning document

Table H-1 Consolidated list of natural resources surveys and studies conducted at Naval Weapons Station Seal Beach Detachment Fallbrook

Taxon Focus	Survey Year(s)	CITATION	Survey Focus
Weed Control	1996-1997	Agri Chemical & Supply Inc.1998. Bridal broom (Genista monosperma) control on Naval Ordance Center, Pacific Division, Fallbrook Detachment, California: 1997 Report (1996-1997 Seasons). Unpublished report prepared by Giessow, J., J. Giessow, and G. Omori. of Agri Chemical & Supply Inc. Contract No. N68711-97-R-8520. (Figures and tables missing from this copy.)	Stationwide
Weed Control	1996-2005	U.S. Department of the Navy (USDON). 2005. Invasive Non-native Plant Control at Naval Weapons Station Seal Beach Detachment Fallbrook: 1996-2005 Summary. Powerpoint Presentation.	Stationwide
Weed Control	1997-1998	Giessow, J. and J. Giessow. 1999. Arundo donax Removal on MCB Camp Pendleton, CA: 1998 Annual Report [1997-1998 field seasons]. Unpublished report prepared for Southwest Division Naval Facilities Command and Marine Corps Base Camp Pendleton. (Note: Arundo treatment area includes portions of the Santa Margarita River along Naval Weapons Station Seal Beach Detachment Fallbrook.)	SMR
Weed Control	1997-1998	Agri Chemical & Supply, Inc. (Agrichem). 1999. Control of *Arundo donax* (giant reed) on Naval Ordnance Center, Pacific Division, Fallbrook Detachment, CA: 1998 Annual Report (covering treatments in 1997 and 1998). Unpublished report prepared for Southwest Division Naval Facilities Command and NOC, Pacific Division, Fallbrook Detachment.	Interior
Weed Control	1997-2000	Agri Chemical & Supply, Inc. 2001. Compilation of field reports for Arundo donax control in support of multiple projects on Marine Corps Base Camp Pendleton: 1997-2000 seasons. (Note: Arundo treatment area includes portions of the Santa Margarita River along Naval Weapons Station Seal Beach Detachment Fallbrook.)	SMR
Weed Control	1998	Agri Chemical & Supply Inc. 1999. Bridal broom (*Genista monosperma*) control on Naval Ordance Center, Pacific Division, Fallbrook Detachment, California: 1998 Report. Unpublished report prepared by Giessow, J., J. Giessow, and G. Omori. of Agri Chemical & Supply Inc. Contract No. N68711-97-R-8520.	Stationwide
Weed Control	1998-2001	Agri Chemical & Supply, Inc. (Agrichem). 2001. Map of Arundo Control at Naval Weapons Station Seal Beach Detachment Fallbrook: 1998-2001 Seasons. (Map Only, 1 pg.)	Stationwide
Weed Control	1999	Agri Chemical & Supply, Inc. (Agrichem). 1999. Control of *Arundo donax* (giant reed) on Naval Ordnance Center, Pacific Division, Fallbrook Detachment, CA: 1999 Annual Report (covering initial treatments and re-treatments carried out in 1999). Unpublished report prepared for Southwest Division Naval Facilities Command and NOC, Pacific Division, Fallbrook Detachment.	Interior
Weed Control	2000-2001	Agri Chemical & Supply, Inc. 2002. Control of *Arundo donax* (Giant Reed) and Pepper Tree (*Schinus molle*) on Naval Ordnance Center, Pacific Division, Fallbrook Detachment, CA: 2000/01 Annual Report. Unpublished report prepared for Southwest Division Naval Facilities Command and NOC, Pacific Division, Fallbrook Detachment. Delivery Order: N68711-99-D-6605/0008&0011.	Interior
Weed Control	2001-2002	Agri Chemical & Supply, Inc. 2002. Control of *Arundo donax* (Giant Reed) and Pepper Tree (*Schinus molle*) on Naval Ordnance Center, Pacific Division, Fallbrook Detachment, CA: 2001/02 Annual Report. Unpublished report prepared for Southwest Division Naval Facilities Command and NOC, Pacific Division, Fallbrook Detachment. Delivery Order: N68711-99-D-6605/0008&0011.	Stationwide
Weed Control	2002	Agri Chemical & Supply, Inc. 2003. Control of Non-native Invasive Plants on Naval Weapons Station Seal Beach Detachment Fallbrook, Fallbrook, CA: 2002 Annual Report. Unpublished report prepared for Southwest Division Naval Facilities Command and NOC, Naval Weapons Station Seal Beach Detachment Fallbrook. Delivery Order: N68711-99-D-6605/0024 & 0033.	Stationwide
Weed Control	2003	Agri Chemical & Supply, Inc. 2004. Control of *Arundo donax* (Giant Reed) on Naval Weapons Station Seal Beach Detachment Fallbrook: 2003 Annual Report. Unpublished report prepared for Southwest Division Naval Facilities Command and Conservation Program Manager, Naval Weapons Station Seal Beach Detachment Fallbrook. Delivery Order: N68711-99-D-6605/0050.	Stationwide
Weed Control	2003	Agri Chemical & Supply, Inc. 2004. Control of Upland Non-Native Invasive Plants on Naval Weapons Station Seal Beach Detachment Fallbrook: 2003 Annual Report. Unpublished report prepared for Southwest Division Naval Facilities Command and Conservation Program Manager, Naval Weapons Station Seal Beach Detachment Fallbrook by Agri Chemical & Supply, Inc., San Diego, California. Delivery Order: N68711-99-D-6605/0033.	Stationwide
Weed Control	2004	Agri Chemical & Supply, Inc. 2004. Control of Upland Non-native Invasive Plants on Naval Weapons Station Seal Beach Detachment Fallbrook: 2004 Report. Unpublished report prepared for Southwest Division Naval Facilities Command and Conservation Program Manager, Naval Weapons Station Seal Beach Detachment Fallbrook. Delivery Order: N68711-99-D-6605/0051.	Stationwide

Table H-1 Consolidated list of natural resources surveys and studies conducted at Naval Weapons Station Seal Beach Detachment Fallbrook

Taxon Focus	Survey Year(s)	CITATION	Survey Focus
Weed Control	2005	Agri Chemical & Supply, Inc. 2006. Exotic plant control on Naval Weapons Station Seal Beach Detachment Fallbrook: 2005 Annual Report. Unpublished report prepared for Southwest Division Naval Facilities Command and Conservation Program Manager, Naval Weapons Station Seal Beach Detachment Fallbrook by Agri Chemical & Supply, Inc., San Diego, California. Contracts: N68711-04-3604/0003, N68711-04-3604/0006, and N68711-99 D-6605/0056.	Stationwide
Weed Control	2006	Agri Chemical & Supply, Inc. 2007. Exotic plant control on Naval Weapons Station Seal Beach Detachment Fallbrook: 2006 Report. Unpublished report prepared for Southwest Division Naval Facilities Command and Conservation Program Manager, Naval Weapons Station Seal Beach Detachment Fallbrook by Agri Chemical & Supply, Inc., San Diego, California.	Stationwide
Weed Control	2007	Giessow, J., J. Giessow, and G. Omori. 2008. Invasive Non-native Plant Control on Naval Weapons Station Seal Beach Detachment Fallbrook 2007 Report. Unpublished report submitted by Agri Chemical & Supply Inc. to the Environmental Programs and Services Office, Naval Weapons Station Seal Beach Detachment Fallbrook, California.	Stationwide
Weed Control	2008	Giessow, J., J. Giessow, G. Omori, & S. Bishop. 2010. Invasive Non-native Plant Control on Naval Weapons Station Seal Beach Detachment Fallbrook: 2008 Season. Unpublished report submitted by Agri Chemical & Supply Inc. to the Environmental Programs and Services Office, Naval Weapons Station Seal Beach Detachment Fallbrook, Fallbrook California.	Stationwide
Weed Control	2009	Giessow, J., J. Giessow, G. Omori, & S. Bishop. 2011. Invasive Non-native Plant Control on Naval Weapons Station Seal Beach Detachment Fallbrook: 2009 Season. Unpublished report submitted by Agri Chemical & Supply Inc. to the Environmental Programs and Services Office, Naval Weapons Station Seal Beach Detachment Fallbrook, Fallbrook California.	Stationwide
Weed Control	2010	Giessow, J., J. Giessow, G. Omori, & S. Bishop. 2011. Invasive Non-native Plant Control on Naval Weapons Station Seal Beach Detachment Fallbrook: 2010 Season. Unpublished report submitted by Agri Chemical & Supply Inc. to the Environmental Programs and Services Office, Naval Weapons Station Seal Beach Detachment Fallbrook, Fallbrook California.	Stationwide
Weed Control	2011	Agri Chemical & Supply, Inc. 2012. Invasive non-native plant control on Naval Weapons Station Seal Beach Detachment Fallbrook: 2011 season. Unpublished report submitted by Agri Chemical & Supply Inc. to the Environmental Programs and Services Office, Naval Weapons Station Seal Beach Detachment Fallbrook, Fallbrook, California.	Stationwide
Weed Control	2012	Agri Chemical & Supply, Inc. 2012. Invasive non-native plant control on Naval Weapons Station Seal Beach Detachment Fallbrook: 2012 season. Unpublished report submitted by Agri Chemical & Supply Inc. to the Environmental Programs and Services Office, Naval Weapons Station Seal Beach Detachment Fallbrook, Fallbrook, California.	Stationwide
Weed Control	2012	Lawson, D.M. Wolf, C.M. and V.M. Shoblock. 2012. Barbed goatgrass (Aegilops triuncialis) at Naval Weapons Station Seal Beach Detachment Fallbrook: Proposed Eradication and Monitoring Program. Prepared for Conservation Program Manager, Naval Weapons Station Seal Beach Detachment Fallbrook, San Diego County, California.	Planning document
Weed Control	2012-2015	Lawson, D.M. and C.M. Wolf. In prep. Goatgrass (*Aegilops triuncialis*) eradication and adaptive management program at Naval Weapons Station Seal Beach Detachment Fallbrook: 2012- 2015.	Stationwide
Weed Control	2013-2014	Agri Chemical & Supply, Inc. 2014. FY12 Exotic Pest Plant Species Control on Naval Weapons Station Seal Beach Detachment Fallbrook: 2013-2014 season. Unpublished report submitted by Agri Chemical & Supply Inc. to the Environmental Programs and Services Office, Naval Weapons Station Seal Beach Detachment Fallbrook, Fallbrook, California.	Stationwide
Weed Control	2014	California Invasive Plant Council (Cal-IPC). 2015. Prioritizing invasive plant species for eradication, containment and surveillance, case study: Naval Weaspons Station Seal Beach Detachment Fallbrook. Unpublished report funded by the Department of Defense Legacy Resource Management Program (project 13-621) and prepared by Cal-IPC (contact: Elizabeth Brusati), Berkeley, California.	Planning document
Weed Control	2014-2015	Agri Chemical & Supply, Inc. (Agrichem) 2015. Invasive, Exotic Plant Species Control at Naval Weapons Station Seal Beach Detachment Fallbrook: 2014-2015 Season. Unpublished report submitted by Agri Chemical & Supply Inc. (Contract # N62473-10-D-0802 / 0091) to the Environmental Programs and Services Office, Naval Weapons Station Seal Beach Detachment Fallbrook, Fallbrook, California.	Stationwide

Table H-1 Consolidated list of natural resources surveys and studies conducted at Naval Weapons Station Seal Beach Detachment Fallbrook

Taxon Focus	Survey Year(s)	CITATION	Survey Focus
INVERTEBRATES			
Ants & Termites?	1990s	San Diego State University [SDSU]. 1994. USN Fallbrook Naval Weapons Facility Resource Management Study, Quarterly Report. Dates October 1, 1994-December 31, 1994. Includes attachments. (need copy)	Stationwide?
Fairy Shrimp	2002-2003	Cobb, C. and K. O'Connor. 2004. Presence/Absence Surveys for Fairy Shrimp Conducted during the 2002-2003 Wet Season at Naval Weapons Station Seal Beach Detachment Fallbrook: 90-day report (with field data sheets). Unpublished report prepared by Southwest Division, Naval Facilities Engineering Command (Permit Number NAVYSW-9).	Stationwide; vernal pools
Fairy Shrimp	2002-2005	Cobb, C. 2009. Presence/Absence Surveys for Fairy Shrimp Conducted during the 2002-2003 and 2004-2005 Wet Seasons at Naval Weapons Station Seal Beach Detachment Fallbrook. Unpublished report prepared by Coralie Cobb (Naval Facilities Engineering Command, Southwest) for Public Works Department, Naval Weapons Station Seal Beach Detachment Fallbrook, Fallbrook California.	Stationwide; vernal pools
Aquatic Invertebrates	2013, 2015	Amec Foster Wheeler Environment & Infrastructure Inc. (Amec Foster Wheeler). 2016. Aquatic Invertebrate Baseline Surveys at Naval Weapons Station Seal Beach Detachment Fallbrook: 2013 and 2015 Seasons. Final Report submitted to Environmental Programs and Services Office, Naval Weapons Station Seal Beach Detachment Fallbrook, San Diego County, California.	Stationwide
Terrestrial Invertebrates, Lepidoptera	2013, 2015	Osborne Biological Consulting and Amec Foster Wheeler. 2016. Baseline Terrestrial Invertebrate Surveys on Naval Weapons Station Seal Beach Detachment Fallbrook, San Diego County, California. Unpublished report submitted by Osborne Biological Consulting and Amec Foster Wheeler to Naval Facilities Engineering Command Southwest, California.	Stationwide
FISH			
Fish: General	c.1975	Wells, A.W. and J.S. Diana. 1975. Survey of the freshwater fishes and their habitats in the Coastal Drainages of Southern California.	Coastal drainages
Fish: General	1997-1998	Warburton, Manna L., Camm C. Swift, and Robert N. Fisher. 2000. Status and Distribution of Fishes in the Santa Margarita Drainage. U.S. Geological Survey, for The Nature Conservancy.	Santa Margarita River
Fish: Steelhead Habitat	c.1998	USFWS. 1998. Southern steelhead (Oncorhynchus mykiss) habitat suitability survey of the Santa Margarita River, San Mateo, and San Onofre Creeks on Marine Corps Base Camp Pendleton, California. Document prepared by J.S. Lang, B.F. Oppenheim, and R.N. Knight, Coastal California Fish and Wildlife Office, Arcata, CA, for AC/S Environmental Security, MCB Camp Pendleton.	Santa Margarita River
Fish: General	2001-2002	Knight, R. and M. Palmer. 2002. Naval Weapons Station Detachment Fallbrook Fish Population Data: Winter 2001-2002. Collection of field data sheets from fish sampling performed by installation personnel in cooperation with California Fish and Game at Depot and Lower Lakes on Naval Weapons Station Seal Beach Detachment Fallbrook, Fallbrook, California.	Depot and Lower Lakes
Fish: Pacific Lamprey	c.2009	Swift, C.C. and S.R. Howard. 2009. Current status and distribution of the Pacific lamprey south of Point Conception, Southern Coastal California, USA. American Fisheries Society Symposium 72:1-9.	Santa Margarita River
Steelhead	2011-2013	Cardno ENTRIX. 2013. Santa Margarita River Steelhead Habitat Assessment and Enhancement Plan. Unpublished report prepared for Trout Unlimited, with funding from California Department of Wildlife (Grant Number PI050013 00),by Cardno ENTRIX, Santa Barbara, California.	Santa Margarita River
AMPHIBIANS AND REPTILES			
Orange-throated whiptail	1981	McGurty, B.M. 1981. Status survey report on the orange-throated whiptail lizard, *Cnemidophorus hyperythrus beldingi*, occurring on Camp Pendleton U.S. Marine Corps Base, Miramar U.S. Naval Air Station, Fallbrook Annex U.S. Naval Weapons Station, during the survey period August to November 1981. Report prepared by Brian M. McGurty, U.S. Fish and Wildlife Service, Endangered Species Office, contract 11310-0129-81.	Stationwide
Orange-throated whiptail & SD Horned Lizard	1989-1990	Brattstrom, B.H. 1990. Status survey of the Orange-throated Whiptail,*Cnemidophorus hyperythrus beldingi*, and the San Diego Horned,*Phrynosoma coronatum blainvillei*: Progress Reports for 1989-1990 field seasons. Regionwide report that includes Detachment Fallbrook, submitted to the California Department of Fish and Game (Rancho Cordova, CA). Fish and Game Contract, FG 8597.	Stationwide
SD Horned Lizard	1990	Brattstrom, B.H. 1992. Status survey of the San Diego Horned Lizard on the Naval Weapons Depot, Fallbrook Annex, San Diego County, CA (1990 field season). Unpublished final (draft) report that was part of a larger study in southern California for California Department of Fish and Game (FG8597) by BHB with the Department of Biology, California State University, Fullerton, California. 11pp.	Stationwide

Table H-1 Consolidated list of natural resources surveys and studies conducted at Naval Weapons Station Seal Beach Detachment Fallbrook

Taxon Focus	Survey Year(s)	CITATION	Survey Focus
Coast horned lizard	1990-1991	Brattstrom, B.H. 2013. Distribution of the coast horned lizard, Phrynosoma coronatum, in southern California. Bull. Southern California Acad. Sci. 112(3):206-216.	Region, includes Det. FB
Orange-throated whiptail	1990-1991	Brattstrom, B.H. 2000. The range, habitat requirements, and abundance of the orange-throated whiptail, Cnemidophorus hyperthyrus beldingi. Bull. Southern California Acad. Sci. 99(1):1-24	Region, includes Det. FB
SD Horned Lizard	c.1991	Brattstrom, B.H. 1993. Status survey of the San Diego Horned Lizard on the Naval Weapons Station, Fallbrook Annex, San Diego County, CA. Stamped "REVIEW COPY ONLY, DO NOT DISTRIBUTE". (Data of survey season is ambiguous; appears to be same 1990 data as Brattstrom92; need final copy.)	Stationwide
Herps: General	1993-1994	Garcia, R.M. and J.E. Berrian. c1995. Herpetological surveys of Naval Weapons Station Seal Beach, Fallbrook Annex, 1993-94. Draft Report prepared by RMG & JEB, San Diego State University Foundation, San Diego, for SWDIV NAVFACENGCOM. 16 pp.	Stationwide
ARTO	2001	Varanus Biological Services [Varanus]. 2004. Preliminary Investigation Into the Distribution of the Arroyo Toad (Bufo Californicus) on Naval Weapons Station Seal Beach Detachment Fallbrook (2001 Season). Unpublished report submitted by W. E. Haas (P.I) to Tierra Data Systems and the Naval Weapons Station Seal Beach Detachment Fallbrook Environmental Programs and Services Office. [Previously cited as: Varanus Biological Services [Varanus]. 2004. Arroyo Toad Work Summary and Progress Report (Report VBSI 01-11-2001). December 2001 Progress Report.]	Stationwide
ARTO	2002	Varanus Monitoring Services (Varanus). 2006. Effects of Wildfire on the Arroyo Toad (Bufo californicus) at Naval Weapons Station Seal Beach Detachment Fallbrook (2002 Season). Unpublished report submitted by W. E. Haas (P.I) to the Naval Weapons Station Seal Beach Detachment Fallbrook Environmental Programs and Services Office.	Upland?
ARTO	2003	Varanus Monitoring Services (Varanus). 2006. Results of 2003 Breeding Season Surveys for the Arroyo Toad (*Bufo californicus*) on Naval Weapons Station Seal Beach Detachment Fallbrook (2003 Season). Unpublished report submitted by W. E. Haas (P.I) to the Naval Weapons Station Seal Beach Detachment Fallbrook Environmental Programs and Services Office.	Breeding
Herp: General	2003	Varanus Biological Services (Varanus). 2004. Herpetological Surveys on Naval Weapons Station Seal Beach Detachment Fallbrook (2003 Season). Unpublished DRAFT Annual Report submitted by W. E. Haas (P.I) to the Naval Weapons Station Seal Beach Detachment Fallbrook Environmental Programs and Services Office.	Stationwide
Herp: General	2004	Varanus Biological Services (Varanus). 2004. Herpetological Surveys on Naval Weapons Station Seal Beach Detachment Fallbrook (2004 Season). Unpublished DRAFT Annual Report submitted by W. E. Haas (P.I) to the Naval Weapons Station Seal Beach Detachment Fallbrook Environmental Programs and Services Office.	Stationwide
ARTO	2006-2008	Bloom, P. H., C. A. Niemela, and R. Lovich. 2010. Arroyo toad upland habitat utilization study on Naval Weapons Station Seal Beach Detachment Fallbrook, San Diego County, 2006-2008. Unpublished report prepared for Environmental Programs and Service Office, Naval Weapons Station Seal Beach Detachment Fallbrook, Fallbrook, California	Upland
ARTO	2010-2011	ICF International and Business and Ecology Consulting (ICF & BEC). 2013. Arroyo Toad Five year Survey (2010 Season) and Habitat Model Validation at Naval Weapons Station Seal Beach Detachment Fallbrook, California. Unpublished Final Report prepared for Naval Weapons Station Seal Beach Detachment Fallbrook and Naval Facilities Engineering Command Southwest.	Breeding & Upland
Amphibian Disease (Bd) Study	2013	Lannoo, M.J., C.Petersen, R.E. Lovich, C. Phillips. 2014. Department of Defense Amphibian Disease [Batrachochytrium dendrobatidis (Bd)] Survey: Natural Resource Manager Training and Data Collection. Department of Defense Legacy Resource Mangement Program, Project Number 12-426.	National, includes Det. FB
Herp: General + ARTO	2013-2014	Hollingsworth, B.D. and M.A. Stepek. 2015. Arroyo Toad Habitat Model Validation and General Herpetological Survey (2013-2014 Seasons) on Naval Weapons Station Seal Beach Detachment Fallbrook, California. Unpublished Final Report prepared for the Naval Weapons Station Seal Beach Detachment Fallbrook and Naval Facilities Engineering Command Southwest	Stationwide
ARTO	2014-2016	Hollingsworth, B.D. and M.A. Stepek. In prep. Arroyo Toad Survey and Upland Study (2014-2016 Seasons) at Naval Weapons Station Seal Beach Detachment Fallbrook, California. Unpublished report prepared by San Diego Natural History Museum for Detachment Fallbrook, under contract with Naval Facilities Engineering Command Atlantic and Southwest (Cooperative Agreement N62470-14-2-9011).	Santa Margarita River, Upland

Table H-1 Consolidated list of natural resources surveys and studies conducted at Naval Weapons Station Seal Beach Detachment Fallbrook

Taxon Focus	Survey Year(s)	CITATION	Survey Focus
BIRDS			
LBVI	1987	Kus, B. 1988. An evaluation of the suitability of riparian woodlands at the Fallbrook Annex, Naval weapons Station, Seal Beach, as breeding habitat for the least Bell's vireo (1987 season). Unpublished report originally submitted to the U.S. Navy on 15 April 1988, revised 18 July 1988, by B.E.K., Department of Biology, San Diego State University, San Diego, California.	Habitat Suitability
LBVI/SWFL	1993-2001	Burr, T.A. 2002. Surveys for the endangered least Bell's vireo (Vireo bellii pusillus) on Naval Weapons Station Seal Beach, Detachment Fallbrook, California, 1993-2001. Prepared by T.A. Burr, U.S. Navy, Naval Facilities Engineering Command Southwest Division, San Diego, California, for Conservation Program Manager, Naval Weapons Station Seal Beach Detachment Fallbrook, under contract N4761501POE-0046.	Point counts
LBVI	1998, 2000	Weaver, K. 2001. Map of Least Bell's Vireo observations in 1998 and 2000 on Naval Weapons Station Seal Beach Detachment Fallbrook. 1 pp. (Map Only - No accompanying report.)	Interior
LBVI/SWFL	2002	Unitt, P. and W.E. Haas. 2003. Surveys for the Least Bell's Vireo and the Southwestern Willow Flycatcher at Naval Weapons Station Seal Beach, Detachment Fallbrook, 2002. Unpublished report prepared by San Diego Natural History Museum (P. Unitt) and Vananus Biological Services (W.E. Haas) for U.S. Navy, Southwest Division Naval Facilities Engineering Command, San Diego, CA, under contract number N68711-02-LT-00012.	Stationwide; directed searches, 3 passes, & 30 point count stations
LBVI	2002	U.S. Department of the Navy (USDON). 2003. Least Bell's Vireo Habitat Inventory Naval Weapons Station Seal Beach, Detachment Fallbrook, May 2003. Prepared for Weapons Environmental Support Office, Naval Weapons Station Seal Beach, Detachment Fallbrook. Prepared by L. Criley (principle author), San Diego, CA.	Habitat inventory; suitability classification
LBVI	2003	Varanus Biological Services [Varanus]. Circa 2003. Surveys for the Least Bell's Vireo and the Southwestern Willow Flycatcher at Naval Weapons Station Seal Beach, Detachment Fallbrook, 2003. Unpublished report prepared by San Diego Natural History Museum (P. Unitt) and Vananus Biological Services (W.E. Haas) for U.S. Navy, Southwest Division Naval Facilities Engineering Command, San Diego, CA, under contract number N68711-02-LT-00012.	Interior only?
LBVI/SWFL	2004	Varanus Biological Services (Varanus). 2004. Least Bell's Vireo Surveys on Naval Weapons Station Seal Beach, Detachment Fallbrook, Monthly Report for July 2004. Unpublished report prepared by Vananus Biological Services (W.E. Haas) for U.S. Navy, Southwest Division Naval Facilities Engineering Command, San Diego, CA, under contract number N68711-03-M-6605.	Interior only
LBVI/SWFL	2007	Niemela, C. A. and P. H. Bloom. 2009. 2007 Least Bell's Vireo Breeding Survey at Naval Weapons Station Seal Beach Detachment Fallbrook, San Diego County, California. Unpublished report submitted by Western Foundation of Vertebrate Zoology to the Environmental Programs and Service Office, Naval Weapons Station Seal Beach Detachment Fallbrook, Fallbrook, California.	Stationwide
LBVI/SWFL	2008	Tierra Data, Inc. (TDI). 2013. Five-Year Station-Wide Survey for the Least Bell's Vireo (Vireo bellii pusillus) at Naval Weapons Station Seal Beach Detachment Fallbrook: 2008 Season. Unpublished Final Report submitted by Tierra Data, Inc. to the Environmental Programs and Services Office, Naval Weapons Station Seal Beach Detachment Fallbrook, Fallbrook, California.	stationwide; Five-Year Protocol
LBVI/SWFL	2009	Niemela, C. A., Moore, K. J., and P. H. Bloom. 2012. Annual Least Bell's Vireo Surveys at Naval Weapons Station Seal Beach Detachment Fallbrook: 2009 Season. Unpublished report submitted by Western Foundation of Vertebrate Zoology to the Environmental Programs and Service Office, Naval Weapons Station Seal Beach Detachment Fallbrook, Fallbrook, California.	Interior; Annual Protocol
LBVI/SWFL	2010	ICF International. 2012. Annual Least Bell's Vireo Surveys at Naval Weapons Station Seal Beach Detachment Fallbrook: 2010 Season. Final. November. Unpublished report submitted by Kylie Fischer to Naval Weapons Station Seal Beach Detachment Fallbrook and Naval Facilities Engineering Command Southwest, San Diego, California.	Interior; Annual Protocol
LBVI/SWFL	2011	ICF International. 2013. Annual Least Bell's Vireo Surveys at Naval Weapons Station Seal Beach Detachment Fallbrook, San Diego, California: 2011 Survey Season. Unpublished final report submitted by Kylie Fischer to Naval Weapons Station Seal Beach Detachment Fallbrook and Naval Facilities Engineering Command Southwest, San Diego, California.	Interior; Annual Protocol
LBVI/SWFL	2012	ICF International. 2014. Annual Least Bell's Vireo Surveys at Naval Weapons Station Seal Beach Detachment Fallbrook, San Diego, California: 2012 Season. Unpublished report submitted by Kylie Fischer to Naval Weapons Station Seal Beach Detachment Fallbrook and Naval Facilities Engineering Command Southwest, San Diego, California.	Interior; Annual Protocol

Table H-1 Consolidated list of natural resources surveys and studies conducted at Naval Weapons Station Seal Beach Detachment Fallbrook

Taxon Focus	Survey Year(s)	CITATION	Survey Focus
LBVI/SWFL	2013	ICF International. 2016. Station-wide Least Bell's Vireo Surveys at Naval Weapons Station Seal Beach Detachment Fallbrook, San Diego, California: 2013 Survey Season. Unpublished report submitted by Kylie Fischer to Naval Weapons Station Seal Beach Detachment Fallbrook and Naval Facilities Engineering Command Southwest, San Diego, California.	stationwide; Five-Year Protocol
LBVI/SWFL	2014	Multimac JV. 2016. Annual Least Bell's Vireo Surveys at Naval Weapons Station Seal Beach Detachment Fallbrook, San Diego, California: 2014 Season. Unpublished report submitted by Kylie Fischer to Naval Weapons Station Seal Beach Detachment Fallbrook and Naval Facilities Engineering Command Southwest, San Diego, California.	Interior; Annual Protocol
LBVI/SWFL	2014	U.S. Department of the Navy (USDON). 2014. Five-year Station-wide and annual survey protocols for the least Bell's vireo at Naval Weapons Station Seal Beach Detachment Fallbrook. Unpublished report (revision: 8 December 2014) prepared by C.M. Wolf, Environmental Programs and Services Office, Naval Weapons Station Seal Beach Detachment Fallbrook, Fallbrook, California.	Planning document
LBVI/SWFL	2015	MultiMAC JV. In prep. Annual Abbreviated Least Bell's Vireo Surveys, Naval Weapons Station Seal Beach Detachment Fallbrook, San Diego, California: 2015 Season.	Interior; Annual Protocol
LBVI/SWFL	2016	Multimac JV. In prep. Annual Least Bell's Vireo Surveys at Naval Weapons Station Seal Beach Detachment Fallbrook, San Diego, California: 2016 Season.	Interior; Annual Protocol
CAGN, CACW	1990	U.S. Fish and Wildlife Service (USFWS). 1992. California gnatcatcher and cactus wren surveys of the Naval Weapons Station, Fallbrook Annex (Spring 1990, Winter 1990-91). Unpublished report prepared by Doreen Stadtlander, U.S. Fish and Wildlife Service, for U.S. Navy, Southwestern Division, Naval Facilities Engineering Command, San Diego, California, under contract N68711-90-LT-0011.	stationwide
CAGN, CACW	1994	Varanus Biological Services (Varanus). 1994. Fourth quarterly report, 1994 California gnatcatcher surveys and subsequent spot-mapping. Naval Weapons Station, Fallbrook Annex. Report prepared for San Diego State Foundation, 9 pp. [As cited in Varanus (2002, CAGN 2000 Season rpt); CAGN surveys were conducted "between June & August of 1994".]	Stationwide
CAGN	1996	Hunsaker, D. 1996. California gnatcatcher monitoring report for nest parasitism by brown-headed cowbirds at Fallbrook Naval Weapons Station (1996 Season). Unpublished report prepared by Don Hunsaker, San Diego State University Foundation, for Naval Weapons Station Seal Beach Detachment Fallbrook, Fallbrook, California, under contract LT-3018.	Cowbird parasitism focus
CAGN	2000	Varanus Biological Services, Inc. (Varanus). 2002. Surveys to Determine Number and Distribution of California Gnatcatchers (Polioptila californica) at the Naval Weapons Station Seal Beach, Detachment Fallbrook (2000 Season). Unpublished report prepared by Varanus Biological Services, Inc. (under contract with Tierra Data Systems) for Naval Weapons Station Seal Beach Detachment Fallbrook, Fallbrook, California.	Stationwide
CAGN	2002	Varanus Biological Services (Varanus). 2004. Results of spot-mapping to determine use area size and habitat preferences of the California gnatcatchers (Polioptila californica) at the Naval Weapons Station Seal Beach Detachment Fallbrook: Breeding season spot mapping component (2002 Season). Unpublished report prepared by Varanus Biological Services, Inc. (under contract with Tierra Data, Inc.) for Naval Weapons Station Seal Beach Detachment Fallbrook, Fallbrook, California.	Spot Mapping
CAGN	2008	GANDA & Cadre 2008. Coastal California Gnatcatcher Annual Monitoring Program at Naval Weapons Station Seal Beach Detachment Fallbrook: 2008 Season. Unpublished report prepared by Garcia and Associates (GANDA) and Cadre Environmental to the Environmental Programs and Services Office, Naval Weapons Station Seal Beach Detachment Fallbrook, Fallbrook, California.	Annual Abbreviated
CAGN	2008	Unitt, P. 2008. Coastal California gnatcatcher studies and management approach for Naval Weapons Station Seal Beach Detachment Fallbrook, San Diego County, California. Report prepared under Cooperative Agreement N68711-03-LT-A0050 for Naval Weapons Station Seal Beach Detachment Fallbrook and Naval Engineering Facilities Command, Southwest.	Planning document
CAGN, CACW	2009	GANDA & Cadre. 2010. Five-Year, Station-wide Survey for the Coastal California Gnatcatcher at Naval Weapons Station Seal Beach Detachment Fallbrook: 2009 Season. Unpublished report prepared by Garcia and Associates (GANDA) and Cadre Environmental to the Environmental Programs and Services Office, Naval Weapons Station Seal Beach Detachment Fallbrook, Fallbrook, California.	Stationwide
CAGN, CACW	2010	ICF International [ICF]. 2011. California Gnatcatcher Surveys at Naval Weapons Station Seal Beach Detachment Fallbrook: 2010 Season. Unpublished report submitted by Kylie Fischer to Naval Weapons Station Seal Beach Detachment Fallbrook and Naval Facilities Engineering Command Southwest.	Annual Abbreviated
CACW	2011	Barr, K.R, A.G. Vandergast, and B.E. Kus. 2012. Genetic connectivity in the coastal cactus wren. Data summary report prepared by U.S. Geological Survey for SDMMP.	Region, includes Det. FB

Table H-1 Consolidated list of natural resources surveys and studies conducted at Naval Weapons Station Seal Beach Detachment Fallbrook

Taxon Focus	Survey Year(s)	CITATION	Survey Focus
CACW	2011	Barr, K.R, A.G. Vandergast, and B.E. Kus. 2013. Genetic structure in the cactus wren in coastal southern California. Data summary report prepared by U.S. Geological Survey for California Department of Fish and Wildlife.	Region, includes Det. FB
CAGN, CACW	2011	ICF International [ICF]. 2014. California Gnatcatcher Surveys at Naval Weapons Station Seal Beach Detachment Fallbrook: 2011 Season. Unpublished report submitted by Kylie Fischer to Naval Weapons Station Seal Beach Detachment Fallbrook and Naval Facilities Engineering Command Southwest.	Annual Abbreviated
CAGN, CACW	2012	ICF International [ICF]. 2014. California Gnatcatcher Surveys at Naval Weapons Station Seal Beach Detachment Fallbrook: 2012 Season. Unpublished report submitted by Kylie Fischer to Naval Weapons Station Seal Beach Detachment Fallbrook and Naval Facilities Engineering Command Southwest.	Annual Abbreviated
CAGN	2012-2013	Vandergast, A.G, B.E. Kus, K.R. Barr, and K.L. Preston. 2014. Genetic structure in the California gnatcatcher in coastal southern California and implications for monitoring and management. Data summary report prepared for CDFW, by U.S. Geological Survey.	Project-level
CAGN, CACW	2013	ICF International [ICF]. 2014. California Gnatcatcher Surveys at Naval Weapons Station Seal Beach Detachment Fallbrook: 2013 Season. Unpublished report submitted by Kylie Fischer to Naval Weapons Station Seal Beach Detachment Fallbrook and Naval Facilities Engineering Command Southwest.	Annual Abbreviated
CAGN, CACW	2014	Kidd Biological, Inc. 2016. Five-Year Station-Wide Survey Results for California Gnatcatcher Surveys at Naval Weapons Station Seal Beach Detachment Fallbrook: 2014 Season. Repor prepared by Nina J. Kidd of Kidd Biological, Inc. for GeomorphIS, LLC under contract with Naval Weapons Station Seal Beach Detachment Fallbrook and Naval Facilities Engineering Command Southwest.	Stationwide
CAGN, CACW	2014	U.S. Department of the Navy (USDON). 2014. Survey and mapping protocols for coastal California gnatcatchers and coastal sage scrub at Naval Weapons Station Seal Beach Detachment Fallbrook. Unpublished report (revision: 8 December 2014) prepared by C.M. Wolf, Environmental Programs and Services Office, Naval Weapons Station Seal Beach Detachment Fallbrook, Fallbrook, California.	Planning document
CAGN, CACW	2015	MultiMAC JV. In prep. Annual California Gnatcatcher Surveys, Naval Weapons Station Seal Beach Detachment Fallbrook, San Diego, California: 2015 Season.	Interior; Annual Protocol
CAGN, CACW	2016	Kidd Biological, Inc. In prep. Annual California Gnatcatcher Surveys at Naval Weapons Station Seal Beach Detachment Fallbrook: 2016 Season.	Interior; Annual Protocol
Raptors	1993-1995	Bloom, P.H. 1996. Raptor Status and Management Recommendations for Naval Ordnance Center, Pacific Division, Fallbrook Detachment, and Naval Weapons Station, Seal Beach, 1993/95. Prepared for Southwest Division, Naval Facilities Engineering Command by Western Foundation of Vertebrate Zoology.	Stationwide
Raptors	2012	Tierra Data, Inc. (TDI). 2012. Mapping power poles for raptor protection on Naval Weapons Station Seal Beach Detachment Fallbrook. Unpublished report submitted by Tierra Data, Inc. to Naval Weapons Station Seal Beach Detachment Fallbrook and Naval Facilities Engineering Command Southwest, San Diego, California.	Stationwide
Raptors	2015	ICF International/Kidd Biological Inc. In prep. Stationwide Raptor Breeding Survey at Naval Weapons Station Seal Beach Detachment Fallbrook: 2015 season.	Stationwide
Raptors	2016	Vernadero/Kidd Biological Inc. In prep. Stationwide Raptor Breeding Survey at Naval Weapons Station Seal Beach Detachment Fallbrook: 2016 season.	Stationwide
TUVU	2013	California Animal Health & Food Safety Laboratory System (CAHFS). 2013. Preliminary Version 1 Lab Report for Case # D1309249 (negative results of turkey vulture [TUVU] lead sampling). CAHFS Laboratory Systems, P.O. Box 1770, Davis, California 95617.	Project-level
MAPS	2001	Campbell BioConsulting Inc. 2002. Neotropical Migratory Bird Monitoring Project and Vegetative Communities Study on Naval Weapons Station, Seal Beach, Detachment Fallbrook: 2001 Season. Final Report to Detachment Fallbrook and to Southwest Division, Naval Facilities Engineering Command, BRAC Construction Office/ROICC Miramar, San Diego, CA.	Net stations
MAPS	2002	Campbell BioConsulting Inc. 2003. Neotropical Migratory Bird Monitoring Project on Naval Weapons Station, Seal Beach, Detachment Fallbrook: 2002 Season. Final Report to Detachment Fallbrook and to Southwest Division, Naval Facilities Engineering Command, San Diego, CA.	Net stations
MAPS	2003	Jones & Stokes. 2005. Neotropical Migratory Bird Monitoring Project on Naval Weapons Station, Seal Beach, Detachment Fallbrook: 2003 Season. Final Report to Detachment Fallbrook and to Southwest Division, Naval Facilities Engineering Command, San Diego, CA.	Net stations
MAPS	2001-2005	Jones & Stokes. 2008. Final Neotropical Migratory Bird Monitoring Project at Naval Weapons Station Seal Beach Detachment Fallbrook: 2005 Season and Cumulative Results (2001-2005). Final Report to Detachment Fallbrook and Naval Facilities Engineering Command, Southwest, San Diego, CA, under Cooperative Agreement number N68711-03-LT-A0049.	Net stations

Table H-1 Consolidated list of natural resources surveys and studies conducted at Naval Weapons Station Seal Beach Detachment Fallbrook

Taxon Focus	Survey Year(s)	CITATION	Survey Focus
MAMMALS			
Rodents	1972	Bleich, V.C. 1973. Ecology of Rodents at the United States Naval Weapons Station Seal Beach, Fallbrook Annex, San Diego County, California. Masters thesis presented to the Department of Biology, California State University, Long Beach, California. 102 pp.	Stationwide
Mountain Lion	1987-1989	Padley, W.D. 1991. Mountain lion distribution and movements at Naval Weapons Station, Fallbrook, 1987-1989. Unpublished report prepared by WDP, California State Polytechnic University, Pomona, California.	Stationwide
Bats	1994	Brown, P. 1995. Bat surveys Fallbrook Naval Weapons Facility. Technical report prepared by Dr. Patricia Brown for Naval Facilities Engineering Command, Southwest Division. 3pp.	Stationwide
Bats	1997-1998	The Environmental Trust. 2002. Bat roost relocation project (1997-1998 seasons). Unpublished report submitted by under contract (# N68711-97-LT-70045) for Naval Weapons Station Seal Beach Detachment Fallbrook.	Roost Relocation
Bats	2013-2014	Stokes, D.C. 2015. Bat surveys and monitoring on Naval Weapons Station Seal Beach Detachment Fallbrook, San Diego, California: 2013-2014 Seasons. Technical report prepared for Naval Facilities Engineering Command Southwest and Naval Weapons Station Seal Beach Detachment Fallbrook, California. 48pp.	Stationwide
Badger	2011	Brehme, C.S., C.Rochester, S.A. Hathaway, B.H. Smith, and N.R Fischer. 2012. Rapid assessment of the distribution of American badgers within western San Diego County (2011 Season). Data summary prepared for California Department of Fish and Game. 42 pp.	Regional, including Det. FB
SKR	1980-1981	Beauchamp, A. C. 1981. Status Review Study of Dipidomys stephensi on Marine Corps Base Camp Pendleton, Seal Beach Naval Weapons Station-Fallbrook Annex, and March Air Force Base, California. Report prepared by A.C.B. for U.S. Department of the Interior Fish and Wildlife Service.	Regional, including Det. FB
SKR	1990-1992	U.S. Fish and Wildlife Service (USFWS). 1993. Stephens' kangaroo rat study, Naval Weapon Station, Fallbrook Annex, San Diego County, California (1990-1992 seasons). Prepared for U.S. Navy, Southwestern Division, Naval Facilities Engineering Command. San Diego, California.	Stationwide
SKR	1994	Montgomery, S.J. 1994. Results of a Preliminary Update of Stephens' Kangaroo Rats on Fallbrook Naval Weapons Station, Fallbrook, California. Prepared by SJM Biological Consultants for the San Diego Foundation and the U.S. Navy, Southwest Division, Naval Facilities Engineering Command, San Diego, California.	Spot Mapping
SKR	c.1994-1995	Montgomery, S.J. 1996. Final report of a Stephens' kangaroo rat relocation project at the P151 missile maintenance facility, Naval Weapons Station, Fallbrook Annex. Fallbrook, California. Prepared for Cox Construction Co., Carlsbad, California. [Note: Structure is known today as Building 380 missile maintenance facility.]	Project-level
SKR	1994-1996	Montgomery, S.J. 1997. Stephens' kangaroo rat relocation study for the P-143 HARM missile storage building project at the Fallbrook Naval Weapons Station, Fallbrook California. Unpublished report prepared for Kvaas Construction Company, San Diego, California. [Note: Project is known today as the 900-series missile magazine complex.]	Project-level
SKR	1998-1999	Montgomery, S.J. 1999. Stephens' kangaroo rat trapping and relocation associated with the Phoenix Road improvement on weapons support facility Seal Beach, Fallbrook Detachment. Unpublished report prepared for the Environmental Office at Detachment Fallbrook under Cooperative Agreement #N68711-98-LT-80066.	Project-level
SKR	2001-2002	Montgomery, S.J., D.J. Grout, A. Davenport, R.N. Knight. 2005. Stephens' kangaroo rat monitoring program, and results of the 2001-2002 monitoring session, at Naval Weapons Station Seal Beach, Detachment Fallbrook, Fallbrook, California. Unpublished report (10 March 2005) prepared for Conservation Program Manager, Naval Weapons Station Seal Beach, Detachment Fallbrook, Fallbrook, California.	Annual Plot Monitoring
SKR	2001-2002	SJM Biological Consultants, Inc. 2005. Results of an October 2001 – February 2002 Station-wide survey for Stephens' kangaroo rats (*Dipodomys stephensi*) at Naval Weapons Station Seal Beach, Detachment Fallbrook, Fallbrook, California. Prepared for the Conservation Program Manager, Naval Weapons Station Seal Beach, Detachment Fallbrook. Fallbrook, California. Note: errata sheet added in 2014 that affects the estimated occupied and suitable unoccupied SKR habitat from this survey.	Stationwide
SKR	2002-2004	Montgomery, S. J., D.J. Grout, C.M. Wolf, V.M. Shoblock, A. Davenport, and R.N. Knight. 2008. Stephens' kangaroo rat monitoring program, and results of annual monitoring sessions between spring 2002 and fall 2004, at Naval Weapons Station Seal Beach Detachment Fallbrook. Unpublished report submitted by SJM Biological Consultants to the Environmental Programs and Services Office, Naval Weapons Station Seal Beach Detachment Fallbrook, Fallbrook, California.	Annual Plot Monitoring

Table H-1 Consolidated list of natural resources surveys and studies conducted at Naval Weapons Station Seal Beach Detachment Fallbrook

Taxon Focus	Survey Year(s)	CITATION	Survey Focus
SKR	2003-2005	Montgomery, S.J. and CH2MHill. 2008. SKR Habitat Restoration and Monitoring: Results of 2003-2005 Stephens' kangaroo rat habitat restoration and monitoring studies at the former napalm storage sites, San Diego County, California. Unpublished report submitted by Stephen J. Montgomery (P.I.) to the Environmental Prorams and Services Office, Naval Weapons Station Seal Beach Detachment Fallbrook, Fallbrook, California.	Habitat treatment
SKR	2004	Montgomery, S.J. and CH2MHill. 2004. Results of the January 2004 monitoring session at the Stephens' kangaroo rat restoration plots at the former napalm storage sites, San Diego County, California: Monitoring Report No. 1. Unpublished report prepared for Naval Weapons Station Seal Beach Detachment Fallbrook, Fallbrook, California.	Habitat treatment
SKR	2006	Montgomery, S. J., D.J. Grout, and V.M. Shoblock. 2010. Results of the 2006 Stephens' Kangaroo Rat Annual Monitoring Session at Naval Weapons Station Seal Beach Detachment Fallbrook. Unpublished report submitted by SJM Biological Consultants to the Environmental Programs and Services Office, Naval Weapons Station Seal Beach Detachment Fallbrook, Fallbrook, California under Naval Facilities Engineering Command Southwest Contract #N68711-00-D-4413/0025 with Tierra Data, Inc.	Annual Plot Monitoring
SKR	2007	Montgomery, S.J. and D.J. Grout. 2011. Results of the 2007 Station-wide Mapping Survey for the Stephens' Kangaroo Rat (*Dipodomys stephensi*) at Naval Weapons Station Seal Beach Detachment Fallbrook. Unpublished report submitted by SJM Biological Consultants, Inc. to the Environmental Programs and Services Office, Naval Weapons Station Seal Beach Detachment Fallbrook, Fallbrook, California.	Stationwide
SKR	2008-2009	Innovative Inclosures. 2013. Stephens' Kangaroo Rat Habitat Enhancement at Naval Weapons Station Seal Beach Detachment Fallbrook: 2008-2009 Seasons. Unpublished report prepared for the Environmental Programs and Services Office, Naval Weapons Station Seal Beach Detachment Fallbrook, Fallbrook, California by Innovative Inclosures, Murrieta, California.	Habitat Treatment
SKR	2008-2010	Montgomery, S. J. 2014. Results of 2008–2010 Stephens' Kangaroo Rat annual monitoring sessions at Naval Weapons Station Seal Beach Detachment Fallbrook. Unpublished report submitted by SJM Biological Consultants, Inc. under contract with Tierra Data, Inc. to the Environmental Programs and Services Office, Naval Weapons Station Seal Beach Detachment Fallbrook, Fallbrook, California.	Annual monitoring SKR
SKR	2009-2010	ICF International. 2010. Results of Stephens' kangaroo rat trapping, captivity, and release program for the 2009 Building 366 demolition project, Naval Weapons Station Seal Beach Detachment Fallbrook, California. Unpublished report submitted by Phillip Richards (Principal Investigator) to the Environmental Programs and Services Office, Naval Weapons Station Seal Beach Detachment Fallbrook and Naval Facilities Engineering Command Southwest.	Project-level
SKR	2010-2011	Tetra Tech, Inc. 2013. Stephens' Kangaroo Rat Habitat Enhancement and Monitoring at Naval Weapons Station Seal Beach Detachment Fallbrook: 2010-2011 Seasons. Unpublished report prepared for the Environmental Programs and Services Office, Naval Weapons Station Seal Beach Detachment Fallbrook, Fallbrook, California by Tetra Tech, Inc., Arlington, Virginia.	Habitat Treatment
SKR	2011	SJM Biological Consultants, Inc. 2014. Results of the 2011 Stephens' Kangaroo Rat Annual Monitoring Session at Naval Weapons Station Seal Beach Detachment Fallbrook. Unpublished report submitted by SJM Biological Consultants under contract with ICF International for Naval Facilities Engineering Command Southwest, California.	Annual Plot Monitoring
SKR	2012	SJM Biological Consultants, Inc. 2016. Results of the 2012 Stephens' Kangaroo Rat Annual Monitoring Session at Naval Weapons Station Seal Beach Detachment Fallbrook. Unpublished report submitted by SJM Biological Consultants under contract with ICF International for Naval Facilities Engineering Command Southwest, California.	Plot Monitoring
SKR	2013	SJM Biological Consultants, Inc. 2016. Results of the 2013 Stephens' kangaroo rat annual monitoring Session at Naval Weapons Station Seal Beach Detachment Fallbrook. Unpublished report submitted by SJM Biological Consultants under contract with ICF International for Naval Facilities Engineering Command Southwest, California.	Plot Monitoring
SKR	2013	SJM Biological Consultants, Inc. 2016. Results of the 2013 panel mapping of Stephens' kangaroo rat occupancy at Naval Weapons Station Seal Beach Detachment Fallbrook. Unpublished report submitted by SJM Biological Consultants under contract with ICF International for Naval Facilities Engineering Command Southwest, California.	Panel Mapping
SKR	2014	SJM Biological Consultants, Inc. 2016. Results of the 2014 Stephens' kangaroo rat annual monitoring at Naval Weapons Station Seal Beach Detachment Fallbrook. Unpublished report submitted by SJM Biological Consultants under contract with GeomorphIS for Naval Facilities Engineering Command Southwest, California.	Plot Monitoring

Table H-1 Consolidated list of natural resources surveys and studies conducted at Naval Weapons Station Seal Beach Detachment Fallbrook

Taxon Focus	Survey Year(s)	CITATION	Survey Focus
SKR	2014	SJM Biological Consultants, Inc. 2016. Stephens' kangaroo rat panel mapping survey at Naval Weapons Station Seal Beach Detachment Fallbrook: 2014 season. Unpublished report submitted by SJM Biological Consultants under contract to GeomorphIS for Naval Facilities Engineering Command Southwest, California.	Panel Mapping
SKR	2015	SJM Biological Consultants, Inc. In prep. Results of the 2015 Stephens' kangaroo rat annual monitoring at Naval Weapons Station Seal Beach Detachment Fallbrook.	Plot Monitoring
SKR	2015	ECORP Consulting, Inc. 2015. Results of Stephens' Kangaroo Rat Trap and Hold Program for the 2015 Remedial Investigation for Munitions Response Program Site UXO1 Naval Weapons Station Seal Beach Detachment Fallbrook, California. Unpublished report submitted by ECORP Consulting Inc. to the Environmental Programs and Services Office, Naval Weapons Station Seal Beach Detachment Fallbrook and Naval Facilities Engineering Command Southwest.	Project-level
SKR	2015	SJM Biological Consultants, Inc. In prep. Results of the 2015 panel mapping of Stephens' kangaroo rat occupancy at Naval Weapons Station Seal Beach Detachment Fallbrook.	Panel Mapping
GENERAL, MULTI-SPECIES			
General NR Study	1990s	Hunsaker, D. 1995. Status of the sensitive biological resources at Naval Ordnance Center, Pacific Division, Fallbrook Detachment, California. Department of Biology, San Diego State University, San Diego, CA. Prepared for Southwest Division Naval Facilities Engineering Command. Agreement No. N68711-93-LT-3018.	Stationwide
General NR Study	c.1992	Hunsaker II, D. 1992. Santa Margarita River monitoring program: Final report with appendices. For Eastern Municipal Water District and Rancho California Water District, Contract No. R91-001-001 and No. R91-004-00, San Jacinto.	Santa Margarita River
General NR Study	1994	Hunsaker II, D 1994. USN Fallbrook Naval Weapons Facility Resource Management Study (1 July-30 Sept quarterly report). San Diego State University.	Stationwide
General NR Study	1994	Hunsaker II, D 1994. USN Fallbrook Naval Weapons Facility Resource Management Study (1 Oct-31 Dec quarterly report). San Diego State University.	Stationwide
General NR Study	1994	San Diego State University [SDSU]. 1994. USN Fallbrook Naval Weapons Facility Resource Management Study, Quarterly Report. Dates July 1, 1994-September 30, 1994. Includes attachments.	Stationwide
General NR Study	1996	Hunsaker, D. and K. Clark. 1996. DRAFT Naval Ordnance Center Pacific Division Fallbrook Detachment Natural Resources Management Plan. Prepared by DH and KC, Department of Biology, San Diego State University, for Department of the Navy, Southwest Division Naval Facilities Engineering Command. Agreement No. N68711-93-LT-3018.	Planning document
Mgmt: NR Plan	1987	U.S. Department of the Navy (USDON). 1987. Comprehensive Natural Resources Management Plan (also: Land Management Plan), Naval Weapons Station, Seal Beach, Fallbrook Annex, California. Prepared by WESTNAVFACENGCOM Natural Resources Management Branch in cooperation with Regional Environmental Consultants (RECON) and includes a 1988 Prescribed Burn Plan Supplement. Note: document appears to have two different title pages; both are included here for cross-reference.	Planning document
Mgmt: Outdoor Recreation Plan	1992	U.S. Department of the Navy, Naval Weapons Station, Seal Beach (USDON). 1992. Natural resources management plan: Section 3.5, Outdoor Recreation, Naval Weapons Station, Seal Beach, Fallbrook Annex. December 1992. Environmental Division, Seal Beach, CA. 35p.	Planning document
Mgmt: Fish, Wildlife Plan	1995	Kelsey, R. 1995. Fish and Wildlife Management Plan. Naval Ordnance Center Pacific Division Fallbrook Detachment. Prepared by Rodd Kelsey, Naval Weapons Station Seal Beach, Prepared for Naval Ordnance Center Pacific Division Fallbrook Detachment. ("Draft" hand written)	Planning document
Mgmt: INRMP	1996	U.S. Department of the Navy (USDON). 1996. Integrated Natural Resources Management Plan, Naval Ordnance Center Pacific Division, Fallbrook Detachment. Final Report. December 1996. USDON Southwest Division Contract No. N68711-95-D-7605/0005. San Diego, CA. Prepared by Tierra Data Systems, Reedley, CA.	Planning document
MGMT: WFMP	2003	U.S. Department of the Navy (USDON). 2003. Wildland Fire Management Plan. Naval Weapons Station Seal Beach, Detachment Fallbrook Weapons Environmental Support Office. Prepared with contracted support from Tierra Data, Inc. and Firewise 2000 under Contract # N68711-95-D-7605/0063 and #N6871-00-M-4419 with U.S. Navy, Southwest Division Naval Facilities Engineering Command, San Diego, CA.	Planning document
Mgmt: INRMP	2006	U.S. Department of the Navy (USDON). 2006. Integrated Natural Resources Management Plan for Naval Weapons Station Seal Beach Detachment Fallbrook (v3). Prepared with contracted support from Tierra Data, Inc. (GSA contract #9T1S522DB) for the Naval Weapons Station Seal Beach Detachment Fallbrook, Fallbrook, California.	Planning document

Table H-1 Consolidated list of natural resources surveys and studies conducted at Naval Weapons Station Seal Beach Detachment Fallbrook

Taxon Focus	Survey Year(s)	CITATION	Survey Focus
MGMT: Pest Plan	2011	U.S. Department of the Navy (USDON). 2011. Integrated Pest Management Plan: Naval Weapons Station Seal Beach, California, including Detachment Corona and Detachment Fallbrook. Prepared by M. Medina, R. Schallmann, and N. Olmstead of Naval Facilities Engineering Command Southwest.	Planning document
Mgmt: Climate Change	2013	Enquist, C., D. Lawson, R. Wolf, C.M. Wolf, and L. Kellogg. 2013b. Facilitating Climate Change Adaptation in Naval Weapons Station Seal Beach Detachment Fallbrook's INRMP, San Diego County, California. Workshop Summary. 29 pp. http://www.denix.osd.mil/nr/upload/Facilitating-Climate-Change-Adaptation-in-Naval-Weapons-Station-Seal-Beach-Detachment-Fallbrook-s-INRMP-San-Diego-County-	Planning document
Mgmt: INRMP	2016	U.S. Department of the Navy (USDON). 2016. Integrated Natural Resources Management Plan for Naval Weapons Station Seal Beach Detachment Fallbrook. Produced by the Environmental Programs and Services Office, 700 Ammunition Road, Fallbrook, California.	Planning document
Soils, Erosion Control	1990	Kellogg, E.M. and J.L. Kellogg. 1990. Soil erosion inventory, Naval Weapons Station, Seal Beach, Fallbrook, CA.. May 1990. Contract No. N68711-89-M-5006.	Stationwide
Soils, Erosion Control	2001	U.S. Department of the Navy (USDON) 2002. Ordnance Storage Magazines Final Magazines: Final Erosion Maintenance/Repair Study. Prepared by USDON Commander Navy Region Southwest. 170 pp.	Stationwide
Soils, Erosion Control	2012	AMEC Environment & Infrastructure, Inc. (AMEC). 2013. Soil Conservation and Site Inventory Report Naval Weapons Station Seal Beach Detachment Fallbrook. Unpublished report submitted by AMEC to the Environmental Programs and Services Office, Naval Weapons Station Seal Beach Detachment Fallbrook, Fallbrook, California.	Stationwide
Soils, Erosion Control	2013	AMEC Environment & Infrastructure, Inc. (AMEC). 2013. Fallbrook Creek Final Stabilization Report: Naval Weapons Station Seal Beach, Detachment Fallbrook. Prepared by Michael Hogan, Integrated Environmental Restoration Services, under contract with AMEC.	Project-level
Soils, Erosion Control	2014-2015	Apex Contracting and Consulting, Inc. [ACCI] 2015. Fallbrook Creek Bank Erosion Control Work at Naval Weapons Station Seal Beach Detachment Fallbrook, California: 2014-2015 seasons. Unpublished report submitted by ACCI to Naval Weapons Station Seal Beach Detachment Fallbrook under contract (#N62473-11-D-2224-0105) with Naval Facilities Engineering Command Southwest, San Diego.	Project-level
LTETM	1995	San Diego State University (SDSU). 1996. Long term ecological trend monitoring program: 1995 field season report for the Naval Ordnance Center, Pacific Division, Fallbrook Detachment, California. Prepared by Giessow, J., L. Seiger, and P. Zedler, San Diego State University, for Department of the Navy, Southwest Division, contract number N68711-94-LT-4061.	Plots
LTETM	1996	San Diego State University (SDSU). 1997. Long term ecological trend monitoring program: 1996 field season report for the Naval Ordnance Center, Pacific Division, Fallbrook Detachment, California. Prepared by Giessow, J., L. Seiger, and P. Zedler, San Diego State University, for Department of the Navy, Southwest Division, contract number N68711-94-LT-4061. (DRAFT only on file; need final.)	Plots
LTETM	1998	San Diego State University (SDSU). 2001. Long Term Ecologiccal Trend Monitoring Program 1998 Field Season Report for the Naval Ordnance Center Pacific Division, Fallbrook Detachment, CA. Final Report. Prepared by SDSU, Pepared for DON, Southwest Division under Contract No. N68711-94-LT-4061	Plots
LTETM	1999	San Diego State University. 2001 (SDSU). Long Term Ecologiccal Trend Monitoring Program 1999 Field Season Report for the Naval Ordnance Center Pacific Division, Fallbrook Detachment, CA. Final Report. Prepared by SDSU, Pepared for DON, Southwest Division under Contract No. N68711-94-LT-4061	Plots
LTETM	2001	Tierra Data, Inc. (TDI). 2003. Long Term Ecological Trend Monitoring Program 2001 Annual Report, Naval Weapons Station Seal Beach, Detachment Fallbrook, Final, 6 Jan 2003. Prepared by Tierra Data, Inc. Prepared for: DON, Southwest Division under Contract No. N68711-00-D-4413. (Appendix A Bound Separately)	Plots
LTETM	2006	Tierra Data, Inc. (TDI). 2006. Long Term Ecological Trend Monitoring at Naval Weapons Station Seal Beach Detachment Fallbrook, California:Literature Review and Sampling Methodology, report submitted by Tierra Data, Inc. to the Naval Weapons Station Seal Beach Detachment Fallbrook under contract number N68711-00-D-4414/0026	Literature Review
LTETM	2006	Tierra Data, Inc. 2007. Long Term Ecological Trend Monitoring at Naval Weapons Station Seal Beach Detachment Fallbrook, California: Plot Reallocation & Sampling Methods Update and Data Entry: Management and Analysis, report submitted by Tierra Data, Inc. to the Naval Weapons Station Seal Beach Detachment Fallbrook under contract number N68711-05-D-8004/0014	Planning document

Table H-1 Consolidated list of natural resources surveys and studies conducted at Naval Weapons Station Seal Beach Detachment Fallbrook

Taxon Focus	Survey Year(s)	CITATION	Survey Focus
LTETM	2007	U.S. Department of the Navy (USDON). 2007. Long Term Ecological Trend Monitoring at Naval Weapons Station Seal Beach Detachment Fallbrook, California: 2007 Field Season. Compilation of data for subsample of plots surveyed by Detachment Fallbrook personnel with support from Tierra Data, Incorporated.	Plots
LTETM	2008	Tierra Data, Inc. (TDI). 2011. Long Term Ecological Trend Monitoring at Naval Weapons Station Seal Beach Detachment Fallbrook, California: 2008 Field Season. Unpublished final report submitted by Tierra Data, Inc. to the Naval Weapons Station Seal Beach Detachment Fallbrook.	Plots
LTETM	2014-2015	Tierra Data, Inc. (TDI). In prep. Long Term Ecological Trend Monitoring at Naval Weapons Station Seal Beach Detachment Fallbrook, California: 2014-2015 Field Seasons.	Plots
AG, Cattle	1977	U.S. Department of the Navy, Western Division (USDON). 1977. Soil and Water Conservation Plan for the Grazing Outlease at Naval Weapons Station Fallbrook, San Diego County, California. Prepared by Natural Resources Management Branch, Real Estate Division	Superceded
AG, Economic Evaluation	1985	CIC Research, Inc. 1985. An economic and resource evaluation for agriculture at the Fallbrook Annex of the Naval Weapons Station Seal Beach. Unpublished report prepared for Department of the Navy Western Division, Naval Facilities Engineering Command. This report is also Attachment 1 within the Comprehensive Natural Resources Management Plan for the Fallbrook Annex (USDON 1987).	Planning document
AG, Pond Plan	1987	U.S. Department of Agriculture (USDA). 1987. Livestock-Wildlife [Current B380] Pond Plan: Drawings and Specifications. Unpublished document prepared by USDA Soil Conservation Service for U.S. Navy, Naval Weapons Station Fallbrook Annex.	Project-level
AG, Range Assessment	1989	U.S. Department of Agriculture (USDA). 1989. Letter summarizing “Grazing Outlease-Range residues at Fallbrook Annex” from Jason Jackson, District Conservationist (USDA, Soil Conservation Service), to Edie Jacobsen, U.S. Navy, dated June 29, 1989.	Stationwide
AG, Range Assessment	1990	U.S. Department of Agriculture (USDA). 1990. Letter summarizing “Annual Range residues for Fallbrook Annex” from Jason Jackson, District Conservationist (USDA, Soil Conservation Service), to Edie Jacobsen, U.S. Navy, dated August 8, 1990.	Stationwide
AG, Range Assessment	1991	U.S. Department of Agriculture (USDA). 1991. Letter summarizing “Annual Range residues for Fallbrook Annex” from Jason Jackson, District Conservationist (USDA, Soil Conservation Service), to Edie Jacobsen, U.S. Navy, dated June 13, 1991.	Stationwide
AG, Range Assessment	1995	U.S. Department of Agriculture (USDA). 1995. Letter summarizing “Annual Range residues for Fallbrook Annex and Camp Pendleton” from Vic Smothers, District Conservationist (USDA, Natural Resources Conservation Service), to Edie Jacobsen, U.S. Navy, dated October 23, 1995.	Stationwide
AG, Range Assessment	1996	U.S. Department of Agriculture (USDA). 1996. Letter summarizing “Annual Range residues for Fallbrook NWS and Camp Pendleton” from Vic Smothers, District Conservationist (USDA, Natural Resources Conservation Service), to Edie Jacobsen, U.S. Navy, dated September 3, 1996.	Stationwide
AG, Range Assessment	1997	U.S. Department of Agriculture (USDA). 1997. Letter summarizing “Annual Range residues for Fallbrook NWS and Camp Pendleton” from Vic Smothers, District Conservationist (USDA, Natural Resources Conservation Service), to Edie Jacobsen, U.S. Navy, dated September 4, 1997.	Stationwide
AG, Range Assessment	1998	U.S. Department of Agriculture (USDA). 1998. Letter summarizing “Annual Range residues for Fallbrook NWS and Camp Pendleton” from Vic Smothers, District Conservationist (USDA, Natural Resources Conservation Service), to Jennifer Stone, U.S. Navy, dated July 23, 1998.	Stationwide
AG, Range Assessment	1999	U.S. Department of Agriculture (USDA). 1999. Letter summarizing “Annual Range residues for Fallbrook NWS and Camp Pendleton” from Vic Smothers, District Conservationist (USDA, Natural Resources Conservation Service), to Jennifer Stone, U.S. Navy, undated but letter is eporting on data collected in September 1999.	Stationwide
AG, Cattle	2006	George, M. 2006. Cattle Water Study, Naval Weapons Station Seal Beach Detachment Fallbrook, California. Unpublished report prepared for Conservation Program Manager, Naval Weapons Station Seal Beach Detachment Fallbrook (Contract No. N68711-04-LTA0059).	Stationwide
AG, Cattle	2011	AMEC Earth & Environmental, Inc. (AMEC). 2011. Cattle water well feasibility study at Naval Weapons Station Seal Beach Detachment Fallbrook. Unpublished report prepared by AMEC, San Diego, California, for Detachment Fallbrook under contract with Naval Facilities Engineering Command Southwest (N62473-07-D-3201).	Stationwide
AG, Cattle	2011	AMEC Earth & Environmental, Inc. (AMEC). 2012. Cattle water well feasibility and conceptual design study at Naval Weapons Station Seal Beach Detachment Fallbrook. Unpublished report prepared by AMEC, San Diego, California, for Detachment Fallbrook under contract with Naval Facilities Engineering Command Southwest (N62473-07-D-3201).	Stationwide

Table H-1 Consolidated list of natural resources surveys and studies conducted at Naval Weapons Station Seal Beach Detachment Fallbrook

Taxon Focus	Survey Year(s)	CITATION	Survey Focus
AG, Cattle	2015	U.S. Department of the Navy [USDON]. 2015. Grazing Conservation Plan for Livestock Grazing Outlease, Parcel 4A01, Naval Weapons Station Seal Beach Detachment Fallbrook, California. Unpublished report prepared by Naval Facilities Engineering Command Southwest Division, San Diego, CA.	Planning document
AG, Cattle	2016	U.S. Department of the Navy [USDON]. 2016. Monitoring Protocol for the Grazing Management Program at Naval Weapons Station Seal Beach Detachment Fallbrook. Prepared with support from Tetra Tech, Inc. and Sage Associates under contract with Naval Facilities Engineering Command Southwest (#N62470-08-D-1008, TO 0068).	Planning document
AG, Cattle	2016	U.S. Department of the Navy (USDON). 2016. Grazing Management Plan for Naval Weapons Station Seal Beach Detachment Fallbrook. Prepared with support from Tetra Tech, Inc. and Sage Associates under contract with Naval Facilities Engineering Command Southwest (#N62470-08-D-1008, TO 0068).	Planning document
Fire Mapping	2014	Tetra Tech, Inc. 2015. Mission Driven Wildland Fire Mapping Project: 2014 Pre-final Annual Report. Prepared by Tetra Tech, Inc., Arlington, Virginia for Environmental Security, Marine Corps Base Camp Pendleton	Stationwide
Fire Mapping	2014	U.S. Forest Service (USFS). 2014. Basilone Complex Burned Area Emergency Response (BAER) Assessment: Natural Resources (Wildlife and Botany). Prepared by Jeff Wells (USFS Cleveland NF) and Dan Teater (USFS Tahoe NF) for Naval Weapons Station Fallbrook and USMC Camp Pendleton.	Stationwide
Exotic Aquatic Animals	2012	ECORPS. 2013. Removal of nonnative aquatic animals detrimental to the Tidewater Goby, Arroyo Toad, and other native species, Marine Corps Base Camp Pendleton, CA: Final Report of 2012 Results. Unpublished report submitted by ECORPS consulting, Inc. to the Wildlife Management Branch, Marine Corps Base Camp Pendleton. Includes portions of, and funded in part by, Naval Weapons Station Seal Beach Detachment Fallbrook.	Santa Margarita River
Exotic Aquatic Animals	2013	ECORPS. 2015. Removal of nonnative aquatic animals detrimental to the Tidewater Goby, Arroyo Toad, and other native species, Marine Corps Base Camp Pendleton, CA: Final Report of 2013 Results. Unpublished report submitted by ECORPS consulting, Inc. to the Wildlife Management Branch, Marine Corps Base Camp Pendleton. Includes portions of, and funded in part by, Naval Weapons Station Seal Beach Detachment Fallbrook.	Santa Margarita River
Exotic Aquatic Animals	2014	ECORPS. 2015. Removal of nonnative aquatic animals detrimental to the Tidewater Goby, Arroyo Toad, and other native species, Marine Corps Base Camp Pendleton, CA: DRAFT Report of 2014 Results. Unpublished report submitted by ECORPS consulting, Inc. to the Wildlife Management Branch, Marine Corps Base Camp Pendleton. Includes portions of, and funded in part by, Naval Weapons Station Seal Beach Detachment Fallbrook.	Santa Margarita River
Exotic Aquatic Animals	2015	ECORPS. 2015. Removal of nonnative aquatic animals detrimental to the Tidewater Goby, Arroyo Toad, and other native species, Marine Corps Base Camp Pendleton, CA: DRAFT Report of 2015 Results. Unpublished report submitted by ECORPS consulting, Inc. to the Wildlife Management Branch, Marine Corps Base Camp Pendleton. Includes portions of, and funded in part by, Naval Weapons Station Seal Beach Detachment Fallbrook.	Santa Margarita River
Exotic Aquatic Animals	2016	ECORPS. In prep. Removal of nonnative aquatic animals detrimental to the Tidewater Goby Arroyo Toad, and other native species, Marine Corps Base Camp Pendleton, CA: 2016 Results. Includes portions of, and funded in part by, Naval Weapons Station Seal Beach Detachment Fallbrook.	Santa Margarita River

APPENDIX I

SOILS

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Table I-1. Soil Types That Occur at Detachment Fallbrook.

Soil Code	Description	Erodibility[1]	Range Site[2]
Bonsall Series			
Moderately well drained, shallow and moderately deep sandy loams that have a heavy clay loam subsoil. Slopes are concave and range from 2-15%. Elevation ranges from 200 to 2,500 feet. Typically associated with grasses and forbs.			
BlC	Bonsall sandy loam, 2%-9% slopes	slight	Claypan
BlC2	Bonsall sandy loam, 2%-9% slopes, eroded	slight	Claypan
Bosanko Series			
Well drained, moderately deep clays that formed in material derived from acid igneous rock. These soils are uplands and undulating to hilly. Sloes range from 2-30%. Elevation ranges from 300 to 2,500 feet. Soils may have a stony surface layer.			
BsC	Bosanko clay, 2%-9% slopes	slight 1	Clayey
Cieneba Series			
Excessively drained, very shallow to shallow coarse sandy loams. Formed from materials weathered in place from granitic rock. Rolling to mountainous uplands. Slopes of 5-75%. Elevation from 500 to 3,000 feet. Vegetation is typically scrubs, chaparrals, and grassland.			
ClD2	Cieneba coarse sandy loam, 5%-15% slopes, eroded	severe 16	Shallow Loamy
ClG2	Cieneba coarse sandy loam, 30%-65-% eroded	severe 1	Shallow Loamy
CmE2	Cieneba rocky course sandy loam, 9%-30% slopes, eroded	severe 16	Shallow Loamy
CmrG	Cieneba very rocky course sandy loam, 30%-75% slopes	severe 1	Shallow Loamy
Cieneba-Fallbrook Series			
55% Cieneba and 40% Fallbrook. Elevations from 200-3,000 feet. Rock outcrops cover around 10% of surface and large boulders around 10%.			
CnG2	Cieneba-Fallbrook rocky sandy loams, 30%-65% slopes, eroded	severe 1	not suitable
Fallbrook Series			
Well drained, moderately deep to deep sandy loams that formed in material weathered in place from granodiorite. Soils are uplands and have slopes of 2-30%. Elevations from 200-2,500 feet. Vegetation is primarily annual grasses, oaks, or broadleaf chaparral with intermittent areas of chamise.			
FaB	Fallbrook sandy loam, 2%-5% slopes	severe 16	not suitable
FaC	Fallbrook sandy loam, 5%-9% slopes	severe 16	Loamy
FaC2	Fallbrook sandy loam, 5%-9% slopes	severe 16	Loamy
FaD2	Fallbrook sandy loam, 9%-15% slopes	severe 16	Loamy
FaE2	Fallbrook sandy loam,15%-30% slopes, eroded	severe 16	Loamy
FaE3	Fallbrook sandy loam, 9%-30% slopes, severely eroded	severe 16	Shallow Loamy
FeE	Fallbrook rocky sandy loam,9%-30% slopes	severe 16	Loamy
FeE2	Fallbrook rocky sandy loam,9%-30% slopes, eroded	severe 16	Loamy
Fallbrook-Vista Series			
50% Fallbrook and 40% Vista. Found in uplands. Elevations from 200 to 3,000 feet.			
FvD	Fallbrook-Vista sandy loams, 9%-15% slopes	severe 16	not suitable
FvE	Fallbrook-Vista sandy loams, 15%-30% slopes	severe 16	not suitable
Greenfield Series			
Well drained, very deep sandy loams derived from granitic alluvium. These soils are alluvial fans and plains. Slopes of 0-15%. Elevations from 400 to 800 feet. Vegetation is general grasses and forbs and live oaks.			
GrC	Greenfield sandy loam, 5%-9% slopes	severe 16	not suitable
Placentia Series			
Moderately well drained sandy loams that have a sandy clay subsoil derived from granitic alluvium. Found on old alluvial fans. Slopes from 0-15%. Elevations range from 200 to 1,800 feet. Vegetation is typically, grasses, forbs, and chamise.			
PeC	Placentia sandy loam, 2%-9% slopes	severe 9	Claypan

Soil Code	Description	Erodibility[1]	Range Site[2]
PeC2	Placentia sandy loam, 5%-9% slopes, eroded	severe 9	Claypan
PfC	Placentia sandy loam, thick surface, 2%-9% slopes	severe 16	Claypan
Ramona Series			
Well drained, very deep sandy loams that have a sandy loam subsoil formed in granitic alluvium. Found on terraces and alluvial fans. Slopes of 0-30%. Elevations from 200 to 1,800 feet. Vegetation is typically grasses, forbs, chamise, and oaks.			
RaC2	Ramona sandy loam, 5%-9% slopes, eroded	severe 16	Loamy
Riverwash			
Occurs in intermittent stream channels and is typically sandy, gravelly, or cobbly. It is excessively drained and rapidly permeable. Can be barren of vegetation but may have sycamores and oaks in the banks. Sparse shrubs and forbs grow in patches.			
Rm	Riverwash	severe 2	not suitable
Tujunga Series			
Very deep, excessively drained sands derived from granitic alluvium. Found on alluvial fans and floodplains. Slopes of 0-5%. Elevations from sea level to 1,500 feet. Vegetation is grasses, forbs, and scattered oaks.			
TuB	Tujunga sand, 0%-5% slopes	severe 2	Sandy
Visalia Series			
Moderately well drained, very deep sandy loams derived from granitic alluvium. Found on alluvial flood plains. Slopes of 0-15%. Elevations from 400 to 2,000 feet. Vegetation is grasses, scrubs, chaparral, and live oaks.			
VaB	Visalia sandy loam, 2%-5% slopes	severe 16	not suitable
VaC	Visalia sandy loam, 5%-9% slopes	severe 16	Loamy
Vista Series			
Well drained, moderately deep and deep coarse sandy loams derived from granodiorite or quartz diorite. Found on uplands. Slopes of 5-65%. Elevations from 300 to 2,500 feet. Vegetation consists of scrubs, chaparral, grasses, forbs, and scattered oaks.			
VsC	Vista coarse sandy loam, 5%-9% slopes	severe 16	Loamy
VsD	Vista coarse sandy loam, 9%-15% slopes	moderate 2	Loamy
VsD2	Vista coarse sandy loam, 9%-15% slope, eroded	moderate 2	Loamy
VsE	Vista coarse sandy loam,15%-30% slopes	moderate 2	Loamy
VsE2	Vista coarse sandy loam,15%-30% slopes, eroded	moderate 2	Loamy
VsG	Vista coarse sandy loam, 30%-65% slopes	severe 1	Loamy
VvE	Vista rocky sandy loam,15%-30% slopes	moderate 2	Loamy
VvG	Vista rocky coarse sandy loam, 30%-65% slopes	severe 1	Loamy

[1] Erodibility Rating System-
Slight indicates that water erosion is a minor problem and the soil is suitable for intensive use if other factors are favorable.
Moderate and Severe indicate that protective and corrective measures are needed before and during the time the soil is used. Numerals indicate soil properties or qualities that affect erodibility. 1 refers to slope; 2 to surface layer texture; 9 to depth to hard rock, hardpan, or any layer that restricts permeability; 16 to grade of structure in the surface layer. Absence of rating means no valid interpretations can be made.

[2] Range Sites are kinds of rangeland that produce significantly different kinds and amounts of vegetation. Each site has a different potential for production of forage and presents different management problems. Clayey- The estimated total annual yield is 1,000 to 2,400 pounds per acre. The estimated total annual yield that wildlife and livestock can graze is 900 to 2,000 pounds per acre.
Claypan- The estimated total annual yield ranges from 400 to 1,500 pounds per acre. The estimated total annual yield that wildlife and livestock can graze ranges from 350 to 1,350 pounds per acre.
Loamy- The estimated total annual yield ranges from 600 to 1,800 pounds per acre. The estimated total annual yield that wildlife and livestock can graze is 350 to 1,200 pounds per acre.
Sandy- The estimated total annual yield ranges from 300 to 1,500 pounds per acre. The estimated total annual yield that wildlife and livestock can graze is 225 to 1,000 pounds per acre.
Shallow Loamy- The estimated total annual yield ranges from 50 to 300 pounds per acre. The estimated total annual yield that wildlife and livestock can graze is 25 to 150 pounds per acre.

Source: U.S. Department of Agriculture (USDA). 1973. Soil survey, San Diego Area, California. Soil Conservation Service and Forest Service. Roy H. Bowman (ed.) San Diego, CA.

APPENDIX J

PLANT LIST

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A comprehensive list of plant species that have been documented on Detachment Fallbrook is provided in Table J-1. Summary statistics of the plant species on the installation (e.g., total number of species, number of special status species, number of native versus nonnative species) are maintained in Section 3.8 of this INRMP. Species that were only identified to the level of genera are not included in the plant list unless they are the sole representation of a genus. Detachment Fallbrook Watch List species are those for which additional information is needed, including verification of the species presence on the installation.

Plant nomenclature is generally consistent with the "The Jepson Manual: Vascular Plants of California, Second Edition" (Baldwin et al. 2012). For some species, the Jepson Online Interchange for California Floristics (http://ucjeps.berkeley.edu/interchange.html) or the "Checklist to the Vascular Plants of San Diego County" (Rebman & Simpson 2014) was used to capture more currently accepted scientific names. Synonyms are provided for nomenclature that has changed or may be in the process of changing.

References for plant species on the list are generally limited to surveys or studies conducted by botanists for the primary purpose of plant identification unless appropriate documentation (voucher specimen and/o photograph, collector name, location, etc.) is provided for the record. Species for which voucher specimens are available are indicated the "Date Last Collected" column in Table J-1. Voucher specimens collected during Navy studies are maintained on site in the Detachment Fallbrook herbarium. Herbarium collection information, including collector name, collector number, number of specimens, and collection location coordinates, are maintained in the electronic Excel spreadsheet associated with this appendix. Other repositories, such as San Diego Natural History Museum Herbarium or San Diego State University, may also be cited for voucher specimens of plants collected at Detachment Fallbrook.

Table J-2 presents plant species that have not been documented on the installation but are highlighted as Detachment Fallbrook Watch List species. These include special status or invasive plant species that are known to occur in the region and for which early detection would benefit natural resources management.

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Table J-1. Plant Species That Have Been Documented on Detachment Fallbrook

Scientific Name	*	†	§	V	Common Name	Synonyms	Special Status	Cal-IPC Rank	References
LYCOPHYTES									
Selaginellaceae - Spike-moss family									
Selaginella bigelovii				V	Bushy spike-moss				1, 3, 4, 5
FERNS									
Blechnaceae - Deer Fern family									
Woodwardia fimbriata				V	Giant chain fern	*Woodwardia chamissoi; Woodwardia radicans*			1, 4, 5
Dennstaedtiaceae - Bracken family									
Pteridium aquilinum var. *pubescens*			§	V	Hairy brackenfern	*Pteridium aquilinum* (of previous reports)			4
Dryopteridaceae - Wood Fern family									
Dryopteris arguta				V	Coastal woodfern				1, 3, 4, 5
Polystichum imbricans ssp. *curtum*			§		Narrowleaf sword fern				4
Equisetaceae - Horsetail family									
Equisetum hyemale ssp. *affine*			§		Winter horsetail				3
Marsileaceae - Marsilea family									
Marsilea vestita ssp. *vestita*			§		Hairy clover fern	*Marsilea vestita* (of previous reports)			3, 4
Pilularia americana			§		American pillwort				3
Polypodiaceae - Polypody family									
Polypodium californicum				V	California polypody				1, 3, 4, 5
Pteridaceae - Brake family									
Adiantum jordanii				V	California maidenhair				1, 3, 4, 5
Aspidotis californica				V	California lace fern				5
Cheilanthes newberryi				V	Newberry's lip fern				1, 3, 4
Pellaea andromedifolia				V	Coffee cliff-break				1, 3, 4
Pellaea mucronata var. *californica*			§		California bird's-foot cliff-break				3, 4
Pellaea mucronata var. *mucronata*			§	V	Bird's-foot cliff-break				4, 5
Pentagramma triangularis ssp. *triangularis*				V	Goldback fern				1, 3, 4, 5
Pentagramma triangularis ssp. *viscosa*			§	V	Silverback fern				1

Table J-1. Plant Species That Have Been Documented on Detachment Fallbrook

Scientific Name	*	†	§	V	Common Name	Synonyms	Special Status	Cal-IPC Rank	References
GYMNOSPERMS									
Ephedraceae - Ephedra family									
Ephedra californica			§		California ephedra				1
Pinaceae - Pine family									
Pinus halepense			§	V	Aleppo pine				3, 5
MAGNOLIIDS									
Saururaceae - Lizard's-tail family									
Anemopsis californica				V	Yerba mansa				1, 3, 4, 5
NYMPHALES									
Nymphaecaeae - Waterlily family									
Nymphaea mexicana	*			V	Yellow waterlily				80
EUDICOTS									
Adoxaceae - Muskroot family									
Sambucus nigra ssp. *caerulea*			§	V	Blue elderberry	*Sambucus mexicana*			1, 3, 4, 5
Aizoaceae - Fig-marigold family									
Carpobrotus edulis	*		§		Hottentot fig			High	1, 3, 4
Amaranthaceae - Amaranth family									
Amaranthus albus	*			V	Tumbleweed	*Amaranthus graecizans*			1, 4
Amaranthus blitoides				V	Prostrate amaranthus				5
Amaranthus retroflexus				V	Rough pigweed				5
Anacardiaceae - Sumac family									
Malosma laurina				V	Laurel sumac				1, 3, 4, 5
Rhus aromatica			§	V	Skunk bush	*Rhus trilobata*			1, 3, 4
Rhus integrifolia				V	Lemonade berry				1, 3, 4, 5
Schinus molle	*			V	Peruvian pepper tree			Limited	1, 2, 3, 4, 5
Schinus terebinthifolius	*		§	V	Brazilian pepper tree			Limited	1, 3, 4, 5
Toxicodendron diversilobum				V	Western poison oak				1, 3, 4, 5

Table J-1. Plant Species That Have Been Documented on Detachment Fallbrook

Scientific Name	*	†	§	V	Common Name	Synonyms	Special Status	Cal-IPC Rank	References
Apiaceae - Carrot family									
Apiastrum angustifolium				V	Mock parsley				1, 3, 5
Apium graveolens	*			V	Celery				1, 3, 4
Bowlesia incana			§		Hoary bowlesia				3
Conium maculatum	*			V	Poison hemlock			Moderate	1, 3, 4, 5
Daucus pusillus				V	Rattlesnake weed				1, 3, 4, 5
Foeniculum vulgare	*			V	Fennel			High	1, 2, 3, 4, 5
Lomatium dasycarpum ssp. *dasycarpum*				V	Woolly fruit lomatium				1, 3, 4, 5
Sanicula arguta				V	Sharptooth sanicle	*Sanicula simulans*			1, 3, 4, 5
Sanicula bipinnatifida			§		Purple sanicle				4
Sanicula crassicaulis				V	Pacific sanicle				1, 3, 5
Sanicula tuberosa			§		Turkey pea sanicle				1, 4
Tauschia arguta			§		Southern umbrellawort				3, 4
Torilis arvensis	*			V	Tall hedge parsley			Moderate	1, 3, 4, 5
Torilis nodosa	*		§		Short hedge parsley				1, 3
Yabea microcarpa			§		False carrot	*Caucalis microcarpa*			4
Apocynaceae - Dogbane family									
Asclepias fascicularis			§	V	Narrow-leaf milkweed				1, 3, 4, 5
Funastrum cynanchoides var. *hartwegii*			§	V	Hartweg's climbing milkweed	*Sarcostemma cynanchoides* ssp. *hartwegii*			1, 5
Funastrum hirtellum			§		Hairy climbing milkweed	*Sarcostemma hirtellum*			4
Nerium oleander	*			V	Oleander				1
Vinca major	*		§		Greater periwinkle			Moderate	4
Asteraceae - Sunflower family									
Acourtia microcephala				V	Sacapellote				1, 3, 4, 5
Ambrosia acanthicarpa			§		Annual bur-sage				4
Ambrosia psilostachya				V	Western ragweed				1, 3, 4, 5
Anthemis cotula	*			V	Mayweed	*Anthemis foetida; Chamaemelum cotula; Chamaemelum foetidum; Maruta cotula*			1, 3

Table J-1. Plant Species That Have Been Documented on Detachment Fallbrook

Scientific Name	*	†	§	V	Common Name	Synonyms	Special Status	Cal-IPC Rank	References
Artemisia californica				V	California sagebrush				1, 3, 4, 5
Artemisia douglasiana				V	Douglas' sagebrush				1, 3, 4, 5
Artemisia dracunculus			§		Tarragon sagebrush				4
Baccharis pilularis ssp. *consanguinea*				V	Coyote brush	*Baccharis pilularis* ssp. *pilularis (as reported on Fallbrook)*			1, 3, 4
Baccharis salicifolia ssp. salicifolia				V	Mule fat	*Baccharis glutinosa*			1, 3, 4, 5
Baccharis sarothroides			§		Broom baccharis				1, 3, 4
Bahiopsis laciniata			§		San Diego County viguiera	*Viguiera laciniata*	CRPR 4.2		4
Bebbia juncea var. *aspera*				V	Sweetbush				1, 3, 4
Brickellia californica				V	California brickellbush	*Bulbostylis californica; Brickellia tenera; Brickellia californica* var. *tenera; Brickellia wrightii* var. *tenera; Coleosanthus californicus*			1, 3, 4, 5
Carduus pycnocephalus ssp. *pycnocephalus*	*		§	V	Italian thistle			Moderate	1, 3, 4, 5
Centaurea benedicta	*		§		Blessed starthistle	*Cnicus benedictus*			3
Centaurea melitensis	*			V	Tocalote			Moderate	1, 3, 4, 5
Chaenactis artemisiifolia			§	V	White pincushion	*Chaenactis artemisiaefolia*			1, 3, 4, 5
Chaenactis glabriuscula var. *glabriuscula*				V	Yellow pincushion				1, 3, 4, 5
Cichorium intybus	*		§		Chicory				3
Cirsium occidentale var. *californicum*			§		California thistle				1, 3, 4
Cirsium occidentale var. *occidentale*				V	cobwebby thistle				5
Cirsium vulgare	*		§	V	Bull thistle			Moderate	3, 4, 5
Corethrogyne filaginifolia var. *filaginifolia*			§	V	Common sand aster	*Lessingia filaginifolia var. californica; Lessingia filaginifolia var. filaginifolia; Corethrogyne filaginifolia (per new Jepson)*			1, 3, 4, 5
Cotula australis	*			V	Australian cotula				1, 3, 4
Cotula coronopifolia	*			V	Brass-buttons			Limited	1, 3, 4
Cynara cardunculus ssp. *flavescens*	*	†	§		Artichoke Thistle			Moderate	2
Deinandra fasciculata			§	V	Fascicled tarplant	*Hemizonia fasciculata*			1, 3, 4, 5
Deinandra paniculata				V	San Diego tarplant		CPR 4.2		5
Dimorphotheca fruticosa	*		§		Trailing African cape marigold, Trailing African daisy	*Osteospermum fruticosum; Calendula fruticosa*			4

Table J-1. Plant Species That Have Been Documented on Detachment Fallbrook

Scientific Name	*	†	§	V	Common Name	Synonyms	Special Status	Cal-IPC Rank	References
Dimorphotheca sinuata	*			V	Blue-eye cape marigold				5
Encelia californica			§	V	California encelia				3, 4, 5
Ericameria brachylepis			§		Boundary goldenbush				3, 4
Ericameria palmeri var. *pachylepis*			§	V	Thickbracted goldenbush				4, 5
Erigeron bonariensis	*		§	V	Flax-leaved horseweed	*Conyza bonariensis*			1, 4, 5
Erigeron canadensis			§	V	Horseweed	*Conyza canadensis*			1, 3, 4, 5
Erigeron foliosus var. *foliosus*				V	Leafy daisy				1, 3, 4, 5
Erigeron sumatrensis	*		§		Sumatra daisy	*Conyza sumatrensis; Conyza floribunda; Conyza bilbaoana*			4
Eriophyllum confertiflorum var. confertiflorum				V	Golden woolly sunflower	*Eriophyllum confertiflorum* var. *latum*			1, 3, 4, 5
Euthamia occidentalis					Western goldenrod				4
Gamochaeta pensylvanica	*			V	Purple cudweed	*Gnaphalium purpureum*			5
Gazania linearis	*			V	Treasureflower			Moderate	1, 5
Glebionis coronaria	*		§		Crown daisy	*Chrysanthemum coronarium*		Moderate	3
Gnaphalium palustre			§	V	Western marsh cudweed				1, 3, 4, 5
Grindelia camporum			§	V	Field gumplant	*Grindelia camporum* var. *bracteosum; Grindelia hirsutula* var. *davyi*			3, 4, 5
Gutierrezia sarothrae			§		Matchweed				4
Hazardia squarrosa var. grindelioides				V	Southern saw toothed goldenbush	*Hazardia squarrosa*			1, 3, 4, 5
Hedypnois rhagadioloides	*			V	Crete weed	*Hedypnois cretica*			1, 3, 4, 5
Helianthella californica var. *nevadensis*			§		Nevada helianthella				3
Helianthus annuus			§		Annual sunflower				3
Helianthus californicus			§		California sunflower				4
Helianthus gracilentus			§		Slender sunflower				3, 4
Helminthotheca echioides	*		§	V	Bristly ox-tongue	*Picris echioides*		Limited	1, 3, 4, 5
Heterotheca grandiflora				V	Telegraph weed				1, 3, 4, 5
Heterotheca sessiliflora ssp. *echioides*			§		Viper's sessileflower false goldenaster	*Heterotheca sessiliflora* var. *echioides*			4
Hypochaeris glabra	*			V	Smooth cat's-ear			Limited	1, 3, 4, 5

Table J-1. Plant Species That Have Been Documented on Detachment Fallbrook

Scientific Name	*	†	§	V	Common Name	Synonyms	Special Status	Cal-IPC Rank	References
Isocoma menziesii var. *menziesii*				V	Spreading goldenbush				1, 3, 4
Isocoma menziesii var. *vernonioides*				V	Coastal goldenbush				4, 5
Lactuca serriola	*			V	Prickly lettuce				1, 3, 4, 5
Lasthenia coronaria				V	Southern goldfields				1
Lasthenia gracilis					Common goldfields	*Lasthenia chrysostoma; Lasthenia californica ssp. californica; Lasthenia hirsutula, Lasthenia californica*			1, 3, 4
Layia platyglossa				V	Broad ray tidy-tips				1, 3
Lepidospartum squamatum					California broomsage	*Baccharis sarothroides* var. *pluricephala*			3
Logfia filaginoides				V	California cottonrose	*Filago californica*			1, 4, 5
Logfia gallica	*			V	French cottonrose	*Filago gallica*			1, 3, 4, 5
Madia gracilis				V	Slender madia				1, 3
Madia sativa					Common madia				3, 4
Matricaria discoidea	*			V	Pineapple weed	*Chamomilla suaveolens; Matricaria matricarioides*			3, 4, 5
Microseris douglasii ssp. *platycarpha*					Small-flowered microseris		CRPR 4.2		3
Microseris elegans					Elegant silverpuffs				3
Onopordum acanthium ssp. *acanthium*	*		§		Scotch thistle	*Onopordum acanthium*		High	4
Osmadenia tenella				V	Osmadenia	*Calycadenia tenella*			1, 3, 4, 5
Palafoxia arida var. *arida*					Desert palafox				3
Pluchea odorata var. *odorata*					Saltmarsh fleabane				4
Pluchea sericea					Arrow-weed				3
Porophyllum gracile				V	Slender odora				1, 3, 4
Pseudognaphalium beneolens					Fragrant everlasting	*Gnaphalium canescens ssp. beneolens*			4
Pseudognaphalium biolettii				V	Bi-color everlasting	*Gnaphalium bicolor*			1, 3, 4, 5
Pseudognaphalium californicum				V	California everlasting	*Gnaphalium californicum*			1, 3, 4, 5
Pseudognaphalium leucocephalum					White rabbit-tobacco	*Gnaphalium leucocephalum*	CRPR 2B.2		3
Pseudognaphalium luteoalbum	*				White lamb everlasting	*Gnaphalium luteoalbum*			1, 3, 4
Pseudognaphalium microcephalum				V	White head everlasting	*Gnaphalium canescens; Gnaphalium canescens* ssp. *microcephalum; Gnaphalium microcephalum; Pseudognaphalium cansecens* ssp. *microcephalum*			3, 4

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Scientific Name	*	†	§	V	Common Name	Synonyms	Special Status	Cal-IPC Rank	References
Pseudognaphalium stramineum				V	Cotton batting everlasting	*Gnaphalium stramineum*			1, 4, 5
Psilocarphus brevissimus var. *brevissimus*				V	Dwarf woolly-marbles	*Psilocarphus globiferus*			4, 5
Pulicaria paludosa	*				Spanish false fleabane				4
Rafinesquia californica				V	California chicory				1, 4, 5
Senecio vulgaris	*			V	Common ragwort				1, 3, 4, 5
Silybum marianum	*			V	Blessed milkthistle			Limited	1, 3, 4, 5
Solidago velutina ssp. *californica*					California goldenrod	*Solidago californica*			3, 4
Sonchus asper ssp. *asper*	*			V	Prickly sow thistle				1, 3, 4, 5
Sonchus oleraceus	*			V	Common sow thistle				1, 3, 4, 5
Stebbinsoseris heterocarpa					Grassland stebbinsoseris				4
Stephanomeria diegensis				V	San Diego wreath-plant				5
Stephanomeria exigua ssp. *deanei*				V	Deane's wire-lettuce				1, 4, 5
Stephanomeria virgata					Rod wire-lettuce				1, 3, 4
Stylocline gnaphaloides				V	Everlasting neststraw				3, 4, 5
Taraxacum officinale	*			V	Common dandelion				5
Uropappus lindleyi				V	Silver puffs				1, 3, 4, 5
Venegasia carpesioides					Canyon sunflower				3
Xanthium spinosum	*				Spiny cocklebur				3
Xanthium strumarium				V	Cocklebur				1, 3, 4, 5
Betulaceae - Birch Family									
Alnus rhombifolia					Alder				4
Boraginaceae - Borage family									
Amsinckia intermedia				V	Common fiddleneck	*Amsinckia menziesii* var. *intermedia*			1, 3, 4, 5
Amsinckia menziesii				V	Rigid fiddleneck	*Amsinckia menziesii* var. *menziesii*			5
Cryptantha intermedia var. *intermedia*				V	Clearwater cryptantha	*Cryptantha intermedia* (of previous reports)			1, 3, 4, 5
Cryptantha micromeres				V	Minute-flowered cryptantha				1, 3, 4, 5
Emmenanthe penduliflora var. *penduliflora*					Whispering bells	*Emmenanthe penduliflora*			4, 5
Eriodictyon crassifolium					Thickleaf yerba santa				1, 3

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Scientific Name	*	†	§	V	Common Name	Synonyms	Special Status	Cal-IPC Rank	References
Eucrypta chrysanthemifolia var. *chrysanthemifolia*				V	Spotted hideseed				1, 3, 4, 5
Eucrypta micrantha					Dainty desert hideseed				4
Harpagonella palmeri				V	Palmer's grappling hook		CRPR 4.2		5
Heliotropium curassavicum var. *oculatum*				V	Alkali heliotrope				1, 3, 4, 5
Nemophila menziesii var. integrifolia				V	Menzie's baby blue eyes	*Nemophila menziesii*			1, 3
Pectocarya linearis ssp. *ferocula*				V	Narrow-toothed pectocarya				
Pectocarya penicillata				V	Northern pectocarya				4, 5
Phacelia cicutaria var. *hispida*				V	Hairy caterpillar phacelia				1, 3, 5
Phacelia distans					Wild heliotrope phacelia	*Phacelia cinerea*			3
Phacelia minor				V	Wild canterbury bells				5
Phacelia parryi				V	Parry's phacelia				1, 3, 4, 5
Phacelia ramosissima				V	Branching phacelia	*Phacelia ramosissima* var. *austrolitoralis; Phacelia ramosissima* var. *eremophila; Phacelia ramosissima* var. *latifolia; Phacelia ramosissima* var. *montereyensis*			1, 3, 4, 5
Pholistoma auritum var. *auritum*				V	Purple fiesta flower	*Pholistoma auritum* (of previous reports)			1, 3, 4
Pholistoma membranaceum					White fiesta flower				1, 3
Plagiobothrys arizonicus				V	Arizona popcornflower				5
Plagiobothrys collinus var. *californicus*				V	California popcornflower	*Plagiobothrys californicus* var. *californicus*			4
Plagiobothrys collinus var. *fulvescens*					Rough stem hill popcornflower				3, 4
Plagiobothrys collinus var. *gracilis*				V	San Diego pocornflower				5
Brassicaceae - Mustard family									
Arabis sp.					Rockcress				4
Athysanus pusillus				V	Common sandweed	*Thysanocarpus pusillus*			1
Brassica nigra	*			V	Black mustard			Moderate	1, 3, 4, 5
Cardamine californica					Milk maids	*Dentaria californica; Cardamine californica* var. *cardiophylla; Cardamine californica* var. *cuneata; Cardamine californica* var. *integrifolia; Cardamine californica* var. *sinuata*			1
Caulanthus heterophyllus				V	San Diego jewelflower	*Caulanthus heterophyllus* var. *pseudosimulans; Streptanthus heterophyllus; Caulanthus stenocarpus; Guillenia heterophylla*			1

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Scientific Name	*	†	§	V	Common Name	Synonyms	Special Status	Cal-IPC Rank	References
Hirschfeldia incana	*			V	Shortpod mustard	*Brassica geniculata*		Moderate	1, 3, 4, 5
Lepidium didymum	*			V	Lesser wart-cress	*Coronopus didymus*			5
Lepidium nitidum					Shining pepper-grass	*Lepidium nitidum* var. *howellii; Lepidium nitidum* var. *oreganum*			3, 4
Lepidium virginicum					Peppergrass	*Lepidium virginicum ssp. menziesii*			5
Lobularia maritima	*			V	Sweet alyssum			Limited	1, 3, 4
Nasturtium officinale				V	Medicinal water cress	*Rorippa nasturtium-aquaticum*			1, 3, 4, 5
Raphanus sativus	*			V	Radish			Limited	1, 3, 4, 5
Sisymbrium irio	*			V	London rocket			Moderate	5
Sisymbrium officinale	*			V	Hedge mustard				1
Sisymbrium orientale	*				Indian hedgemustard				4
Thysanocarpus laciniatus				V	Notch fringepod				1, 3
Cactaceae - Cactus family									
Cylindropuntia prolifera					Coast cholla	*Opuntia prolifera*			3, 4, 5
Opuntia X vaseyi				V	Mesa prickly pear	*Opuntia semispinosa; Opuntia occidentalis; Opuntia littoralis* (Fallbrook reports)			1, 3, 4, 5
Opuntia oricola					Chaparral prickly pear				3, 4
Campanulaceae - Bellflower family									
Triodanis biflora				V	Small venus' looking-glass				5
Caprifoliaceae - Honeysuckle family									
Lonicera subspicata var. *denudata*				V	Johnston's honeysuckle				1, 3, 4, 5
Caryophyllaceae - Pink family									
Cardionema ramosissimum				V	Sandcarpet				3, 4, 5
Cerastium glomeratum	*			V	Sticky mouse-ear chickweed				1, 3, 4, 5
Herniaria hirsuta var. *cinerea*	*				Hairy rupturewort	*Herniaria hirsuta* ssp. *cinerea*			4
Polycarpon tetraphyllum var. *tetraphyllum*	*			V	Four leaf manyseed	*Polycarpon tetraphyllum* (of previous reports)			3, 4, 5
Silene antirrhina				V	Sleepy catchfly				1, 5
Silene gallica	*			V	Windmill catchfly				1, 4, 5
Silene laciniata ssp. *laciniata*				V	Cardinal catchfly				1, 3, 5

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Scientific Name	*	†	§	V	Common Name	Synonyms	Special Status	Cal-IPC Rank	References
Spergula arvensis	*				Starwort				1, 3, 4
Spergularia rubra	*			V	Red sand-spurrey				3, 4, 5
Stellaria media	*			V	Common chickweed				1, 3, 4, 5
Chenopodiaceae - Goosefoot family									
Atriplex canescens var. *canescens*					Four-wing saltbush				1
Atriplex lentiformis					Big saltbush	*Obione lentiformis*			1
Atriplex prostrata	*				Fat-hen	*Atriplex triangularis; Atriplex hastata; Atriplex patula* ssp. *hastata*			4
Atriplex semibaccata	*			V	Australian saltbush	*Atriplex flagellaris*		Moderate	1, 3, 4, 5
Atriplex suberecta	*				Sprawling saltbush				4
Chenopodium album	*			V	Lamb's quarters				1, 3, 4
Chenopodium californicum				V	California goosefoot				1, 3, 4, 5
Chenopodium murale	*			V	Nettle-leaf goosefoot				5
Dysphania ambrosioides	*				Mexican tea	*Chenopodium ambrosioides*			1, 3
Salsola australis	*			V	Australian tumbleweed	*Salsola tragus* in part			4, 5
Salsola tragus	*			V	Prickly russian thistle	*Salsola iberica; Salsola kali* var. *tenuifolia; Salsola pestifer*			1, 3, 4
Cistaceae - Rock-rose family									
Crocanthemum scoparium var. *vulgare*				V	Alderson's rush-rose	*Helianthemum scoparium* (of previous reports)			1, 3, 4
Cleomaceae - Spiderflower family									
Peritoma arborea					Bladderpod	*Isomeris arborea*			4

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Scientific Name	*	†	§	V	Common Name	Synonyms	Special Status	Cal-IPC Rank	References
Convolvulaceae - Morning-glory family									
Calystegia macrostegia ssp. arida				V	Southern California morning-glory				5
Calystegia macrostegia ssp. *intermedia*				V	Intermediate coast morning-glory				3
Calystegia macrostegia ssp. *tenuifolia*					San Diego coast morning-glory				3
Convolvulus arvensis	*			V	Orchard morning-glory				3, 4, 5
Cuscuta californica				V	Chaparral dodder				1, 3, 4
Cuscuta subinclusa				V	Canyon dodder				4, 5
Crassulaceae - Stonecrop family									
Crassula aquatica					Water pygmyweed	*Crassula saginoides*			4
Crassula connata				V	Pygmyweed	*Crassula connata* var. *connata; Crassula connata* var. *erectoides; Crassula connata* var. *eremica; Crassula connata* var. *subsimplex*			1, 3, 4, 5
Dudleya edulis				V	Ladies fingers				1, 3, 4
Dudleya lanceolata				V	Lance-leaved dudleya				1, 3, 4, 5
Dudleya pulverulenta				V	Chalk dudleya				1, 3, 4
Cucurbitaceae - Gourd family									
Cucurbita foetidissima				V	Calabazilla				1, 3, 4, 5
Marah macrocarpa				V	Large fruit wild cucumber	*Marah macrocarpus* var. *major; Marah macrocarpus* var. *macrocarpus; Marah macrocarpa* var. *micrantha; Marah macrocarpus*			1, 3, 4, 5
Ericaceae - Heath family									
Xylococcus bicolor					Mission manzanita				3
Euphorbiaceae - Spurge family									
Croton californicus					California croton	*Croton californicus* var. *mohavensis; Croton californicus* var. *tenuis*			1, 3
Croton setigerus				V	Doveweed	*Eremocarpus setigerus*			1, 3, 4, 5
Euphorbia albomarginata					White margin spurge	*Chamaesyce albomarginata*			4
Euphorbia maculata	*			V	Spotted spurge	*Chamaesyce maculata*			1, 4, 5
Euphorbia micromera					Sonoran spurge	*Chamaesyce micromera*			1

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Scientific Name	*	†	§	V	Common Name	Synonyms	Special Status	Cal-IPC Rank	References
Euphorbia nutans	*				Nodding spurge	*Chamaesyce nutans*			1
Euphorbia peplus	*			V	Petty spurge				1, 4, 5
Euphorbia polycarpa var. polycarpa				V	Many seed spurge	*Chamaesyce polycarpa; Chamaesyce polycarpa var. polycarpa; Euphorbia polycarpa*			1, 3, 4, 5
Euphorbia spathulata				V	Warty spurge				1, 5
Ricinus communis	*			V	Castorbean			Limited	1, 2, 3, 4, 5
Stillingia linearifolia					Thin leaf toothleaf				1
Fabaceae - Legume family									
Acacia constricta	*				White thorn acacia				3
Acacia longifolia	*			V	Sydney golden wattle				5
Acacia melanoxylon	*				Blackwood wattle			Limited	3, 4
Acmispon americanus var. *americanus*				V	Spanish-clover	*Lotus amercianus* var. *americanus, Lotus purshianus*			1, 3, 4, 5
Acmispon argophyllus var. *argophyllus*					Silver lotus	*Lotus argophyllus* var. *argophyllus*			1
Acmispon glaber var. *glaber*				V	Deerweed	*Lotus scoparius* var. *scoparius*			1, 3, 4, 5
Acmispon heermannii var. *heermannii*				V	Heermann's lotus	*Lotus heermannii*			1, 4, 5
Acmispon micranthus				V	San Diego lotus	*Lotus hamatus*			1, 3, 4, 5
Acmispon strigosus				V	Strigose lotus	*Lotus strigosus*			1, 3, 4, 5
Albizia sp.				V	Mimosa				3
Astragalus gambelianus				V	Gambel's locoweed				5
Cytisus multiflorus	*			V	Spanish broom				1
Genista monosperma	*			V	Bridal veil broom	*Retama monosperma*		Moderate	1, 2, 3, 5
Lathyrus vestitus				V	Common pacific pea				3, 4
Lathyrus vestitus var. alefeldii				V	San Diego sweet pea				5
Lathyrus vestitus var. *vestitus*					Canyon sweet pea				1
Lupinus bicolor				V	Miniature lupine				1, 3, 4
Lupinus concinnus				V	Bajada lupine				5
Lupinus excubitus				V	Grape soda lupine	*Lupinus cf. excubitus*			1, 5
Lupinus excubitus var. *hallii*				V	Hall's grape soda lupine				3, 4, 5

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Scientific Name	*	†	§	V	Common Name	Synonyms	Special Status	Cal-IPC Rank	References
Lupinus hirsutissimus				V	Stinging lupine				3, 4, 5
Lupinus sparsiflorus				V	Coulter's lupine				5
Lupinus succulentus				V	Arroyo lupine				3, 4, 5
Lupinus truncatus				V	Cut leaf lupine				1, 3, 4, 5
Medicago minima	*			V	Tiny burclover				4
Medicago polymorpha	*			V	California burclover			Limited	1, 3, 4
Melilotus albus	*			V	White sweetclover	*Melilotus alba*			1, 3, 4
Melilotus indicus	*			V	Indian sweetclover	*Melilotus indica*			1, 3, 5
Parkinsonia aculeata	*				Mexican palo verde				3
Prosopis glandulosa var. *torreyana*	*			V	Honey Mesquite				5
Trifolium ciliolatum				V	Foothill clover				1, 3, 5
Trifolium depauperatum var. *amplectens*					Pale dwarf sack clover				3
Trifolium depauperatum var. *truncatum*				V	Dwarf-sack clover				5
Trifolium gracilentum				V	Pinpoint clover	*Trifolium gracilentum* var. *inconspicuum*			3, 4, 5
Trifolium hirtum	*			V	Rose clover			Moderate	1, 3, 4, 5
Trifolium microcephalum				V	Small head clover				1, 3, 5
Trifolium pratense	*				Red clover				3
Trifolium variegatum				V	Whitetip clover				1
Trifolium willdenovii				V	Tomcat clover				1, 4, 5
Trifolium wormskioldii					Cow clover				3
Vicia americana ssp. *americana*					American vetch	*Vicia americana* (of previous reports)			1, 3, 4
Vicia hassei				V	Slender vetch				1, 3
Vicia ludoviciana ssp. ludoviciana				V	Deer pea vetch				5
Vicia sativa ssp. *nigra*	*				Narrow-leaved vetch	*Vicia angustifolia*			3
Vicia sativa ssp. *sativa*	*			V	Spring vetch				1, 3, 4
Vicia villosa	*			V	Winter vetch				1, 3, 4
Vicia villosa ssp. *varia*				V					5

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Scientific Name	*	†	§	V	Common Name	Synonyms	Special Status	Cal-IPC Rank	References
Fagaceae - Oak family									
Quercus berberidifolia X Q. engelmanni					Scrub oak/ Engelmann oak hybrid	*Quercus pacifica x lobata*			3, 4
Quercus agrifolia				V	Coast live oak				1, 3, 4, 5
Quercus berberidifolia				V	Scrub oak				1, 3, 4
Quercus engelmannii				V	Engelmann oak		CRPR 4.2		1, 3, 4
Quercus wislizeni var. *wislizeni*					Interior live oak	*Quercus wislizeni* (of previous reports)			4
Frankeniaceae - Frankenia family									
Frankenia salina					Alkali heath	*Frankenia grandifolia; Frankenia grandifolia* var. *campestris*			4
Gentianaceae - Gentian family									
Eustoma exaltatum ssp. *exaltatum*					Catchfly prairie gentian	*Eustoma exaltatum* (of previous reports)			3
Zeltnera exaltata					Tall centaury	*Centaurium altatum*			3
Zeltnera venusta				V	California centaury	*Centaurium venustum*			1, 3, 4, 5
Geraniaceae - Geranium family									
Erodium botrys	*			V	Longbeak filaree				1, 3, 4, 5
Erodium brachycarpum	*				Shortfruit filaree				4
Erodium cicutarium	*			V	Redstem filaree			Limited	1, 3, 4, 5
Erodium moschatum	*			V	Whitestem filaree				1, 3, 4, 5
Geranium carolinianum				V	Carolina geranium	*Geranium sphaerospermum*			1, 3, 4, 5
Geranium dissectum	*				Cutleaf geranium			Moderate	4
Geranium pusillum	*				Small geranium				3
Grossulariaceae - Gooseberry family									
Ribes indecorum					White flowering currant				1, 3, 4
Ribes malvaceum					Chaparral currant				3
Juglandaceae - Walnut family									
Carya illinoinensis	*				Pecan				4
Juglans californica					Southern California black walnut	*Juglans californica* var. *californica*	CRPR 4.2		4

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Scientific Name	*	†	§	V	Common Name	Synonyms	Special Status	Cal-IPC Rank	References
Lamiaceae - Mint family									
Marrubium vulgare	*			V	Horehound			Limited	1, 3, 4, 5
Mentha spicata	*				Spearmint				4
Salvia apiana				V	White sage				1, 3, 4, 5
Salvia columbariae				V	Chia	*Salvia columbariae* var. *ziegleri*			1, 3, 4, 5
Salvia mellifera				V	Black sage				1, 3, 4, 5
Salvia vaseyi					Scallopleaf sage				3
Stachys bergii				V	Berg's hedgenettle	*Stachys ajugoides* var. *rigida; Stachys rigida* ssp. *lanata*			1, 3, 4
Stachys rigida var. quercetorum				V	Oak hedge-nettle	*Stachys ajugoides* var. *rigida* (in part)			5
Trichostema lanatum					Woolly blue curls				3
Trichostema lanceolatum				V	Vinegar weed				1, 3, 4, 5
Lythraceae - Loosestrife family									
Ammannia coccinea					Valley redstem				4
Lythrum californicum				V	California loosestrife				1, 4
Lythrum hyssopifolia	*				Grass poly	*Lythrum hyssopifolium*		Limited	1, 3, 4
Malvaceae - Mallow family									
Malacothamnus densiflorus					Many flowered bush-mallow	*Malacothamnus densiflorus* var. *viscidus*			3, 4
Malacothamnus fasciculatus var. *fasciculatus*				V	Chaparral bush-mallow	*Malacothamnus fasciculatus* (of previous reports)			3, 4, 5
Malva parviflora	*			V	Cheeseweed				1, 3, 4, 5
Malvella leprosa					Alkali mallow				5
Sidalcea hickmanii ssp. *parishii*					Parish's checkerbloom		SR		3
Sidalcea malviflora				V	Checkerbloom	*Sidalcea malvaeflora*			3
Sidalcea sparsifolia				V	Southern checkerbloom	*Sidalcea malviflora* ssp. *sparsifolia*			1, 4, 5
Meliaceae - Mahogany family									
Melia azedarach	*			V	China berry				3, 4, 5

Table J-1. Plant Species That Have Been Documented on Detachment Fallbrook

Scientific Name	*	†	§	V	Common Name	Synonyms	Special Status	Cal-IPC Rank	References
Montiaceae - Purslane family									
Calandrinia ciliata				V	Red maids	*Calandrinia menziesii*			1, 3, 4, 5
Claytonia perfoliata ssp. *perfoliata*				V	Round leaf miner's lettuce	*Claytonia perfoliata* var. *perfoliata*			1, 3, 4, 5
Myrsinaceae - Myrsine family									
Lysimachia arvensis	*			V	Scarlet pimpernel	*Anagallis arvensis*			1, 3, 4, 5
Lysimachia minima					Chaffweed	*Centunculus minimus; Anagallis minima*			3
Myrtaceae - Myrtle family									
Eucalyptus camaldulensis	*			V	Red gum			Limited	1, 3, 5
Eucalyptus citriodora	*				Lemon scented gum				2
Eucalyptus globulus	*			V	Blue gum			Moderate	3, 4, 5
Eucalyptus sideroxylon	*				Red iron bark	*Eucalyptus sideroxylon var. rosea*			2
Melaleuca viminalis	*				Weeping bottlebrush	*Callistemon viminalis*			4
Nyctaginaceae - Four O'clock family									
Mirabilis laevis var. *crassifolia*				V	Coastal wishbone plant	*Mirabilis californica*			1, 3, 4, 5
Oleaceae - Olive family									
Fraxinus uhdei	*			V	Shamel ash				4, 5
Fraxinus velutina					Velvet ash	*Fraxinus pennsylvanica* ssp. *velutina; Fraxinus velutina* var. *coriacea*			3, 4
Olea europaea	*			V	Olive			Limited	1, 2, 3, 4, 5
Onagraceae - Evening Primrose family									
Camissonia strigulosa					Sandysoil suncup	*Oenothera strigulosa*			3, 4
Camissoniopsis bistorta				V	California sun cup	*Oenothera bistorta* var. *veitchiana; Oenothera heterophylla; Camissonia bistorta*			1, 3, 4, 5
Camissoniopsis cheiranthifolia ssp. *suffruticosa*				V	Beach evening-primrose	*Camissonia cheiranthifolia* ssp. *suffruticosa; Oenothera cheiranthifolia* ssp. *suffruticosa; Camissonia cheiranthifolia (of previous reports)*			3
Camissoniopsis lewisii				V	Lewis's evening-primrose	*Camissonia lewisii*	CRPR 3		5
Camissoniopsis robusta				V	Robust sun cup	*Camissonia robusta*			5
Clarkia epilobioides				V	Canyon clarkia				1, 4
Clarkia purpurea				V	Purple clarkia				1

Table J-1. Plant Species That Have Been Documented on Detachment Fallbrook

Scientific Name	*	†	§	V	Common Name	Synonyms	Special Status	Cal-IPC Rank	References
Clarkia purpurea ssp. *quadrivulnera*				V	Four spot purple clarkia				4, 5
Clarkia purpurea ssp. *viminea*					Slender purple clarkia				3, 4
Epilobium brachycarpum				V	Tall annual willowherb	*Epilobium paniculatum; Epilobium paniculatum* var. *jucundum; Epilobium paniculatum* var. *laevicaule; Epilobium paniculatum*			4
Epilobium canum				V	California fuchsia				1, 3, 4
Epilobium ciliatum ssp. *ciliatum*				V	Willow herb	*Epilobium ciliatum* (of previous lists)			4, 5
Eulobus californicus					False-mustard	*Oenothera leptocarpa; Camissonia californica*			1, 3, 5
Ludwigia hexapetala	*		§		Six petaled water primrose	*Ludwigia grandiflora* ssp. *hapetala*		High	4
Ludwigia peploides	*				Floating water primrose				3
Oenothera elata				V	Great marsh evening primrose				1, 3, 4
Orobanchaceae - Broom-rape family									
Castilleja affinis ssp. *affinis*				V	Coast indian paintbrush				1, 3, 4, 5
Castilleja exserta ssp. *exserta*				V	Purple owl's clover	*Orthocarpus purpurascens* var. *pallidus*			1, 3, 4, 5
Castilleja foliolosa				V	Woolly indian paintbrush				1, 3, 4
Cordylanthus rigidus					Stiffbranch bird's-beak				3, 4
Orobanche parishii var. *parishii*			§		Parish's broom-rape	*Orobanche californica* var. *parishii*			99
Oxalidaceae - Oxalis family									
Oxalis californica				V	California wood-sorrel	*Oxalis albicans* ssp. *californica*			1, 3, 4, 5
Oxalis corniculata	*				Creeping wood-sorrel				3
Oxalis pes-caprae	*			V	Bermuda buttercup			Moderate	1, 3, 4, 5
Paeoniaceae - Peony family									
Paeonia californica				V	California peony				1, 3, 4, 5
Papaveraceae - Poppy family									
Eschscholzia californica				V	California poppy				1, 3, 4, 5
Platystemon californicus					Cream cups				4

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Scientific Name	*	†	§	V	Common Name	Synonyms	Special Status	Cal-IPC Rank	References
Phrymaceae - Lopseed family									
Diplacus X *australis*				V	San Diego bush monkeyflower	*Mimulus aurantiacus,* in part			1, 3, 4, 5
Diplacus brevipes			§	V	Widethroat yellow monkeyflower	*Mimulus brevipes*			3, 4, 5, 99
Erythranthe cardinalis				V	Scarlet monkeyflower	*Mimulus cardinalis*			1
Erythranthe guttata				V	Seep monkeyflower	*Mimulus guttatus*			1, 3, 4, 5
Mimethanthe pilosa					Downy monkeyflower	*Mimulus pilosus*			4
Phytolaccaceae - Pokeweed family									
Phytolacca americana var. *americana*	*				American pokeweed	*Phytolacca americana* (of previous reports)		Limited	4
Plantaginaceae - Plantain family									
Antirrhinum coulterianum					Coulter's snapdragon				1, 3, 4
Antirrhinum kelloggii				V	Climbing snapdragon				1, 3, 5
Antirrhinum nuttallianum				V	Nuttall's snapdragon				1, 3, 4
Antirrhinum nuttallianum ssp. *nuttallianum*				V	Nuttall's snapdragon				5
Antirrhinum nuttallianum ssp. *subsessile*				V	Big-gland Nuttall's snapdragon				5
Callitriche sp.				V	Water starwort				3, 4
Collinsia heterophylla				V	Purple chinese houses				1, 4
Keckiella antirrhinoides				V	Snapdragon bush penstemon				1
Keckiella cordifolia				V	Heartleaf bush penstemon				1, 3, 4, 5
Nuttallanthus texanus				V	Blue toadflax	*Linaria canadensis*			1, 3, 4, 5
Penstemon centranthifolius					Scarlet bugler				3
Penstemon spectabilis var. *spectabilis*					Showy beardtongue				3
Plantago coronopus	*				Buckhorn plantain				3
Plantago elongata					Prairie plantain	*Plantago bigelovii; Plantago elongata* ssp. *pentasperma*			3
Plantago erecta				V	Dot seed plantain				1, 3, 4, 5
Plantago lanceolata	*				English plantain			Limited	3, 5
Plantago major	*			V	Common plantain	*Plantago major* var. *pilgeri; Plantago major* var. *scopulorum*			1, 3, 4
Plantago virginica	*				Dwarf plantain				3

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Scientific Name	*	†	§	V	Common Name	Synonyms	Special Status	Cal-IPC Rank	References
Veronica anagallis-aquatica	*				Water speedwell				4
Veronica peregrina ssp. *xalapensis*					Purslane speedwell				3
Platanaceae - Sycamore family									
Platanus racemosa				V	Western sycamore				1, 3, 4, 5
Plumbaginaceae - Leadwort family									
Limonium perezii	*			V	Perez's marsh rosemary	*Statice perezii*			1, 3
Limonium sinuatum	*			V	Wavyleaf marsh rosemary				4, 5
Polemoniaceae - Phlox family									
Allophyllum glutinosum				V	Sticky false gilyflower				1, 4
Eriastrum filifolium				V	Thread-leaf Woolly-star				5
Eriastrum sapphirinum					Sapphire woollystar				3, 4
Gilia achilleifolia ssp. abrotanifolia				V	Ball gilia	*Gilia achilleifolia* (of previous reports)			5
Gilia angelensis				V	Chaparral gilia				1, 3, 4, 5
Navarretia hamata ssp. *Leptantha*				V	Hooked navarretia	*Navarretia hamata* (previous reports)			3, 4
Polygalaceae - Milkwort family									
Polygala cornuta var. *fishiae*					Fish's milkwort	*Polygala cornuta* ssp. *fishiae*	CRPR 4.3		1
Polygonaceae - Buckwheat family									
Chorizanthe fimbriata var. *fimbriata*				V	Fringed spineflower	*Chorizanthe fimbriata* (of previous reports)			1, 3, 4, 5
Chorizanthe procumbens				V	Prostrate spineflower				1, 4, 5
Chorizanthe staticoides				V	Statice spineflower				3, 4
Eriogonum davidsonii					Davidson's buckwheat				3
Eriogonum elongatum var. *elongatum*					Longstem buckwheat	*Eriogonum elongatum* (of previous reports)			1, 3, 4, 5
Eriogonum fasciculatum var. *foliolosum*				V	California buckwheat	*Eriogonum fasciculatum* var. *fasciculatum* (of previous reports)			1, 3, 4 ,5
Eriogonum gracile				V	Slender woolly buckwheat				1
Eriogonum gracile var. *gracile*				V	Slender buckwheat				3, 4, 5
Eriogonum gracile var. *incultum*				V	Smooth slender buckwheat				5
Persicaria lapathifolia				V	Willow smartweed	*Polygonum lapathifolium*			1, 3, 4, 5

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Scientific Name	*	†	§	V	Common Name	Synonyms	Special Status	Cal-IPC Rank	References
Persicaria maculosa	*				Lady's thumb smartweed	*Polygonum persicaria*			1
Persicaria punctata					Dotted smartweed	*Polygonum punctatum*			4
Polygonum aviculare ssp. *depressum*	*			V	Dented oval leaf knotweed	*Polygonum arenastrum*			1, 5
Pterostegia drymarioides				V	Granny's hairnet				1, 3, 4, 5
Rumex conglomeratus	*			V	Clustered dock				1, 3, 4
Rumex crispus	*			V	Curly dock			Limited	1, 3, 4, 5
Rumex fueginus					Golden dock	*Rumex maritimus*			1, 4
Rumex salicifolius					Willow dock	*Rumex salicifolius* var. *salicifolius*			1, 3, 4
Primulaceae - Primrose family									
Primula clevelandii ssp. *clevelandii*					Padre's shooting star	*Dodecatheon clevelandii* ssp. *clevelandii*			3
Proteaceae - Protea family									
Grevillea robusta	*				Silkoak				3
Ranunculaceae - Buttercup family									
Clematis lasiantha					Chaparral virgin's bower				1, 3, 4
Clematis pauciflora				V	Ropevine clematis				5
Delphinium parryi ssp. *parryi*				V	Parry's larkspur				1, 4
Ranunculus californicus					California buttercup				4
Thalictrum fendleri var. *polycarpum*				V	Smooth-leaf Meadow-rue	*Thalictrum fendleri* (of previous reports)			3, 4, 5
Rhamnaceae - Buckthorn family									
Ceanothus crassifolius					Hoaryleaf ceanothus				1, 4
Ceanothus tomentosus					Woollyleaf ceanothus	*Ceanothus tomentosus* var. *olivaceus*			1
Frangula californica ssp. *californica*				V	California coffeeberry	*Rhamnus californica, Rhamnus californica* ssp. *californica*			3, 4, 5
Rhamnus crocea				V	Spiny redberry				1, 3, 5
Rhamnus ilicifolia				V	Hollyleaf redberry	*Rhamnus crocea* ssp. *ilicifolia*			1, 3, 4
Rosaceae - Rose family									
Adenostoma fasciculatum				V	Chamise				1, 3, 4
Cercocarpus betuloides					Birchleaf mountain mahogany				3, 4

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Scientific Name	*	†	§	V	Common Name	Synonyms	Special Status	Cal-IPC Rank	References
Cercocarpus minutiflorus				V	San Diego mountain mahogany				1, 3, 4
Drymocallis glandulosa				V	Sticky cinquefoil	*Potentilla* sp.			3
Heteromeles arbutifolia				V	Toyon				1, 3, 4, 5
Prunus ilicifolia					Holly leaf cherry				1, 3
Rosa californica				V	California rose				1, 3, 4, 5
Rubus ursinus					California blackberry				1, 3, 4, 5
Rubiaceae - Madder family									
Galium angustifolium ssp. angustifolium				V	Narrow-leaf bedstraw				1, 3, 4, 5
Galium aparine				V	Common bedstraw				1, 3, 4, 5
Galium nuttallii ssp. *nuttallii*				V	San Diego bedstraw	*Galium nuttalii* (of previous reports)			1, 4, 5
Rutaceae - Rue family									
Cneoridium dumosum					Bushrue				1
Salicaceae - Willow family									
Populus fremontii ssp. *fremontii*					Fremont cottonwood	*Populus deltoides* var. *fremontii, Populus fremontii* (of previous reports)			1, 3, 4
Populus trichocarpa					Hairy cottonwood	*Populus balsamifera* ssp. *trichocarpa*			1, 3, 4
Salix exigua				V	Sand bar willow				1, 3, 4
Salix gooddingii				V	Goodding's black willow				1, 3, 4, 5
Salix laevigata				V	Red willow	*Salix bonplandiana* var. *laevigata*			1, 3, 4, 5
Salix lasiandra var. *lasiandra*					Shining Willow	*Salix lucida* ssp. *lasiandra*			3, 4
Salix lasiolepis				V	Arroyo willow				1, 3, 4, 5
Saxifragaceae - Saxifrage family									
Jepsonia parryi					Parry's jepsonia				1, 3
Lithophragma affine				V	San Francisco woodland-star				1, 4
Scrophulariaceae - Figwort family									
Scrophularia californica				V	California figwort	*Scrophularia californica* ssp. *floribunda; Scrophularia californica* ssp. *californica*			1, 3, 4, 5
Verbascum blattaria	*			V	Moth mullein				1, 3, 4
Verbascum virgatum	*			V	Wand mullein				3, 4, 5

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Scientific Name	*	†	§	V	Common Name	Synonyms	Special Status	Cal-IPC Rank	References
Simaroubaceae - Simarouba family									
Ailanthus altissima	*				Tree of heaven			Moderate	2
Solanaceae - Nightshade family									
Datura wrightii				V	Wright's jimsonweed				1, 3, 4, 5
Nicotiana glauca	*			V	Tree tobacco			Moderate	1, 2, 3, 4, 5
Nicotiana quadrivalvis				V	Indian Tobacco				5
Physalis crassifolia				V	Greene's ground-cherry	*Physalis greenei*			3, 5
Solanum americanum					White nightshade				1, 3, 4
Solanum douglasii				V	Douglas' nightshade				1, 3, 4, 5
Solanum nigrum	*				Black nightshade				3
Solanum parishii				V	Parish's nightshade				1, 3, 5
Solanum umbelliferum				V	Blue witch				5
Solanum xanti					Chaparral nightshade				1, 4
Styracaceae - Storax family									
Styrax redivivus					Snowdrop bush	*Styrax officinalis* var. *californicus; Styrax officinalis* var. *fulvescens; Styrax officinalis* var. *redivivus, Styrax officinalis* (of previous lists)			3
Tamaricaceae - Tamarisk family									
Tamarix ramosissima	*		§		Hairy tamarix			High	2, 3, 4, 5
Theophrastaceae - Theophrasta family									
Samolus parviflorus				V	Water-pimpernel	*Samolus floribundus*			1, 3, 4
Ulmaceae - Elm family									
Ulmus parvifolia	*				Chinese elm				3
Urticaceae - Nettle family									
Parietaria hespera var. *hespera*				V	Western parietaria				5
Urtica dioica ssp. *holosericea*				V	Hoary stinging nettle				1, 3, 4, 5
Urtica urens	*				Dwarf nettle				3, 4

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Scientific Name	*	†	§	V	Common Name	Synonyms	Special Status	Cal-IPC Rank	References
Verbenaceae - Vervain family									
Verbena lasiostachys var. *lasiostachys*				V	Western vervain	*Verbena lasiostachys* (of previous lists)			1, 3, 4, 5
Violaceae - Violet family									
Viola pedunculata				V	Johnny-jump-up	*Viola pedunculata* ssp. *tenuifolia*			1, 3, 4, 5
Viscaceae - Mistletoe family									
Phoradendron leucarpum ssp. *macrophyllum*					Large leaf mistletoe	*Phoradendron macrophyllum; Phoradendron serotinum* ssp. *macrophyllum*			4
Phoradendron leucarpum ssp. *tomentosum*					Pacific mistletoe	*Phoradendron villosum; Phoradendron serotinum* ssp. *tomentosum*			4
Vitaceae - Grape family									
Vitis girdiana				V	Desert wild grape				1, 3, 4, 5
Zygophyllaceae - Caltrop family									
Tribulus terrestris	*			V	Puncturevine				1
MONOCOTS									
Agavaceae - Agave family									
Agave americana	*				American century plant				4
Agave parryi	*				Parry's agave				3
Chlorogalum parviflorum				V	Small-flowered soap plant				5
Chlorogalum pomeridianum					Wavyleaf soap plant				1, 3, 4, 5
Hesperoyucca whipplei				V	Chaparral yucca	*Yucca whipplei*			1, 3, 4, 5
Yucca schidigera					Mojave yucca	*Yucca californica; Yucca mohavensis*			1, 3, 4
Alliaceae - Onion family									
Allium peninsulare					Red flower onion				1
Allium praecox				V	Early onion				5
Araceae - Arum family									
Lemna minor					Common duckweed				1, 3, 4
Phoenix canariensis	*				Canary Island palm			Limited	3, 4, 5
Washingtonia robusta	*				Mexican fan palm			Moderate	3, 4

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Scientific Name	*	†	§	V	Common Name	Synonyms	Special Status	Cal-IPC Rank	References
Cyperaceae - Sedge family									
Carex pellita					Covered sedge	*Carex lanuginosa*			3, 4
Carex praegracilis					Slender sedge				3, 4
Carex spissa				V	San Diego sedge				1, 3, 4
Carex triquetra				V	Trigonous sedge				1, 3, 4
Cyperus eragrostis				V	Tall flatsedge				1, 3, 4, 5
Cyperus erythrorhizos					Redroot flatsedge				4
Cyperus involucratus	*			V	Umbrella flatsedge				1, 3, 4
Cyperus papyrus	*				Papyrus				1, 3
Eleocharis macrostachya				V	Pale spikerush				1, 3, 4, 5
Eleocharis montevidensis				V	Sand spikerush				1, 4
Schoenoplectus acutus var. *occidentalis*					Western bulrush	*Scirpus acutus* var. *occidentalis, Scirpus acutus* (of previous reports)			1, 3, 4
Schoenoplectus americanus					American bulrush	*Scirpus americanus* var. *olneyi; Scirpus americanus*			1, 4
Schoenoplectus californicus				V	California bulrush	*Scirpus californicus*			1, 4, 5
Scirpus microcarpus					Small fruit bulrush				4
Iridaceae - Iris family									
Sisyrinchium bellum				V	Lovely blue-eyed-grass				1, 3, 4, 5
Juncaceae - Rush family									
Juncus balticus ssp. *ater*				V	Baltic rush	*Juncus arcticus* var. *balticus; Juncus balticus* var. *montanus*			1
Juncus bufonius var. *bufonius*				V	Toad rush	*Juncus bufonius* (of previous reports)			1, 3, 4, 5
Juncus dubius				V	Mariposa rush				3, 4, 80
Juncus macrophyllus				V	Long-leaved rush				5
Juncus mexicanus					Mexican rush	*Juncus arcticus* var. *micanus*			1, 3, 4
Juncus rugulosus					Wrinkled rush				3, 4
Juncus torreyi					Torrey's rush				4
Juncus xiphioides				V	Iris leaved rush				1, 3, 4

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Scientific Name	*	†	§	V	Common Name	Synonyms	Special Status	Cal-IPC Rank	References
Liliaceae - Lily family									
Calochortus splendens				V	Splendid mariposa lily				1, 3, 4, 5
Calochortus weedii var. *weedii*				V	Weed's mariposa lily	*Calochortus weedii* (of previous reports)			1, 3, 4
Melanthiaceae - Camas family									
Poaceae - Grass family									
Aegilops triuncialis	*		§	V	Barbed goat grass			High	3
Agrostis exarata				V	Spike bent grass	*Agrostis ampla; Agrostis arata* var. *monolepis; Agrostis longiligula* var. *australis*			1, 4
Agrostis pallens					Dune bent grass	*Agrostis diegoensis; Agrostis lepida*			3, 4
Aira caryophyllea	*			V	Silver hair grass				1, 3, 4
Ammophila arenaria	*		§		European beachgrass			High	4
Aristida adscensionis				V	Six-weeks three-awn				5
Aristida purpurea var. *purpurea*					Purple three-awn				4
Aristida ternipes var. *gentilis*				V	Hook three-awn				5
Arundo donax	*		§	V	Giant reed			High	1, 2, 4
Avena barbata	*			V	Slender wild oat			Moderate	1, 3, 4, 5
Avena fatua	*			V	Wild oat			Moderate	1, 3, 4, 5
Bothriochloa barbinodis				V	Cane bluestem	*Andropogon barbinodis*			1, 3, 4, 5
Brachypodium distachyon	*			V	Purple false brome			Moderate	1, 3, 4, 5
Briza minor	*			V	Small quaking grass				3, 5
Bromus carinatus var. *carinatus*				V	California brome	*Bromus carinatus* (of previous reports)			4, 5
Bromus catharticus var. *catharticus*	*			V					5
Bromus diandrus	*			V	Ripgut brome	*Bromus rigidus; Bromus diandrus* var. *rigidus*		Moderate	1, 3, 4, 5
Bromus hordeaceus	*			V	Soft brome	*Bromus hordeaceus* ssp. *thominei; Bromus hordeaceus* ssp. *divaricatus; Bromus hordeaceus* ssp. *thominei; Bromus mollis*		Limited	1, 3, 4, 5
Bromus madritensis ssp. *madritensis*	*				Foxtail brome				3
Bromus madritensis ssp. *rubens*	*		§	V	Red brome	*Bromus rubens*		High	1, 3, 4, 5
Bromus sterilis	*			V	Poverty brome				5

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Scientific Name	*	†	§	V	Common Name	Synonyms	Special Status	Cal-IPC Rank	References
Bromus tectorum	*				Cheat grass	*Bromus tectorum* var. *glabratus*		High	1
Cortaderia jubata	*	†		V	Pampas grass, purple pampas grass, pink pampas grass, jubata grass	*Cortaderia atacamensis*		High	2
Crypsis schoenoides	*			V	Swamp prickle grass	*Heleochloa schoenoides*			1
Cynodon dactylon	*			V	Bermuda grass			Moderate	1, 3, 4, 5
Dactylis glomerata	*			V	Orchard grass				5
Digitaria sanguinalis	*			V	Large crab grass				5
Distichlis spicata				V	Salt grass	*Distichlis spicata* var. *divaricata; Distichlis spicata* var. *nana; Distichlis spicata* var. *stolonifera; Distichlis spicata* var. *stricta*			1, 3, 4, 5
Echinochloa crus-galli	*				Barnyard cockspurgrass	*Echinochloa crus-galli* ssp. *spiralis; Echinochloa crus-galli* var. *zelayensis*			4
Ehrharta erecta	*				Panic veldt grass			Moderate	4
Elymus condensatus				V	Giant wildrye	*Leymus condensatus*			3, 4, 5
Elymus glaucus ssp. *glaucus*				V	Blue wildrye	*Elymus glaucus* (of previous reports)			3, 4, 5
Elymus triticoides					Beardless wildrye	*Leymus triticoides*			3, 4
Festuca bromoides	*				Brome fescue	*Vulpia bromoides; Festuca dertonensis*			3, 4
Festuca myuros	*			V	Rattail fescue	*Vulpia myuros* var. *hirsuta; Vulpia myuros* var. *myuros; Festuca megalura; Vulpia myuros*		Moderate	3, 4, 5
Festuca perennis	*			V	Rye grass	*Lolium multiflorum; Lolium perenne*		Moderate	1, 3, 4, 5
Gastridium phleoides	*			V	Nit grass	*Gastridium ventricosum*			1, 3, 4, 5
Hainardia cylindrica	*				Barbgrass	*Rottboellia cylindrica; Lepturus cylindricus; Monerma cylindrica*			3
Hordeum intercedens				V	Vernal barley		CRPR 3.2		3, 5
Hordeum jubatum ssp. *jubatum*					Foxtail barley	*Hordeum jubatum* var. *cespitosum, Hordeum jubatum* (of previous reports)			3
Hordeum murinum ssp. *glaucum*	*			V	Glaucus barley				5
Hordeum murinum ssp. *leporinum*	*			V	Hare barley			Moderate	1, 3, 4
Hordeum vulgare	*				Commercial barley	*Hordeum vulgare* var. *trifurcatum*			1
Koeleria gerardi				V	Bristly Koeler's grass	*Koleria phleoides*			5
Lamarckia aurea	*			V	Goldentop grass				1, 3, 4, 5
Leptochloa fusca ssp. *uninervia*					Mexican sprangletop	*Leptochloa uninervia*			4

Table J-1. Plant Species That Have Been Documented on Detachment Fallbrook

Scientific Name	*	†	§	V	Common Name	Synonyms	Special Status	Cal-IPC Rank	References
Melica imperfecta				V	Coast range onion grass				4, 5
Melinis repens ssp. *repens*	*			V	Natal grass	*Rhynchelytrum repens; Rhynchelytrum roseum; Tricholaena rosea*			1, 4, 5
Muhlenbergia microsperma				V	Littleseed muhly				3, 4, 5
Muhlenbergia rigens				V	Deer grass				4, 5
Panicum capillare					Witch panic grass				4
Parapholis incurva	*				Curved sicklegrass				1
Paspalum dilatatum	*			V	Dallis grass				1
Paspalum distichum					Knot grass	*Paspalum distichum* var. *indutum; Paspalum paspalodes*			3, 4
Pennisetum setaceum	*			V	African fountain grass			Moderate	1, 3, 4, 5
Pentameris airoides ssp. airoides	*			V	False hair grass				5
Phalaris minor	*			V	Little-seeded canary grass				1
Phleum pratense	*				Cultivated timothy				4
Poa annua	*				Annual blue grass				3, 4
Poa pratensis ssp. *pratensis*	*				Kentucky blue grass	*Poa pratensis* (of previous reports)		Limited	4
Polypogon monspeliensis	*			V	Rabbit foot beard grass			Limited	4, 5
Polypogon viridis	*				Water beard grass	*Agrostis viridis; Agrostis semiverticillata; Polypogon semiverticillatus*			3, 4
Schismus arabicus	*				Arabian schismus			Limited	3, 4
Schismus barbatus	*			V	Mediterranean schismus			Limited	4, 5
Setaria parviflora	*			V	Knotroot bristle grass				5
Stipa cernua				V	Nodding needle grass	*Nassella cernua*			4, 5
Stipa coronata					Crested needle grass	*Achnatherum coronatum*			3, 4
Stipa lepida				V	Foothill needle grass	*Nassella lepida*			4, 5
Stipa miliacea var. *miliacea*	*		§	V	Smilo grass	*Piptatherum miliaceum* ssp. *miliaceum; Oryzopsis miliacea; Piptatherum miliaceum*		Limited	4, 5
Stipa pulchra				V	Purple needle grass	*Nassella pulchra*			3, 4, 5

Table J-1. Plant Species That Have Been Documented on Detachment Fallbrook

Scientific Name	*	†	§	V	Common Name	Synonyms	Special Status	Cal-IPC Rank	References
Themidaceae - Brodiaea family									
Bloomeria crocea var. *crocea*				V	Common goldenstar	*Bloomeria crocea* (of previous reports)			1, 3, 4, 5
Brodiaea terrestris ssp. *kernensis*				V	Dwarf brodiaea	*Brodiaea terrestris* (of previous reports)			3, 80
Dichelostemma capitatum ssp. *capitatum*				V	Blue dicks	*Dichelostemma capitatum* (of previous reports)			1, 3, 4, 5
Muilla maritima				V	Common muilla				1, 3, 4, 5
Typhaceae - Cattail family									
Typha domingensis					Southern cattail				3, 4, 5

Table J-2. Watch List for Plant Species *Not* Currently Known to Occur on Detachment Fallbrook.

Scientific Name	*	§	Common Name	Synonyms	Special Status	Cal-IPC Rank	Notes
Eryngium aristulatum var. parishii		§	San Diego button-celery		FE, SE, CRPR 1B.1, MSHCP		2009 – Santa Rosa Plateau 1987 – Coastal MCB Camp Pendleton
Chaenactis glabriuscula var orcuttiana		§	Orcutt's pincushion		CRPR 1B.1		1885 specimen. Fallbrook. Point data given a 1-mile radius, , 0.5 miles (2,500 feet) from Det Fallbrook
Lepidum virginicum ssp. robinsonii		§	Robinson's pepper grass		CRPR 4.3		1992 - Training Area India on MCB Camp Pendleton, 0.91 miles (4,800 feet) 2012 – Training Area Hotel along a fire break, 0.28 miles (1,500 feet) from Det Fallbrook
Dudleya multicaulis		§	Many-stemmed dudleya		CRPR 1B.2		1995 - Kilo Two Training Area on Camp Pendleton Marine Corps Base.
Dudleya viscida		§	Sticky dudleya		CRPR 1B.1, MSHCP		1983 - Roblar Canyon, MCB Camp Pendleton. Point data given a 1-mile radius, 1.7 miles from Det Fallbrook
Arctostaphylos rainbowensis		§	Rainbow Manzanita		CRPR 1B.1, MSHCP		2000 - 17 individuals, approximately 1.0 mile from Det Fallbrook 2007 - 5 plants observed on MCB Camp Pendleton, approximately 900 feet from Det Fallbrook
Tetracoccus dioicus		§	Parry's tetracoccus		CRPR 1B.2, MSHCP		2007 - Many shrubs observed along Harris Road east of De Luz Road, approximately 1.04 miles from Det Fallbrook
Navarretia fossalis		§	Spreading navarretia		FT, CRPR 1B.1		2009 and 2011 – Coastal MCB Camp Pendleton
Brodiaea filifolia		§	Thread-leaved brodiaea		FT, SE, 1B.1, MSHCP		2009- 1 plant observed along Camp De Luz Road southeast of junction with Santa Margarita Road. 0.19 mile (1,000 feet) from Det Fallbrook boundary. 2009 – 1 plant observed, 0.47 miles (2,500 feet) from Det Fallbrook
Monardella hypoleuca ssp. intermedia		§	Intermediate monardella		CRPR 1B.3		1950 – near De Luz, 1987 - Tributary of Talega Canyon; approximately 0.83 air mile WNW of White Oak Spring, Camp Pendleton Marine Corps Base.
Abronia villosa var. aurita		§	Chaparral sand-verbena		CRPR 1B.1		2008, West of Lake O'Neill east of Basilone Road

Table J-2. Watch List for Plant Species *Not* Currently Known to Occur on Detachment Fallbrook.

Scientific Name	*	§	Common Name	Synonyms	Special Status	Cal-IPC Rank	Notes
Atriplex coulteri		§	Coulter's saltbush		CRPR 1B		On Detachment Fallbrook historical plant list, but there was no documentation of its observation.Closest sighting in CNDDB is approximately 9 miles aeay on MCB Camp Pendleton at Las Pulgas Canyon and the coastline.
Gilia nevinii		§	Nevin's gilia		CRPR 4.3		On Detachment Fallbrook historical plant list, but there was no documentation of its observation.No sightings in the CNDDB
Asphodelus fistulosus	*	§	Onionweed			Moderate	Invades grassland, dunes, and roadsides. Avoided by livestock. Can form dense infestations. State Parks is treating this at Crystal Cove. Present on Interstate 5 (Cal-IPC 2015)
Carrichtera annua	*	§	Ward's weed			Watchlist	In Australia, invades grasslands and spreads along roads and trails. This is a fairly new invasive in California. Center for Natural Lands Management is working on this species. (Cal-IPC 2015)
Cytisus striatus	*	§	Portuguese broom			Moderate	Invades woodland and scrub. Present to the east of Fallbrook. Not sure how invasive the population is. Watch for spread. (Cal-IPC 2015)
Ehrharta longiflora	*	§	long-flowered veldtgrass			Moderate	Invades coastal dunes (although it is on record in less coastal areas, e.g., Temecula). State Parks added this species to their EDRR list. (Cal-IPC 2015)
Lepidium chalepense	*	§	hoary cress	*Cardaria draba, Cardaria chalepensis*		Moderate	Invades disturbed open sites, including wetlands, riparian areas, and pastures. Can completely displace desirable species and form a monoculture. On Camp Pendleton EDRR list. Work with regional partners to prevent spread. State Parks is including on its EDRR list. (Cal-IPC 2015)
Senecio quadridentatus	*	§	cotton fireweed			Moderate	In Australia, has been recorded invading grassland, riparian scrub, and woodland. Treated on Pendleton, population along road. Known from only three locations in California so would be a good species to eradicate to prevent it from gaining a foothold in the state. (Cal-IPC 2015)
Spartium junceum	*	§	Spanish broom			High	Invades coastal scrub, chaparral, grasslands, and woodland. Nitrogen fixer. Can add a large amount of flammable fuel to ecosystems. Was eradicated from Camp Pendleton. Small populations are present on Cleveland NF. (Cal-IPC 2015)
Oncosiphon piluliferum	*	§	stinknet			Watchlist	San Diego coast State Park Districts early detection list.
Cortaderia selloana	*	§	Pampas grass			High	Pampasgrass favors dunes, bluffs, coastal shrublands and marshes, inland riparian areas, and disturbed areas.

LEGEND

† – Eradicated
* – Non-native or invasive species
§ – Det Fallbrook Watch List species. Additional information is desired for Watch List species, such as voucher or photo, location, etc. Even species that have vouchers may be on the Watch List. Watch List plant species included in Table J-2 are not currently known to occur on the installation, but they have the potential to occur and are of interest to management for early detection.
V – Vouchered in Detachment Fallbrook herbarium

Special Status:

Federal

FE – Endangered
FT – Threatened

State

SE – Endangered
ST – Threatened
SR – Rare

CRPR – California Rare Plant Rank

1A. – Presumed extinct in California
1B. – Rare or Endangered in California and elsewhere
2. – Rare or Endangered in California, more common elsewhere
3. – Plants for which we need more information - Review list
4. – Plants of limited distribution - Watch list

CRPR Threat Ranks

.1 – Seriously endangered in California
.2 – Fairly endangered in California
.3 – Not very endangered in California

Cal-IPC Status:

High – These species have severe ecological impacts on physical processes, plant and animal communities, and vegetation structure. Their reproductive biology and other attributes are conducive to moderate to high rates of dispersal and establishment. Most are widely distributed ecologically.

Moderate – These species have substantial and apparent—but generally not severe—ecological impacts on physical processes, plant and animal communities, and vegetation structure. Their reproductive biology and other attributes are conducive to moderate to high rates of dispersal, though establishment is generally dependent upon ecological disturbance. Ecological amplitude and distribution may range from limited to widespread.

Limited – These species are invasive but their ecological impacts are minor on a statewide level or there was not enough information to justify a higher score. Their reproductive biology and other attributes result in low to moderate rates of invasiveness. Ecological amplitude and distribution are generally limited, but these species may be locally persistent and problematic.

Reference Citations		
Ref #	**Survey Year(s)**	**Citation**
1	1993-1995	Dudek and Associates, Inc. 1995. Report on the Plant Collections and Vegetation Surveys for Naval Weapons Station, Fallbrook Annex, San Diego County, California (1993-1995 Seasons). Prepared for the Nature Conservancy (contract M67004-91-D-0010, N68711, EJ01) by Dudek and Associates, Inc. (PI: John W. Brown), Encinitas, California.
2	1995	Regional Environmental Consultants (RECON). 1996. Noxious Weed Management Plan for the Naval Ordnance Center, Pacific Division Fallbrook Detachment. Draft report (April 1996) serving as final; prepared under Contract No. N67811-94-D-1657/0004 for Southwest Division, NAVFACENGCOM, San Diego, California.
3	2005-2006	Tierra Data Inc (TDI). 2007. Rare Plant Surveys on Naval Weapons Station Seal Beach Detachment Fallbrook Fallbrook, California: Project Report 2005-2006. Unpublished report submitted by Tierra Data Inc. to the Naval Weapons Station Seal Beach Detachment Fallbrook Environmental Programs and Services Office.
4	2010-2011	Tierra Data Inc (TDI). 2013. 2010-2011 Rare Plant Surveys on Naval Weapons Station Seal Beach Detachment Fallbrook, Fallbrook, California. Unpublished report submitted by Tierra Data Inc. to the Naval Weapons Station Seal Beach Detachment Fallbrook Environmental Programs and Services Office.
5	2015	NOREAS, Inc. 2016. Rare Plant Species Survey at Naval Weapons Station Seal Beach Detachment Fallbrook, California: 2015 Season. Unpublished but submitted by NOREAS, Inc. to Naval Weapons Station Seal Beach Detachment Fallbrook under contract with Naval Facilities Engineering Command (contract # N62473-13-D-4812 Delivery Order No. 0005), San Diego, California.
80	varies	Herbaria specimens located at multiple institutions as provided by the Consortium of California Herbaria (CCH). Available at http://ucjeps.berkeley.edu/consortium. Search term “Fallbrook Naval Weapons Station” in the Geographic Locality field.
99	varies	U.S. Department of the Navy (USDON). 2016. Log of incidental plant and wildlife observations at Naval Weapons Station Seal Beach Detachment Fallbrook. Date accessed: 1 May 2016.

APPENDIX K

ANIMAL LIST

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A comprehensive list of animal species that have been documented on Detachment Fallbrook is provided in Table K-1. Summary statistics of the animal species on the installation (e.g., total number of species, number of special status species, number of native versus nonnative species) are maintained in Section 3.9 of this INRMP. Species that were only identified to the level of genera are not included in the animal list unless they are the sole representation of a genus (e.g., "*Argia* sp."). Occassionally, species have only been identified to the level of Family (e.g., "Sphaeriidae unidentified species"). Detachment Fallbrook Watch List species are those for which additional information is needed, such as verification of the species presence on the installation.

Taxonomic nomenclature follows Crothers (2012) for amphibians and reptiles; American Ornithologists' Union (1998) and all updates for birds; Wilson and Reeder (2005) for mammals; and California Department of Fish and Game Natural Diversity Database (March 2015) for special status species. Sources for invertebrate nomenclature vary.

Table K-2 presents animal species that have not been documented on the installation but are highlighted as Detachment Fallbrook Watch List species. These include special status or invasive animals that are known to occur in the region and for which early detection would benefit natural resources management.

Table K-1. Animal Species That Have Been Documented on Detachment Fallbrook

*	§	Scientific Name	Common Name	Special Status	Res. Status	Source(s)
INVERTEBRATES						
Phylum – Platyhelminthes						
Class Turbellaria						
		Turbellaria unidentified species				44
Phylum – Nemertea						
Class – Enolpa; Order Hoplonemertea						
		Prostoma sp.				44
Phylum – Mollusca						
Class Bivalvia; Order Veneroida						
Corbiculidae - Asian Clam Family						
*		*Corbicula sp.*				44
Sphaeriidae- Fingernail Clam Family						
		Sphaeriidae unidentified species				44
Phylum – Mollusca						
Class – Gastropoda; Order – Basommatophora						
Physidae - Freshwater Snail Family						
		Physa sp.				44
Planorbidae - Ram's Horn Snail Family						
		Ferrissia sp.				44
Phylum – Annelida						
Class - Oligochaeta - Earthworms and Freshwater Worms						
		Oligochaeta unidentified species				44
Phylum – Athropoda						
Class Arachinida – Acari; Order – Sarcoptiformes						
		Oribatei unidentifed species				44
Class Arachinida – Acari; Order – Scorpiones						
		Unidentified species	Scorpion			42, 99
Class Arachinida – Acari; Order – Araneae						
Araneae – Orb-weaver Spider Family						
		Neoscona oaxacensis	Western spotted orb weaver			99
Salticidae – Jumping Spider Family						
		Salticidae unidentifed species				45
Theraphosidae - Tarantula Family						
		Aphonopelma sp.	Tarantula			42
Class Branchiopoda; Order Anostraca						
Branchinectidae - Branchinectid Fairy Shrimp Family						
		Branchinecta lindahli	Versatile Fairy Shrimp			16
Class - Ostracoda - Seed Shrimp						
		Ostracoda unidentified species				44
Class Malacostraca; Order Amphipoda						
Hyalellidae						
		Hyalella sp.				44
Class Malacostraca; Order Decapoda						
Cambaridae - Crayfish Family						
*		*Procambarus clarkii*	Red Swamp Crayfish			9, 18, 27, 36, 38, 41, 44

*	§	Scientific Name	Common Name	Special Status	Res. Status	Source(s)
Class Insecta; Order Blattodea						
Ectobiidae – Cockroach Family						
		Parcoblatta americana	Western Wood Cockroach			45
Class Insecta; Order Ephemeroptera						
Baetidae - Mayfly Family						
		Baetis adonis				44
		Baetis sp.				44
		Fallceon sp.				44
		Paracloeodes minutus				44
Leptophlebidae - Prong-gilled Mayfly Family						
		Tricorythodes sp.				44
Class Insecta; Order Odonata						
Aeshnidae – Hawker Family						
		Aeshna multicolor	Blue-eyed Darner			45
		Anax junius	Green Darner			45
Coenagrionidae - Damsel Fly Family						
		Argia sp.				44
		Coenagrionidae unidentifed species				44
Gomphidae - Clubtail Dragonfly Family						
		Progomphus borealis				44
		Gomphidae unidentified species				44
Libellulidae - Dragonfly Family						
		Libellula saturata	Flame Skimmer			45
		Pantala flavescens	Globe Skimmer			45
		Pantala hymenaea	Spot-winged Glider			45
		Sympetrum corruptum	Variegated Meadowhawk			45
		Tramea lacerata	Black Saddlebags			45
		Tramea onusta	Red Dragonfly			45
Class Insecta; Order Orthoptera						
Acrididae – Grasshopper Family						
		Dissosteira pictipennis	Grasshopper Nymph			45
		Melanoplus sp.	Grasshopper			45
		Melanoplus sp.	Grasshopper			45
		Psoloessa thamnogaea	Grasshopper			45
		Schistocerca nitens	Vagrant Grasshopper			45
		Trimerotropis fontana	Band-winged Grasshopper			45
		Trimerotropis pallidipennis	Pallid-winged Grasshopper			45
Gryllidae – True Cricket Family						
		Gryllus sp.	Field Cricket			45
		Oecanthus sp.	Tree Cricket			45
Stenopelmatidae – Jerusalem Cricket Family						
		Stenopelmatus sp.	Jerusalem Cricket			45
Tettigoniidae – Katydid Family						
		Microcentrum rhombifolium	Greater Anglewing Katydids			45
		Scudderia mexicana	Mexican Bush Katydid			45
		Tettigoniidae unidentifed species				45
Class Insecta; Order Trichoptera						
Hydroptilidae - Caddisfly Family						
		Hydroptila sp.				44

*	§	Scientific Name	Common Name	Special Status	Res. Status	Source(s)
		Hydroptilidae unidentified species				44
Psychomyiidae - Trumpet-net and Tube-making Caddisfly Family						
		Tinodes sp.				44
		Psychomyiidae unidentified species				44
Class Insecta; Order Coleoptera						
Bostrichidae - Horned Powderpost Beetle Family						
		Amphicerus cornutus	Powderpost Bostrichid			45
Buprestidae – Metallic Wood-boring Beetle Family						
*		*Acmaeodera sp.*	Wood-boring Beetle			45
		Chrysobothris sp.	Beetle			45
		Buprestidae unidentified species				45
Cerambycidae – Longhorn Beetle Family						
		Metheapuscella sp.				45
		Prionus californicus	California Prionus			45
		Xylatrechus nauticus	Oak Cordwood Borer			45
Cleridae – Checkered Beetle Family						
		Cymatodera californica	Giant Clerid			45
Coccinellidae – Lady Beetle Family						
		Adalia bipunctata	Two-spotted Lady Beetle			45
		Coccinella septempunctata	Seven-spotted Lady Beetle			45
		Hippodamia convergens	Convergent Lady Beetle			45
		Coccinellidae unidentified species				45
Curculionidae – True Weevil Family						
		Curculionidae unidentified species				45
Dytiscidae - Predaceous Water Beetle Family						
		Laccophilus sp.				44
Elateridae – Click Beetle Family						
		Elateridae unidentified species				45
Hydrophilidae - Water Scavenger Beetle Family						
		Enochrus sp.				44
		Laccobius sp.				44
		Hydrophilidae unidentified species				44
Melandryidae – False Darkling Beetle Family						
		Osphya luteus				45
Mordellidae - Tumbling Flower Beetle Family						
		Mordellidae unidentified species				45
Phengodidae – Glowworm Beetle Family						
		Phengodidae unidentified species				45
Scarabaeidae – Beetle Family						
		Cotinus texana	Metallic Green Fig Beetle			45
Tenebrionidae – Darkling Beetle Family						
		Elodes gracilis				45
		Tenebrionidae unidentified species				45
Trogossitidae – Bark-gnawing Beetle Family						

*	§	Scientific Name	Common Name	Special Status	Res. Status	Source(s)
		Themnochica virescens				45
Class Insecta; Order Dermaptera						
		Demaptera unidentifed species				45
Class Insecta; Order Diptera - True Flies						
Asilidae – Robber Fly Family						
		Stenopogon rufibarbis	Robber Fly			45
		Asilidae unidentified species				45
Bombyliidae – Bee Fly Family						
		Villa moliter				45
		Bombyliidae unidentified species				45
Calliphoridae – Blow Fly Family						
		Phaenicia sericata	Common Green Bottle Fly			45
		Calliphoridae unidentified species				45
Ceratopogonidae - Biting Midges Family						
*		*Atrichopogon sp.*				44
		Bezzia/Palpomyia sp.				44
		Ceratopogonidae unidentifed species				44
		Dasyhelea sp.				44
Chironomidae - Non-biting Midges Family						
		Alotanypus sp.				44
*		*Apedilum sp.*				44
		Chironomini (tribe) unidentified species				44
		Chironomus sp.				44
*		*Cryptochironomus sp.*				44
		Dicrotendipes sp.				44
		Endotribelos sp.				44
*		*Micropsectra sp.*				44
*		*Pentaneura sp.*				44
*		*Phaenopsectra sp.*				44
*		*Polypedilum sp.*				44
*		*Pseudochironomus sp.*				44
*		*Pseudosmittia sp.*				44
*		*Rheotanytarsus sp.*				44
		Tanytarsini sp.				44
		Tanytarsus sp.				44
Dolichopodidae - Long-legged Fly Family						
		Dolichopodidae unidentifed species				44
Empididae - Dance Fly Family						
*		*Hemerodromia sp.*				44
		Neoplasta sp.				44
Muscidae - House Fly Family						
*		*Musca domestica*	House Fly			45
Orthocladiinae - Midge Family						

*	§	Scientific Name	Common Name	Special Status	Res. Status	Source(s)
		Brillia sp.				44
*		*Corynoneura sp.*				44
		Cricotopus sp.				44
		Eukiefferiella brehmi gr.				44
		Eukiefferiella claripennis gr.				44
		Eukiefferiella sp.				44
		Limnophyes sp.				44
		Nanocladius sp.				44
		Orthocladius Complex Species				44
		Orthocladius sp.				44
		Paraphaenocladius sp.				44
		Parametriocnemus sp.				44
		Rheocricotopus sp.				44
		Thienemanniella sp.				44
		Thienemannimyia gr. sp.				44
Prodiamesinae - Midge Family						
		Labrundinia sp.				44
		Paramerina sp.				44
		Procladius sp.				44
Psychodidae - Moth Fly Family						
*		*Pericoma/Telmatoscopus sp.*				44
		Psychodidae unidentified species				44
Sarcophagidae – Flesh Fly Family						
		Sarcophaga sp.				45
Simuliidae - Black Fly Family						
		Simulium sp.				44
		Simuliidae unidentifed species				44
Stratiomyidae - Soldier Fly Family						
		Caloparyphus/Euparyphus sp.				44
		Euparyphus sp.				44
		Hedriodiscus/Odontomyia sp.				44
		Odontomyia sp.				44
Syrphidae – Hover-fly Family						
		Copostylum sp.				45
		Eristlis aenea				45
		Volucella mexicana				45
		Syrphidae unidentified species				45
Tabanidae – Horse-fly Family						
		Tabanus punctifer	Western Horse Fly			45
		Tabanidae unidentified species				45
Tanyderidae - Primitive Crane Fly Family						
		Protanyderus sp.				44
Tipulidae - Crane Fly Family						
		Limonia sp.				44

*	§	Scientific Name	Common Name	Special Status	Res. Status	Source(s)
		Nephrotoma sp.				45
		Tipula sp.				44
Class Insecta; Order Embioptera						
Oligotomidae – Webspinner Family						
		Oligotomidae unidentifed species				45
Class Insecta; Order Hemiptera						
Cicadidae – Cicada Family						
		Homalodisca lacerta	Leafhopper			45
		Cicadidae unidentified species				45
Lygaeidae – Milkweed Bug Family						
		Lygaeus kalmii	Small Milkweed Bug			45
		Nysius sp.	False Chinch Bug			45
Miridae – Mirid Bug Family						
		Lygus sp.	Tarnished Plant Bug			45
Nabidae – Damsel Bug Family						
		Nabis sp.				45
Pentatomidae – Terrestrial Turtle Bug Familly						
		Chlorochroa sayi	Large Green Stink Bug			45
		Chlorochroa uhleri	Uhler's Stink Bug			45
Class Insecta; Order Heteroptera						
Geocoridae – Big-eyed Bug Family						
		Geocoris sp.				45
Lygaeidae – Seed Bug Family						
		Neacoryphus bicrucis	White-crossed Seed Bug			45
Pentatomidae – Terrestrial Turtle Bug Family						
		Pentatomidae unidentified species				45
Pyrrhocoridae – Red Bug Family						
*		*Scantius aegyptius*				45
Reduviidae – Assassin Bug Family						
		Zelus renardii				45
		Reduviidae unidentified species				45
Scutellaridae – Jewel Bug Family						
		Scutellaridae unidentified species				45
Class Insecta; Order Hymenoptera						
Apidae – Honey Bee Family						
		Apis mellifera	Western Honey Bee			45
		Xylocopa californica	California Carpenter Bee			45
		Xylocopa varipuncta	Valley Carpenter Bee			45
Chrysididae – Cuckoo Wasp Family						
		Argochrysis mesillae	Cuckoo Wasp			45
Formicidae - Ant Family						
*		*Linepithema humile*	Argentine Ant			5
		Crematogaster californica	Acrobat Ant			5
		Liometopum occidentale	California Velvety Tree Ant			5, 45

*	§	Scientific Name	Common Name	Special Status	Res. Status	Source(s)
		Camponoyus vicinus	Carpenter Ant			5
		Lasius sp.	Field Ant			5
		Forelius sp.	Forelius Ant			5
		Formica sp.	Honeypot Ant			5
		Pheidole sp.	Harvester Ant			5
		Pheidole californica	Harvester Ant			5
		Pogonomyrmex californicus	Harvester Ant			5, 45
		Pogonomyrmex barbatus	Harvester Ant			5
		Messor pergandi	Harvester Ant			5, 45
		Conomyrma sp.	Pyramid Ant			5
		Solenopsis xyloni	Southern Fire Ant			5
Halictidae – Sweat Bee Family						
		Agapostemon sp.				45
Ichneumonidae – Parasitoid Wasp Family						
*		*Compsocryptus calipterus*				45
		Ichneumonidae unidentified species				45
Megachilidae – Leafcutter and Mason Bee Family						
		Megachile sp.	Solitary Bee			45
Mutillidae – Velvet Ant Wasp Family						
		Dasymutilla vestita	Red Velvet Ant			99
Pompilidae – Spider Wasp Family						
		Pepsis chrysothemis	Tarantula Hawk			45
		Pepsis thysbe	Tarantula Hawk			45
		Pompilidae unidentified species				45
Scoliidae – Scoliid Wasp Family						
		Campsomeris tolteca	Desert Wasp			45
Sphecidae – Sand Wasp, Mud Dauber, and Thread-waisted Wasp Family						
		Ammophila sp.	Thread-waisted Wasp			45
		Chalybion californicum	Blue Mud Wasp			45
		Chlorion aerarium	Cricket Hunter Wasp			45
		Sceliphron caementarium	Black and Yellow Mud Dauber			45
		Tachytes elongatus	Green Eyed Wasp			45
Vespidae – Vespid Wasp Family						
		Polistes apachus	Paper Wasp			45
		Polistes exclamans	Paper Wasp			45
		Vespula sp.	Common Wasp			45
Class Insecta; Oder Isoptera						
Hodotermitidae - Harvestor Termite Family						
		Zootermopsis angusticollis	Dampwood Termite			5
		Reticulitermes hesperus	Subterranean Termite			5
Class Insect; Order Lepidoptera - Moths, Skippers and Butterflies						
Hesperiidae - Skipper Family						
		Erynnis tristis	Mournful Duskywing			45
		Erynnis funeralis	Funereal Duskywing			45
		Erynnis propertius	Propertius Duskywing			45
		Heliopetes ericitorum	Northern White-Skipper			45
		Hylephila phyleus	Fiery Skipper			45
		Lerodia eufala	Eufala Skipper			45
		Ochlodes agricola	Rural Skipper			45
		Ochlodes sylvanoides	Woodland Skipper			45

*	§	Scientific Name	Common Name	Special Status	Res. Status	Source(s)
		Poanes melane	Umber Skipper			45
		Pyrgus albescens	White Checkered Skipper			45
Papilionidae - Swallowtail Family						
		Papilio cresphontes	Giant swallowtail			45
		Papilio zelicaon	Anise Swallowtail			45
		Papilio rutulus	Western Tiger Swallowtail			45
		Papilio eurymedon	Pale Swallowtail			45
Pieridae - White and Sulphur Family						
		Pontia protodice	Checkered White			45
*		*Pieris rapae*	Cabbage White			45
		Anthocharis cethura	Desert Orangetip			45
		Anthocharis sara	Pacific Orangetip			45
		Colias eurytheme	Orange Sulphur			45
		Colias harfordii	Harford's Sulphur			45
		Eurema nicippe	Sleepy Orange			45
		Phoebis sennae	Cloudless Sulphur			45
		Nathalis iole	Dainty Sulphur			45
Lycaenidae - Gossamer-wing Butterfly Family						
		Atlides halesus	Great Purple Hairstreak			45
		Brephidium exilis	Western Pygmy Blue			45
		Callophrys augustinus	Brown Elfin			45
		Callophrys perplexa	Perplexing Hairstreak			45
		Strymon melinus	Gray Hairstreak			45
		Leptotes marina	Marine Blue			45
		Everes amyntula	Western Tailed-Blue			45
		Celastrina ladon	Spring Azure			45
		Euphilotes battoides	Western Square-dotted Blue			45
		Glaucopsyche lygdamus	Silvery Blue			45
		Icaricia acmon	Acmon Blue			45
		Incisalia augustinus	Western Brown Elfin			45
Riodinidae - Metalmark Family						
		Calephelis nemesis	Fatal Metalmark			45
		Apodemia mormo	Behr's Metalmark			45
Nymphalidae - Brush-footed Butterfly Family						
*		*Agraulis vanillae*	Gulf Fritillary			45
		Speyeria callippe	Callippe Fritillary			45
		Chlosyne gabbii	Gabb's Checkerspot			45
		Chlosyne californica	California Patch			45
		Polygonia satyrus	Satyr Comma			45
		Nymphalis californica	California Tortoiseshell			45
		Nymphalis antiopa	Mourning Cloak			45
		Vanessa atalanta	Red Admiral			45
		Vanessa virginiensis	American Lady			45
		Vanessa cardui	Painted Lady			45
		Vanessa annabella	West Coast Lady			45
		Junonia coenia	Common Buckeye			45
		Limenitis lorquini	Lorquin's Admiral			45
		Adelpha bredowii	California Sister			45
		Coenonympha tullia	Common Ringlet			45

*	§	Scientific Name	Common Name	Special Status	Res. Status	Source(s)
		Danaus gilippus	Queen			45
		Danaus plexippus	Monarch	SGCN		45
Saturniidae - Wild Silk Moth Family						
		Hemiluca electra	Electra Buckmoth			45
		Saturnia walterorum	Walter's Silk Moth			45
		Hyalophora euryalus	Ceanothus Silk Moth			99
Sphingidae -Sphinx Moths, Hawkmoth Family						
		Eumorpha achemon	Achemon Sphinx Moth			45
		Hemaris diffinis	Snowberry Clearwing Moth			45
		Hyles lineata	White-lined Sphinx			45
		Manduca sexta	Sphinx Moth			45
		Sphinx perelegans	Elegant Sphinx Moth			45
Noctuidae - Owlet Moths, Miller Moth Family						
		Annaphila decia				45
		Annaphila pseudoastraloga				45
		Autographa biloba	Bilobed Looper Moth			45
		Autographa californica	Alfalfa Looper Moth			45
		Drasteria divergens	Underwing Moth			45
		Euclidia ardita				45
		Heliothis phloxiphaga	Darker-spotted Straw Moth			45
		Megalographa biloba	Bilobed Looper			45
		Schinia pulchripennis	Common Flower Moth			45
*		*Spodoptera exigua*	Small Mottled Willow Moth			45
Erebidae - Erebid Moth Family						
		Caenurgia togataria	Cream Colored Moth			45
Arctiidae - Tiger Moth Family						
		Arachnis picta	Painted tiger moth			45
		Gramia ursina	Tiger moth			45
		Leptarctia californiae	Tiger Moth			45
Class Insecta; Order Mantodea						
Mantidae – Mantis Family						
*		*Iris oratoria*	Mediterranean Mantis			45
		Litaneutria minor	Agile Ground Mantis			45
		Stagmomantis californica	California Mantis			45
Class Insecta; Order Neuropetera						
Chrysopidae – Green Lacewing Family						
		Chrysopa sp.				45
Hemerobiidae – Brown Lacewing Family						
		Hemerobiidae unidentified species				45
Coniopterygidae – Dustywinged Family						
		Coniopterygidae unidentified species				45
Myrmeliontidae – Antlion Family						
		Myrmeliontidae unidentified species				45
		Myrmeliontidae unidentified species				45
VERTEBRATES						
Class Actinopterygii (Fish)						
Cyprinidae - Minnow Family						
		Gila orcutti	Arroyo chub	CSC, MSHCP, SGCN		6

*	§	Scientific Name	Common Name	Special Status	Res. Status	Source(s)
*		*Cyprinus carpio*	Common Carp			41
Ictaluridae - Bullhead Catfish Family						
*		*Ameiurus melas*	Black Bullhead			41
*		*Ameiurus nebulosus*	Brown Bullhead			41
*		*Ameiurus natalis*	Yellow Bullhead			41
*	§	*Ictalurus punctatus*	Channel Catfish			7; needs validation
Salmonidae - Salmon and Trout Family						
	§	*Oncorhynchus mykiss*	Southern Steelhead Trout	FE, CSC, SGCN-CV		24
Poeciliidae - Livebearer Family						
*		*Gambusia affinis*	Western Mosquitofish			11, 38, 41
Gasterosteidae - Stickleback Family						
	§	*Gasterosteus aculeatus*	Threespine Stickleback			1; needs validation
Centrarchidae - Sunfish Family						
*		*Lepomis macrochirus*	Bluegill			11, 27
*		*Lepomis cyanellus*	Green Sunfish			41
*		*Micropterus salmoides*	Largemouth Bass			11, 41
*		*Micropterus coosae*	Redeye Bass			41
Class Amphibia (Amphibians)						
Bufonidae - True Toad Family						
		Anaxyrus boreas	Western Toad		R	1, 5, 9, 18, 27, 31, 32, 42
	§	*Anaxyrus californicus*	Arroyo Toad	FE, CSC, MSHCP, SGCN-CV	R	9, 18, 27, 42
Ranidae - True Frog Family						
*		*Lithobates catesbeianus*	American Bullfrog		R	9, 18, 25, 26, 28, 29, 32, 33, 36, 38, 39, 41, 43
Hylidae - Treefrog Family						
		Pseudacris cadaverina	California Treefrog		R	1, 5, 9, 42
		Pseudacris hypochondriaca	Baja California Treefrog		R	1, 5, 9, 26, 29, 28, 32, 38, 39, 42
Pelobatidae - Spadefoot Family						
		Spea hammondii	Western Spadefoot	CSC, MSHCP, SGCN	R	1, 5, 27, 39, 42
Plethodontidae - Lungless Salamander Family						
	§	*Aneides lugubris*	Arboreal Salamander		R	9
		Batrachoseps major	Southern California Slender Salamander		R	1, 5, 27, 42
Class Reptilia (Reptiles)						
Lizards						
Anniellidae - Legless Lizard Family						
	§	*Anniella pulchra*	California Legless Lizard	CSC, SGCN-CV	R	9
Teiidae - Whiptail Lizard Family						
		Aspidoscelis hyperythra	Orange-throated Whiptail	CSC, MSHCP, SGCN-CV	R	1, 5, 38, 42
		Aspidoscelis tigris	Tiger Whiptail		R	1, 5, 25, 27, 38, 42
Anguidae - Alligator Lizard Family						
		Elgaria multicarinata webbii	San Diego Alligator Lizard		R	1, 5, 26, 27, 29, 28, 32, 42

*	§	Scientific Name	Common Name	Special Status	Res. Status	Source(s)
Phrynosomatidae - Spiny Lizard Family						
	§	*Phrynosoma blainvillii*	Blainville's Horned Lizard	CSC, MSHCP, SGCN-CV	R	1, 5, 99
		Sceloporus occidentalis	Western Fence Lizard		R	1, 5, 25, 26, 27, 29, 32, 33, 38, 42
	§	*Sceloporus orcutti*	Granite Spiny Lizard			5, needs validation
		Uta stansburiana elegans	Western Side-blotched Lizard		R	1, 5, 27, 38, 42
Scincidae - Skink Family						
	§	*Plestiodon gilberti*	Gilbert's Skink		R	46
	§	*Plestiodon skiltonianus interparietalis*	Coronado Skink	CSC	R	1, 5, 42
Snakes						
Colubridae - Colubrid Snake Family						
		Lampropeltis californiae	California Kingsnake		R	1, 5, 29, 33, 42, 99
		Coluber flagellum piceus	Red Racer		R	5, 25, 26, 42, 99
		Coluber lateralis lateralis	California Striped Racer		R	1, 5, 29, 42
		Pituophis catenifer annectens	San Diego Gophersnake		R	1, 5, 26, 28, 42
		Rhinocheilus lecontei	Longnose Snake		R	9, 99
	§	*Salvadora hexalepis virgultea*	Western Patchnose Snake	CSC, SGCN-CV	R	1, 42
Viperidae - Viper and Pitviper Family						
		Crotalus mitchellii pyrrhus	Southwestern Speckled Rattlesnake		R	9, 27, 42, 99
		Crotalus oreganus helleri	Southern Pacific Rattlesnake		R	1, 5, 26, 29, 32, 33, 39, 42, 99
		Crotalus ruber	Red Diamond Rattlesnake	CSC, MSHCP, SGCN	R	1, 5, 9, 26, 29, 38, 42, 99
Xenodontidae - Harmless Rear-Fanged Snake Family						
		Diadophis punctatus similis	San Diego Ring-necked Snake		R	5, 42
		Hypsiglena ochrorhyncha lauberi	San Diego Night Snake		R	9, 42
Boidae - Boa Family						
		Lichanura trivirgata	Rosy Boa		R	7; 99
Leptotyphlopidae - Slender Blind Snake Family						
		Rena humilis	Western Threadsnake		R	5, 42
Natricidae - Harmless Live-Bearing Snake Family						
		Thamnophis hammondii	Two-striped Gartersnake	CSC, MSHCP, SGCN	R	1, 5, 18, 27, 36
	§	*Thamnophis sirtalis*	Common (Red-sided) Garter Snake, South Coast Garter Snake		V	18, needs validation
Turtles						
Emydidae - Box Turtle and Water Turtle Family						
		Actinemys marmorata	Pacific Pond Turtle	CSC, MSHCP, SGCN	R	1, 5, 9, 27, 36, 42
*		*Trachemys scripta elegans*	Red-eared Slider		R	9, 38, 41, 42
Class Aves (Birds)						
Anatidae - Swan, Goose, and Duck Family						
		Branta canadensis	Canada Goose		M, T	22
		Aix sponsa	Wood Duck		M, T	1, 5
		Anas strepera	Gadwall		T	5, 7, 14, 17, 28, 38
		Anas americana	American Wigeon		M	1, 5, 17, 29

*	§	Scientific Name	Common Name	Special Status	Res. Status	Source(s)
		Anas platyrhynchos	Mallard		R	1, 5, 10, 14, 12, 17, 21, 22, 25, 26, 28, 29, 32, 33, 38, 39
		Anas discors	Blue-winged Teal		M	1, 5, 17
		Anas cyanoptera	Cinnamon Teal		M, T	1, 5, 17, 22, 28
		Anas clypeata	Northern Shoveler		M, T	1, 5, 21, 22
		Anas acuta	Northern Pintail		M, T	1, 5
		Anas crecca	Green-winged Teal		M, T	1, 5, 17
		Aythya valisineria	Canvasback		M	1, 5, 17, 22
		Aythya americana	Redhead	CSC, SGCN	M, T	1, 5
		Aythya collaris	Ring-necked Duck		M	1, 5
		Bucephala albeola	Bufflehead		M	1, 5, 17, 22
		Oxyura jamaicensis	Ruddy Duck		R	1, 5, 14, 22, 25, 26, 28, 32, 33, 38
Odontophoridae - New World Quail Family						
		Callipepla californica	California Quail		R	1, 5, 13, 14, 17, 25, 26, 28, 29, 32, 33, 38, 39
Podicipedidae - Grebe Family						
		Podilymbus podiceps	Pied-billed Grebe		R	1, 5, 13, 14, 17, 25, 26, 28, 29, 32, 33, 38, 39
		Aechmophorus occidentalis	Western Grebe		M, T	22
		Aechmophorus clarkii	Clark's Grebe		M, T	22
Phalacrocoracidae - Cormorant Family						
		Phalacrocorax auritus	Double-crested Cormorant		T	1, 5, 10, 13, 14, 21, 22, 32, 33, 39
Pelecanidae - Pelican Family						
		Pelecanus erythrorhynchos	American White Pelican	CSC, SGCN-CV	M	22
Ardeidae - Heron Family						
		Botaurus lentiginosus	American Bittern		T	22
		Ixobrychus exilis	Least Bittern	CSC, SGCN	T	needs source/ validation
		Ardea herodias	Great Blue Heron		T	1, 5, 10, 13, 14, 17, 21, 2, 25, 26, 28, 29, 32, 33, 38, 39
		Ardea alba	Great Egret		T	1, 5, 10, 13, 14, 22, 25, 28, 32, 38, 39
		Egretta thula	Snowy Egret		T	1, 5, 14, 38
		Bubulcus ibis	Cattle Egret		T	1, 5, 17
		Butorides virescens	Green Heron		R	1, 5, 13, 14, 17, 22, 25, 28, 32, 38
		Nycticorax nycticorax	Black-crowned Night-Heron		T	1, 5, 14, 17, 21, 22, 38
Threskiornithidae - Ibis Family						
		Plegadis chihi	White-faced Ibis	MSHCP	T	1, 5, 13, 14, 21, 22, 38
Cathartidae - New World Vulture Family						
		Cathartes aura	Turkey Vulture		R	1, 4, 5, 10, 13, 14, 17, 21, 22, 25, 26, 28, 29, 32, 33, 38, 39
Pandionidae - Osprey Family						
		Pandion haliaetus	Osprey		T	22

*	§	Scientific Name	Common Name	Special Status	Res. Status	Source(s)
Accipitridae - Hawk Family						
		Elanus leucurus	White-tailed Kite	CFP	R	1, 4, 5, 13, 14, 17, 19, 21, 22, 25, 26, 28, 29, 32, 33, 38, 39
		Circus cyaneus	Northern Harrier	CSC, MSHCP, SGCN	R	1, 4, 5, 13, 21, 22, 25, 26, 28, 29, 32, 33, 38, 39
		Accipiter striatus	Sharp-shinned Hawk		M	1, 4, 5, 14, 17, 21, 22, 25, 29
		Accipiter cooperii	Cooper's Hawk		R	1, 4, 5, 14, 17, 13, 21, 22, 25, 26, 28, 29, 32, 33, 38, 39
		Buteo lineatus	Red-shouldered Hawk		R	1, 2, 5, 10, 13, 14, 17, 21, 22, 25, 26, 28, 29, 32, 33, 38, 39
		Buteo swainsoni	Swainson's Hawk	ST, DOD PIF, SGCN-CV	M	1, 4, 29
		Buteo jamaicensis	Red-tailed Hawk		R	1, 4, 5, 10, 13, 14, 17, 21, 22, 25, 26, 28, 29, 32, 33, 38, 39
		Buteo regalis	Ferruginous Hawk		MW	1, 4, 5, 22
		Buteo lagopus	Rough-legged Hawk		M	1, 5
		Aquila chrysaetos	Golden Eagle	BGEPA, CFP, PIF, MSHCP	R	1, 4, 5, 17, 21, 22, 29, 99
		Haliaeetus leucocephalus	Bald Eagle	BGEPA, SE, SGCN	MW, RT	99
Rallidae - Rail and Coot Family						
		Rallus limicola	Virginia Rail		R	13, 17, 32, 38, 39
		Porzana carolina	Sora		R	29, 28, 32, 38
		Gallinula chloropus	Common Moorhen		R	1, 5, 14, 17, 25, 32
		Fulica americana	American Coot		R	1, 5, 14, 17, 21, 22, 25, 26, 28, 29, 32, 33, 38, 39
Recurvirostridae - Stilt and Avocet Family						
		Himantopus mexicanus	Black-necked Stilt		T	1, 5, 17, 22, 38
		Recurvirostra americana	American Avocet		T	22
Charadriidae - Plover Family						
		Pluvialis squatarola	Black-bellied Plover		M	1, 5, 17
		Charadrius vociferus	Killdeer		R	1, 5, 13, 14, 17, 21, 22, 25, 26, 28, 29, 32, 33, 38, 39
Scolopacidae - Sandpiper Family						
		Actitis macularius	Spotted Sandpiper		T	1, 5, 14, 38
		Tringa melanoleuca	Greater Yellowlegs		M	1, 5, 22
		Tringa semipalmata	Willet		M	1, 5
		Calidris alpina	Dunlin		M	1, 5, 17
		Calidris minutilla	Least Sandpiper		M	needs source/ validation
	§	*Calidris mauri*	Western Sandpiper		M	1, 5
		Limnodromus scolopaceus	Long-billed Dowitcher		M	1, 5
		Gallinago gallinago	Common Snipe		M	3
		Phalaropus lobatus	Red-necked Phalarope		M	1, 5
Laridae - Gull and Tern Family						
		Larus canus	Mew Gull		M	22

*	§	Scientific Name	Common Name	Special Status	Res. Status	Source(s)
		Larus delawarensis	Ring-billed Gull		M	1, 5
		Larus occidentalis	Western Gull		T	22
		Larus californicus	California Gull		T	22
	§	*Sternula antillarum*	Least Tern	FE, SGCN-CV	RT	14
		Hydroprogne caspia	Caspian Tern		T	13
Columbidae - Pigeon and Dove Family						
*		*Columba livia*	Rock Pigeon		R	21, 22, 25, 26, 32, 38, 39
		Patagioenas fasciata	Band-tailed Pigeon		T	38
*		*Streptopelia decaocto*	Eurasian Collared-Dove		R	22, 25, 29, 32, 33, 38, 39
		Zenaida macroura	Mourning Dove		R	10, 13, 14, 17, 21, 22, 25, 26, 28, 29, 32, 33, 38, 39
		Columbina passerina	Common Ground-Dove		RR	22
Cuculidae - Cuckoo and Roadrunner Family						
		Geococcyx californianus	Greater Roadrunner		R	10, 14, 17, 13, 21, 22, 26, 25, 29, 28, 33, 32, 39, 38
Tytonidae - Barn Owl Family						
		Tyto alba	Barn Owl		R	1, 4, 5, 13, 21, 22, 25, 28, 29, 32, 33
Strigidae - Typical Owl Family						
		Megascops kennicottii	Western Screech-Owl		R	1, 4, 5, 10, 13
		Bubo virginianus	Great Horned Owl		R	1, 4, 5, 13, 14, 17, 21, 22, 25, 28, 29, 33, 38, 39
		Athene cunicularia	Burrowing Owl	CSC, PIF, MSHCP, BCC, SGCN	W, M	1, 4, 5,17, 21, 22, 99
	§	*Asio otus*	Long-eared Owl	CSC, SGCN		4, 22
Caprimulgidae - Nightjar Family						
		Chordeiles acutipennis	Lesser Nighthawk		T	1, 5, 22
		Phalaenoptilus nuttallii	Common Poorwill		R	1, 5, 13, 14, 17, 43, 99
Apodidae - Swift Family						
		Chaetura vauxi	Vaux's Swift	CSC, SGCN	M	1, 5, 13, 14, 17, 22, 29, 33
		Aeronautes saxatalis	White-throated Swift		MB	1, 5, 13, 14, 21, 22, 26, 28, 29, 33, 38, 39
Trochilidae - Hummingbird Family						
		Archilochus alexandri	Black-chinned Hummingbird		MB	1, 5, 10,13, 14, 17, 22, 25, 26, 28, 29, 32, 33, 38, 39
		Calypte anna	Anna's Hummingbird		R	1, 5, 10 13, 14, 17, 21, 22, 25, 26, 28, 29, 32, 33, 38, 39
		Calypte costae	Costa's Hummingbird	BCC	MB	1, 5, 10, 13, 14, 17, 21, 22, 25, 26, 28, 29, 32, 33, 38, 39
		Selasphorus calliope	Calliope Hummingbird			1, 5, 17
		Selasphorus rufus	Rufous Hummingbird		M	1, 5, 13, 26, 99
		Selasphorus sasin	Allen's Hummingbird	BCC	M	1, 5, 17, 13, 21, 22, 38
		Selasphorus sp.	Rufous/Allen's Hummingbird		M	26, 29, 33, 39

*	§	Scientific Name	Common Name	Special Status	Res. Status	Source(s)
Alcedinidae - Kingfisher Family						
		Ceryle alcyon	Belted Kingfisher		R	1, 5, 13, 14, 17, 21, 22, 38
Picidae - Woodpecker Family						
		Melanerpes formicivorus	Acorn Woodpecker		R	2, 6, 14, 17, 21, 22, 25, 26, 28, 29, 32, 33, 38, 39
		Sphyrapicus ruber	Red-breasted Sapsucker		M	17
		Picoides nuttallii	Nuttall's Woodpecker	BCC	R	1, 5, 10, 13, 14, 17, 21, 22, 25, 26, 28, 29, 32, 33, 38, 39
		Picoides pubescens	Downy Woodpecker		R	1, 5, 13, 14, 17, 22, 28, 38
		Colaptes auratus	Northern Flicker		MB	1, 5, 10,13, 14, 17, 21, 22, 26, 28, 29, 32, 33, 38, 39
Falconidae - Falcon Family						
		Falco sparverius	American Kestrel		R	1, 4, 5, 14, 17, 21, 22, 25, 26, 28, 29, 33, 38, 39
		Falco columbarius	Merlin		M	1, 5
		Falco mexicanus	Prairie Falcon	PIF	M, T	1, 4, 5
		Falco peregrinus	Peregrine Falcon		T	34
Tyrannidae - Tyrant Flycatcher Family						
	§	*Contopus cooperi*	Olive-sided Flycatcher	CSC, PIF, SGCN	M	17, 29
		Contopus sordidulus	Western Wood-Pewee		MB	1, 5, 14, 17, 22, 25, 38, 39
		Empidonax traillii (extimus)	(Southwestern) Willow Flycatcher	(FE), SE, MSHCP, SGCN	M, T	13, 14, 17, 28, 32 (Not identified to subspecies; SWFL known to occur in SMR)
		Empidonax hammondii	Hammond's Flycatcher		M	13, 28, 29, 38
		Empidonax wrightii	Gray Flycatcher		M	28
		Empidonax oberholseri	Dusky Flycatcher		M	14
		Empidonax difficilis	Pacific-slope Flycatcher		MB	1, 5, 13, 14, 17, 21, 22, 25, 26, 28, 32, 33, 38, 39
		Sayornis nigricans	Black Phoebe		R	1, 5, 10, 13, 14, 17, 21, 22, 25, 26, 28, 29, 32, 33, 38, 39
		Sayornis saya	Say's Phoebe		R, M	1, 5, 14, 21, 22, 25, 26, 28, 29, 32, 33, 38, 39
	§	*Pyrocephalus rubinus*	Vermilion Flycatcher	CSC, SGCN	M	12
		Myiarchus cinerascens	Ash-throated Flycatcher		MB	1, 5, 10, 13, 14, 17, 21, 22, 26, 25, 28, 29, 32, 33, 38, 39
		Tyrannus vociferans	Cassin's Kingbird		R	1, 5, 14, 17, 25, 26, 28, 29, 32, 33, 38, 39
		Tyrannus verticalis	Western Kingbird		MB	1, 5, 14, 17, 21, 22, 25, 26, 28, 29, 32, 33, 38, 39
Laniidae - Shrike Family						
	§	*Lanius ludovicianus*	Loggerhead Shrike	CSC, PIF, BCC, SGCN	M, T	1, 5, 10, 13, 22, 29, 33

*	§	Scientific Name	Common Name	Special Status	Res. Status	Source(s)
Vireonidae - Vireo Family						
	§	*Vireo bellii pusillus*	Least Bell's Vireo	FE, SE, MSHCP, SGCN-CV	MB	5, 10, 13, 14, 17, 19, 21, 22, 25, 26, 28, 29, 32, 33, 38, 39
		Vireo cassinii	Cassin's Vireo		T	5, 14, 13, 17,
		Vireo huttoni	Hutton's Vireo		R	5, 14, 17, 22, 25, 28, 29, 32, 33, 38, 39
		Vireo gilvus	Warbling Vireo		M	13, 14, 17, 25, 29, 32, 38
Corvidae - Jay and Crow Family						
		Aphelocoma californica	Western Scrub-Jay		R	1, 5, 10, 13, 14, 17, 21, 22, 25, 26, 28, 29, 32, 33, 38, 39
		Corvus brachyrhynchos	American Crow		R	1, 5, 13, 14, 17, 21, 22, 26, 25, 29, 28, 33, 32, 38, 39
		Corvus corax	Common Raven		R	1, 5, 10, 13, 14, 17, 21, 22, 25, 26, 28, 29, 32, 33, 38, 39
Alaudidae - Lark Family						
		Eremophila alpestris actis	California Horned Lark		R	1, 5, 14, 21, 22, 25, 26, 28, 29, 33, 38, 39
Hirundinidae - Swallow Family						
		Tachycineta bicolor	Tree Swallow		M, T	14, 17, 22
		Tachycineta thalassina	Violet-green Swallow		MB	1, 5, 14, 17, 21, 22, 25, 26, 29, 32, 33, 38, 39
		Stelgidopteryx serripennis	Northern Rough-winged Swallow		MB	1, 5, 13, 14, 17, 22, 25, 28, 29, 32, 33, 38, 39
	§	*Riparia riparia*	Bank Swallow	ST, SGCN	T	17, needs validation
		Petrochelidon pyrrhonota	Cliff Swallow		MB	1, 5, 10, 13, 14, 17, 21, 22, 25, 26, 28, 29, 32, 33, 38, 39
		Hirundo rustica	Barn Swallow		MB	1, 5, 14, 17, 22, 25, 26, 29, 33, 38, 39
Paridae - Titmouse Family						
		Baeolophus inornatus	Oak Titmouse	BCC	R	1, 5, 13, 14, 17, 22, 25, 26, 28, 29, 32, 33, 38, 39
Aegithalidae - Bushtit Family						
		Psaltriparus minimus	Bushtit		R	1, 5, 10, 13, 14, 17, 21, 22, 25, 26, 28, 29, 32, 33, 38, 39
Sittidae - Nuthatch Family						
		Sitta carolinensis	White-breasted Nuthatch		R	26, 28, 29, 33, 38
Troglodytidae - Wren Family						
		Salpinctes obsoletus	Rock Wren		R	1, 5, 26, 29, 32, 33, 38, 39
		Catherpes mexicanus	Canyon Wren		T	32
		Troglodytes aedon	House Wren		R	1, 5, 10,13, 14, 17, 22, 25, 26, 28, 29, 32, 33, 38, 39
		Cistothorus palustris clarkae	Clark's Marsh Wren	CSC, SGCN	R	1, 5, 13, 14, 17, 28, 32, 38

*	§	Scientific Name	Common Name	Special Status	Res. Status	Source(s)
		Thryomanes bewickii	Bewick's Wren		R	1, 5, 10, 13, 14, 17, 21, 22, 25, 26, 28, 29, 32, 33, 38, 39
		Campylorhynchus brunneicapillus sandiegensis	Coastal (San Diego) Cactus Wren	CSC, PIF, MSHCP, BCC, SGCN	R	1, 5, 14, 17, 19, 21, 22, 25, 26, 28, 29, 33, 38, 39
Polioptilidae - Gnatcatcher Family						
		Polioptila caerulea	Blue-gray Gnatcatcher		M, MPB	1, 5, 14, 17, 22, 25, 26, 29, 32, 33, 38, 39
		Polioptila californica californica	Coastal California Gnatcatcher	FT, CSC, MSHCP, SGCN	R	1, 5, 10, 13, 14, 17, 19, 22, 25, 26, 28, 29, 32, 33, 38, 39
Regulidae - Kinglet Family						
		Regulus calendula	Ruby-crowned Kinglet		M	1, 5, 17, 22, 25, 29, 32, 33, 38
Sylviidae - Old World Warblers Family						
		Chamaea fasciata	Wrentit		R	1, 5, 10,13, 14, 17, 21, 22, 25, 26, 28, 29, 32, 33, 38, 39
Turdidae - Thrush Family						
		Sialia mexicana	Western Bluebird		R	1, 5, 14, 17, 21, 22, 25, 26, 32, 33, 38, 39
		Sialia currucoides	Mountain Bluebird		T	3, 22
		Catharus ustulatus	Swainson's Thrush		M	1, 6, 10, 13, 14, 17, 25, 38
		Catharus guttatus	Hermit Thrush		M	1, 5, 17, 21, 22, 26, 29
		Turdus migratorius	American Robin		T, W	1, 5, 17
Mimidae - Thrasher Family						
		Toxostoma redivivum	California Thrasher		R	1, 5, 10,13, 14, 17, 21, 22, 25, 26, 28, 29, 32, 33, 38, 39
		Mimus polyglottos	Northern Mockingbird		R	1, 5, 13, 14, 17, 21, 22, 25, 26, 28, 29, 32, 33, 38
Sturnidae - Starling Family						
*		*Sturnus vulgaris*	European Starling		R	1, 5, 14, 13, 17, 21, 22, 25, 26, 28, 29, 32, 33, 38, 39
Motacillidae - Pipit and Wagtail Family						
		Anthus rufescens	American Pipit		M	1, 5, 17
Bombycillidae - Waxwing Family						
		Bombycilla cedrorum	Cedar Waxwing		M	1, 5, 21, 22, 25
Ptilogonatidae - Silky-flycatcher Family						
		Phainopepla nitens	Phainopepla		MB	1, 5, 10, 13, 14, 17, 21, 22, 25, 26, 28, 29, 32, 33, 38, 39
Parulidae - Wood-Warbler Family						
		Parkesia sp.	Waterthrush		M	10, 13
		Mniotilta varia	Black-and-white Warbler		M	17
		Oreothypis celata	Orange-crowned Warbler		MB	5, 10, 13, 14, 17, 22, 25, 26, 28, 29, 32, 33, 38, 39
		Oreothypis ruficapilla	Nashville Warbler		M	14, 17, 21, 22, 32, 38

*	§	Scientific Name	Common Name	Special Status	Res. Status	Source(s)
		Geothlypis tolmiei	MacGillivray's Warbler		M	13, 14
		Geothlypis trichas	Common Yellowthroat		R	5, 10, 13, 14, 17, 21, 22, 25, 26, 28, 29, 32, 33, 38, 39
		Setophaga citrina	Hooded Warbler		M	10, 13
		Setophaga petechia	Yellow Warbler	CSC, BCC, SGCN	MB	10, 13, 14, 17, 19, 21, 22, 25, 26, 28, 29, 32, 33, 38, 39
		Setophaga coronata	Yellow-rumped Warbler		MW	5, 14, 17, 21, 22, 26, 28, 29, 32, 33, 38, 39
		Setophaga nigrescens	Black-throated Gray Warbler		M	14, 17, 28, 32, 38
		Setophaga townsendi	Townsend's Warbler		M	5, 10, 13, 14, 17, 25, 26, 28, 29, 32, 38
		Setophaga occidentalis	Hermit Warbler		M	14, 17, 25, 38
		Cardellina pusilla	Wilson's Warbler		M	5, 10, 13, 14, 17, 21, 22, 25, 26, 28, 29, 32, 33, 38, 39
		Icteria virens	Yellow-breasted Chat	CSC, MSHCP, SGCN	MB	5, 10, 14, 17, 13, 19, 21, 22, 25, 26, 28, 38, 39
Emberizidae - Sparrow Family						
		Pipilo maculatus	Spotted Towhee		R	5, 10, 13, 14, 17, 21, 22, 25, 26, 28, 29, 32, 33, 38, 39
		Aimophila ruficeps canescens	Southern California Rufous-crowned Sparrow	MSHCP	R	5, 10, 13, 14, 17, 21, 22, 25, 26, 28, 29, 32, 33, 38, 39
		Melozone crissalis	California Towhee		R	5, 10, 13, 14, 17, 21, 22, 25, 26, 28, 29, 32, 33, 38, 39
		Spizella passerina	Chipping Sparrow		T	14, 17
		Spizella breweri	Brewer's Sparrow	PIF	M	17
		Spizella atrogularis	Black-chinned Sparrow	PIF, BCC	MB	5, 22, 33
		Pooecetes gramineus	Vesper Sparrow		M	5, 26, 33, 39
		Chondestes grammacus	Lark Sparrow		R	5, 10, 13, 14, 17, 21, 22, 25, 26, 28, 29, 32, 33, 38, 39
		Artemisiospiza belli belli	Bell's Sage Sparrow	PIF, MSHCP	R	5, 10, 13, 17, 21, 22, 25, 26, 32
		Passerculus sandwichensis	Savannah Sparrow		M	5, 22, 26, 29, 33, 39
		Ammodramus savannarum	Grasshopper Sparrow	CSC, MSHCP, SGCN	R	5, 14, 17, 13, 21, 22, 25, 26, 29, 33, 28, 32, 38, 39
		Passerella iliaca	Fox Sparrow		M, W	5, 17, 22, 26
		Melospiza melodia	Song Sparrow		R	5, 10, 13, 14, 17, 21, 22, 25, 26, 28, 29, 32, 33, 38, 39
		Melospiza lincolnii	Lincoln's Sparrow		M	21, 22
		Melospiza georgiana	Swamp Sparrow		M	22
		Zonotrichia albicollis	White-throated Sparrow		M	14
		Zonotrichia querula	Harris's Sparrow		M	17
		Zonotrichia leucophrys	White-crowned Sparrow		M, W	5, 14, 21, 25, 22, 26, 28, 29, 32, 33, 38, 39
		Zonotrichia atricapilla	Golden-crowned Sparrow		M, W	14, 17, 22, 38,
		Junco hyemalis	Dark-eyed Junco		MB	5, 17, 22
Cardinalidae - Cardinals, Grosbeaks and Allies Family						
		Piranga ludoviciana	Western Tanager		M	5, 13, 14, 17, 28

*	§	Scientific Name	Common Name	Special Status	Res. Status	Source(s)
		Pheucticus melanocephalus	Black-headed Grosbeak		MB	5, 10, 13, 14, 17, 22, 25, 26, 28, 29, 32, 33, 38, 39
		Passerina caerulea	Blue Grosbeak		MB	5, 10, 13, 14, 17, 21, 22, 25, 26, 28, 29, 32, 33, 38, 39
		Passerina amoena	Lazuli Bunting		MB	5, 10, 13, 14, 17, 21, 22, 25, 26, 28, 29, 32, 33, 38, 39
		Passerina cyanea	Indigo Bunting		V	32
Icteridae - Blackbird, Cowbird and Oriole Family						
		Agelaius phoeniceus	Red-winged Blackbird		R	5, 10, 13, 14, 17, 21, 22, 25, 26, 28, 29, 32, 33, 38, 39
	§	*Agelaius tricolor*	Tricolored Blackbird	CSC, PIF, MSHCP, BCC, SGCN	T	17, 22
		Sturnella neglecta	Western Meadowlark		R	5, 10, 13, 14, 17, 21, 22, 25, 26, 28, 29, 32, 33, 38, 39
	§	*Xanthocephalus xanthocephalus*	Yellow-headed Blackbird	CSC, SGCN	T	17, 22
		Euphagus cyanocephalus	Brewer's Blackbird		R	14, 17, 21, 22
		Quiscalus mexicanus	Great-tailed Grackle		R	14, 21, 22, 25, 29, 38, 32, 33, 38, 39
*		*Molothrus ater*	Brown-headed Cowbird		MB	5, 13, 14, 17, 21, 22, 25, 26, 28, 29, 32, 33, 38, 39
		Icterus cucullatus	Hooded Oriole		MB	10, 13, 14, 17, 21, 22, 25, 26, 28, 29, 32, 33, 38
		Icterus bullockii	Bullock's Oriole		MB	5, 10, 13, 14, 17, 21, 22, 25, 26, 28, 29, 32, 33, 38, 39
		Icterus parisorum	Scott's Oriole		M	3
Fringillidae - Finch Family						
		Haemorhous mexicanus	House Finch		R	5, 10, 13, 14, 17, 21, 22, 25, 26, 28, 29, 32, 33, 38, 39
		Haemorhous purpureus	Purple Finch		T	17, 22, 32
		Carduelis psaltria	Lesser Goldfinch		R	5, 10, 13, 14, 17, 21, 22, 25, 26, 28, 29, 32, 33, 38, 39
		Carduelis lawrencei	Lawrence's Goldfinch	PIF, BCC	T	33
		Carduelis tristis	American Goldfinch		R	5, 13, 14, 17, 21, 22, 38
Passeridae - Old World Sparrow Family						
*		*Passer domesticus*	House Sparrow		R	5, 21, 22
Class Mammalia (Mammals)						
Didelphidae - Opossum Family						
*		*Didelphis virginiana*	Virginia Opossum			33, 99
Soricidae - Shrew Family						
		Sorex ornatus	Ornate Shrew			42
		Notiosorex crawfordi	Desert Shrew			needs source/ validation
Talpidae - Mole Family						
		Scapanus latimanus	Broad-footed Mole			needs source/ validation
Vespertilionidae - Vespertilionid Bat Family						
		Myotis californicus	California Myotis			43
		Myotis ciliolabrum	Small-footed Myotis			43

*	§	Scientific Name	Common Name	Special Status	Res. Status	Source(s)
		Myotis yumanensis	Yuma Myotis			1, 5, 43
		Lasiurus blossevillii	Western Red Bat	CSC		43
		Lasiurus cinereus	Hoary Bat			43
		Lasiurus xanthinus	Western Yellow Bat			43
		Parastrellus hesperus	Canyon Bat			43
		Eptesicus fuscus	Big Brown Bat			1, 5, 43
	§	*Antrozous pallidus*	Pallid Bat	CSC, MSHCP, SGCN		1, 5, needs validation
Molossidae - Molossid Bat Family						
		Tadarida brasiliensis	Brazilian Free-tailed Bat			1, 5, 43
		Nyctinomops femorosaccus	Pocketed Free-tailed Bat	CSC		43
		Eumops perotis	Western Mastiff Bat	CSC		1, 5, 43
Leporidae - Hare and Rabbit Family						
		Sylvilagus audubonii	Desert Cottontail			23, 25, 26, 28, 29, 32, 33, 38, 39
		Sylvilagus bachmani	Brush Rabbit			32
	§	*Lepus californicus bennettii*	San Diego Black-tailed Jackrabbit	CSC, MSHCP		26, 29, 33, 39
Sciuridae - Squirrel Family						
		Spermophilus beecheyi	California Ground Squirrel			25, 26, 28, 29, 32, 33, 38, 39
Geomyidae - Pocket Gopher Family						
		Thomomys bottae	Botta's Pocket Gopher			23, 26, 38, 39
Heteromyidae - Heteromyid Family						
	§	*Perognathus longimembris*	Little Pocket Mouse			needs source/ validation
		Chaetodipus californicus femoralis	Dulzura Pocket Mouse	CSC		2, 8, 31, 35, 40
	§	*Chaetodipus fallax fallax*	Northwestern San Diego Pocket Mouse	CSC		2, needs validation
		Dipodomys simulans	Dulzura Kangaroo Rat	SGCN		2, 8, 31, 35, 40
		Dipodomys stephensi	Stephens' Kangaroo Rat	FT, SE, MSHCP, SGCN		1, 2, 5, 8, 15, 23, 31, 35, 40
Castoridae - Beaver Family						
*		*Castor canadensis*	American Beaver			27, 38
Muridae - Mouse, Rat, and Vole Family						
		Reithrodontomys megalotis	Western Harvest Mouse			8, 23
	§	*Peromyscus boylii*	Brush Mouse			needs source/ validation
		Peromyscus eremicus	Cactus Mouse			8
		Peromyscus maniculatus	Deer Mouse			2, 8, 23, 31
	§	*Peromyscus truei*	Piñon Mouse			needs source/ validation
	§	*Onychomys torridus*	Southern Grasshopper Mouse	CSC, SGCN		needs source/ validation
		Neotoma fuscipes	Dusky-footed Woodrat			25, 38, 39
		Neotoma lepida intermedia	San Diego Desert Woodrat	CSC		25
*	§	*Rattus norvegicus*	Norway Rat			needs source/ validation
*	§	*Rattus rattus*	Black Rat			needs source/ validation
*	§	*Mus musculus*	House Mouse			needs source/ validation
	§	*Microtus californicus*	California Vole			needs source/ validation
Canidae - Canid Family						

*	§	Scientific Name	Common Name	Special Status	Res. Status	Source(s)
*		*Canis familiaris*	Domestic Dog			32
		Canis latrans	Coyote			1, 26, 28, 29, 31, 32, 33, 38
		Urocyon cinereoargenteus	Common Gray Fox			29
Procyonidae - Procyonid Family						
	§	*Bassariscus astutus*	Ringtail			needs source/ validation
		Procyon lotor	Northern Raccoon			33, 38
Mustelidae - Mustelid Family						
		Mustela frenata	Long-tailed Weasel			32, 33
	§	*Taxidea taxus*	American Badger	CSC, MSHCP, SGCN		30, 99
Mephitidae - Skunk Family						
	§	*Spilogale gracilis*	Western Spotted Skunk			needs source/ validation
		Mephitis mephitis	Striped Skunk			26, 28, 29, 39
Felidae - Cat Family						
*		*Felis catus*	Domestic Cat			37
	§	*Puma concolor*	Mountain Lion	MSHCP		1, 38, 39
		Lynx rufus	Bobcat			1, 25, 26, 28, 29, 32, 33, 38, 39
Equidae - Equid Family						
*		*Equus caballus*	Domestic Horse			29
Cervidae - Cervid Family						
		Odocoileus hemionus	Southern Mule Deer			25, 26, 28, 29, 32, 33, 38, 39
Bovidae - Bovid Family						
*		*Bos taurus*	Domestic Cattle			25, 26, 28, 29, 32, 33, 38, 39

Table K-2. Watch List of Animal Species Not Currently Known to Occur on Detachment Fallbrook.

*	§	Scientific Name	Common Name	Special Status	Notes
	§	*Streptocephalus woottoni*	Riverside Fairy Shrimp	FE, MSHCP, SGCN	2005, Stuart Mesa, 7.4 miles from Det Fallbrook, Additonal sighting in Lima training area 2009, Santa Rosa Plateau, 7.1 miles from Det Fallbrook
	§	*Branchinecta sandiegonensis*	San Diego Fairy Shrimp	FE, MSHCP, SGCN	2010, Range 409, MCBCP, 1.6 miles from Det Fallbrook
	§	*Lycaena hermes*	Hermes Copper	FC, MSHCP, SGCN	According to K. Osborne, was found once in Fallbrook but that record has never been duplicated. The he knows of are in the upper end of San Clemente Canyon at MCAS Miramar. There are likely other records farther north than MCAS Miramar but CNDDB does not track these sightings.
	§	*Euphydryas editha quino*	Quino Checkerspot Butterfly	FE, MSHCP, SGCN	1951 - Vista, 8.5 miles from Det Fallbrook
	§	*Euphyes vestris harbisonii*	Harbison's Dun Skipper	MSHCP	Reginally rare species found in oak woodlands. Host plant is San Diego sedge (*Carex spissa*)
	§	*Taricha torosa*	California Newt	CSC, MSHCP, SGCN	1999 - Roblar Creek, Camp Pendleton, 3.7 miles from Det Fallbrook boundary
	§	*Coccyzus americanus*	Yellow-billed Cuckoo, Western DPS	FE, SE, SGCN	2011 San Luis Rey River, Gird Road; Santa Margarita River, downstream on CPEN
*	§	*Agrilus auroguttatus*	Gold-spotted Oak Borer		
*	§	*Euwallacea* sp.	Polyphagous shot hole borer		
*	§	*Solenopsis invicta*	Red-imported Fire Ant		
*	§	*Sus scrofa*	Feral Pig		

LEGEND

* – Non-native or invasive species

§ – Detachment Fallbrook Watch List species. Additional information, such as photo and location, is desired. Watch list species generally include species of potential management interest and/or for which there is little data on Detachment Fallbrook. Species not currently known to occur on the installation are included (in a separate table) on the watch list to facilitate early detection. Federally listed threatened or endangered species are already part of a formal monitoring program, as well as many California Species of Special Concern that are recorded as incidental encounters during listed species surveys. Such species are only included as watch list species if their occurrence is rare and/or they are difficult to detect during formal surveys. (The arroyo toad is listed as a watch list species for its potential occurrence within upland habitats.)

Special Status:

Federal:

FE – Endangered
FT – Threatened
FC – Federal Candidate Species
PIF – DOD Partners in Flight Priority Species (May 2011)
BCC – Bird of Conservation Concern

State:

SE – Endangered
ST – Threatened
CSC – California Species of Special Concern
CFP – California Fully Protected Species
SGCN – Species of Greatest Conservation Need (CDFW 2015)
SGCN-CV – Species of Greatest Conservation Need, Climate Vulnerable (CDFW 2015)

Regional:

MSHCP – North County Multiple Species Conservation Plan Covered Species (February 2008)

Res. (Residency) Status:

R – Resident: species is present year-round and breeds on the Detachment.
RR – Rare Resident: is a resident to southern California but is only known to breed in a few locations in the County. Not confirmed breeding on the Detachment.
M – Migrant: species that is only detected as a migrant at the Detachment
MB – Migrant Breeder: species migrates to southern California to breed. Is only present on the Detachment in spring and summer.
MPB – Migrant, Potential Breeder: species migrates to southern California to breed. Has not been documented breeding at the Detachment but there is potential.
MW – Winter: present during the winter (migrant)
T – Transient: species breeds in San Diego County but no breeding habitat is present on the Detachment and thus the sighting is of a transitory individual.
RT – Rare Transient: is a known to occur in San Diego County but is a rare visitor to Detachment Fallbrook.
V – Vagrant: outside of normal range; unusual occurrence.
U – Unknown: not enough information known to determine current status

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APPENDIX L

SPECIES PROFILES

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Contents

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L.1 FEDERALLY LISTED SPECIES DETECTED ON DETACHMENT FALLBROOK

L.1.1 Southern California Steelhead (*Oncorhynchus mykiss*)

L.1.1.1 Description

Southern California steelhead (steelhead) have a complex suite of life history traits of salmonid species. Individuals may exhibit anadromy, meaning they migrate as juveniles from freshwater to the ocean, and then return to spawn in freshwater, or freshwater residency, meaning they reside their entire life in freshwater. Resident forms are usually referred to as "rainbow" or "redband" trout, while andronomous life forms are termed "steelhead". One obvious advantage to the andronomous form is increased fecundity (~3.5% more eggs) attributed to the larger size females obtain in marine environments compared to freshwater habitats; however, the increased mortality rate of andronomous (~10% greater in marine waters) compared to resident *O. mykiss* may negate this advantage, depending upon ecological conditions. (NMFS 2009)

Adults have variable coloration, and may range from silvery with faint dark spotting to dark dorsal coloration with a faded lateral red band and heavy spotting. They have an average size of 20 to 30 inches but can reach up to 45 inches in length and a mature steelhead can weigh as much as 55 pounds in weight but average around 8 to 9 pounds. (NMFS 2009)

L.1.1.2 Regional Distribution

Steelhead were historically distributed throughout the North Pacific Ocean from the Kamchatka Peninsula in Asia to the northern Baja California peninsula (NMFS 1999). Locally, steelhead were reported making runs in the San Mateo, San Onofre, and San Juan Creeks, and in the San Luis Rey and Tijuana Rivers of Orange and San Diego Counties by Hubbs in 1946 (McEwan & Jackson 1996). The species has also been introduced for food or sport in at least 45 countries, and on every continent except Antarctica. The Southern California Steelhead DPS encompasses any existing or potentially native *O. mykiss* populations in watersheds from the Santa Maria River (just north of Point Conception) south to the Tijuana River at the U.S. Mexico border (NMFS 2009).

Historically, steelhead were found in three drainages on MCB Camp Pendleton: San Mateo Creek, San Onofre Creek, and the Santa Margarita River. A long drought from 1948 to 1979 resulted in intolerable water temperatures and insufficient waterflows and is attributed to the virtual extirpation of steelhead on MCB Camp Pendleton (USFWS 1998a). In addition, during the 1950s there was: (1) increased water extraction which resulted in lower water levels and less habitat, increased in-river fishing pressure, and disease transfer; (2) predation following introduction of hatchery trout and predatory game fish; and (3) increased siltation resulting from fire and agricultural activities (USFWS 1998a).

L.1.1.3 Habitat Requirements

Steelhead typically migrate to marine waters after spending 2 years (range 1 to 3 years) in freshwater. Individuals then reside in marine waters typically for 2 or 3 years, prior to returning to their natal stream to spawn as 4- or 5-year-olds. Unlike other Pacific salmon, steelhead are iteroparous, capable of spawning more than once before they die. However, it is rare for steelhead to spawn more than twice before dying; most that do so are females. The maximum age is about 11 years. Winter-run steelhead typically spawn between November and April, and summer-run steelhead typically spawn between May and October. (NMFS 2009)

According to Warburton et al. (2000), holding and rearing habitat for the steelhead exists along the Santa Margarita River; however, spawning habitat is scarcer. Steelhead spawns in gravel beds in shallow waters between 15- 20cm deep, in cool water flows between 48-52 degrees F (Warburton et al. 2000).

L.1.1.4 Reproduction

Depending on water temperature, steelhead eggs may incubate for 1.5 to 4 months in "redds" (nesting gravels) before hatching as "alevins" (a larval life stage dependent on food stored in a yolk sac). Following yolk sac absorption, young juveniles or ''fry'' emerge from the gravel and begin actively feeding. Juveniles rear in freshwater from 1 to 3 years, and then migrate to the ocean as "smolts". (NMFS 1997, 2009)

L.1.1.5 Surveys and Status on Detachment Fallbrook

Prior to 2009, steelhead had not been documented within the Santa Margarita River in decades (e.g., Warburton et al. 2000). In the spring of 2009, three juvenile *O. mykiss* were captured (one each in March, April, and May) by hook and line in the Santa Margarita River mainstem just upstream of the De Luz Road Bridge in the community of Fallbrook. These specimens displayed physical characteristics consistent with the smolt phase of the species. Camp Pendleton requested a tissue sample from one of the captured individuals be analyzed by NOAA's Southwest Fisheries Science Center (NMFS 2010) to confirm genetic ancestry of the specimen. Genetic testing positively identified the Santa Margarita River *O. mykiss* tissue sample to be representative of steelhead ancestry with no indication of hatchery origin (NMFS 2010). This finding, along with documented observations of steelhead by biologists from agencies including California Department of Fish and Game and U.S. Forest Service, led NMFS to conclude that a population of endangered steelhead resides in the Santa Margarita River watershed (NMFS 2010).

During times of elevated river discharge (high flow conditions), the reach of the Santa Margarita River along Detachment Fallbrook likely serves as a migratory corridor both for adult steelhead transiting to/from the ocean to spawn in fresh water lakes and streams further upstream and for their offspring returning to the ocean to forage until maturity.

Focused surveys are not conducted for steelhead on Detachment Fallbrook. The aquatic exotics control program provides an excellent opportunity for detecting the presence of native fish species during low to moderate flow periods. However, exotic aquatic species removal is not conducted during high water flood events when river conditions would be dangerous for personnel, but more optimal for steelhead migration.

The species is also documented to have an intermittent presence within San Mateo Creek on MCB Camp Pendleton (USMC 2012).

L.1.2 Arroyo Toad (*Anaxyrus californicus*)

L.1.2.1 Description

The arroyo toad is a relatively small (5 to 8.1 cm), stocky, blunt-nosed toad with spotted greenish gray to tan warty skin (Stebbins 2003). The arroyo toad is one of three members of the southwestern toad complex (*Bufo microscaphus*) in the *Bufonidae* family. At the time it was federally listed as endangered in 1994 (59 FR 64859–64867), arroyo toad was considered a subspecies of southwestern toad (*B. m. californicus*). Based on recent genetic studies, arroyo toad is now considered a separate species (*B. californicus*) (Gergus 1998). Recent taxonomic work has divided the North American "*Bufo*" into the new genus *Anaxyrus* (Frost et al. 2006).

L.1.2.2 Regional Distribution

The arroyo toad is endemic to the coastal plains, mountains, and desert slopes of central and Southern California and northwestern Baja California from near sea level to about 8,000 feet (2,400 meters). In the 5-Year Review for the species, populations were reported to occur in the following counties: Monterey, San Luis Obispo, Santa Barbara, Ventura, Los Angeles, San Bernardino, Riverside, Orange, San Diego, and Imperial (USFWS 2009a). Since publication of the 5-year Review, the U.S. Geological Survey (USGS) determined from unpublished data that the putative arroyo toad populations in Imperial County are not valid records and, as a result, Imperial County is no longer considered a part of the species' distribution (R. Fisher, pers. comm. 2012). Arroyo toads are generally found in both perennial and intermittent rivers and streams with shallow, sandy to gravelly pools adjacent to sand or fine gravel terraces.

L.1.2.3 Habitat Requirements

General Habitat Requirements

The arroyo toad evolved in an ecological system that is inherently dynamic, with marked seasonal and annual fluctuations in rainfall and flooding. Breeding habitat requirements are highly specialized, and are the key factors when determining habitat suitability (Table L-1). Specifically, arroyo toad requires shallow, slow-moving stream and riparian habitats that are naturally disturbed on a regular basis, primarily by flooding (USFWS 2009a). In order for breeding populations to persist, the stream system must be large enough for regular channel scouring events to occur, but not so large that all sands and habitat structure are lost after floods (Sweet 1992). Factors that influence habitat suitability include stream order, elevation, and floodplain width (Sweet 1992). Stream orders range from one to six. The smallest channels with no tributaries are called first order streams. The confluence of two first order streams forms a second order stream, the confluence of two second order streams forms a third order, and so on. Fifth and sixth order streams are usually large rivers.

Looking at stream order, arroyo toads typically are found in the upper sections of third to sixth order streams that lack the finer silt and clay sediments but that are not dominated by larger cobble and coarse sands. Areas of sandy or friable (readily crumbled) soils are the most important habitat for the species, and these soils can be interspersed with gravel or cobble deposits (70 FR 19562–19633). It is in these areas that arroyo toads typically forage, aestivate, and reproduce (Table L-1). Breeding sites are typically located adjacent to sandy terraces (59 FR 64589–64867); at or near the edge of shallow pools, low-flow stream channels, and ox-bows; and along in-stream sand bars with minimal current (0 to 2 kilometers per hour) and little or no emergent vegetation. Upland non-breeding habitat used during aestivation (described below) includes sage scrub, grassland, mixed chaparral, oak woodland.

Table L-1. General Habitat Associations for Arroyo Toad

Land Cover Type	Land Cover Use	Habitat Designation	Habitat Parameters	Supporting Information
Aquatic	Breeding, larval/ juvenile development	Breeding	All life stages occur around breeding sites	Sweet 1992
Friable soils of upland terraces	Refugia	Foraging, aestivation	Juvenile and adult	

Breeding Habitat

Breeding habitat requirements are highly specialized. Specifically, arroyo toads require shallow, slow-moving stream and riparian habitats that are naturally disturbed on a regular basis, primarily by flooding. Streams and washes with sandy banks free of dense vegetation with mature willow

(*Salix spp.*) stands, cottonwoods (*Populus* spp.), western sycamore (*Platanus racemosa*), riparian habitats of semi-arid areas, and small cobble streambeds provide suitable habitat for the arroyo toad. In order for breeding populations to persist, the stream system must be large enough for regular channel scouring events to occur, but not so large that all sands and habitat structure are lost after floods (Sweet 1992). Factors that influence breeding habitat suitability include stream order, elevation, and floodplain width (Sweet 1992).

Areas of sandy or friable (readily crumbled) soils are important habitat for the species, and these soils can be interspersed with gravel or cobble deposits (USFWS 2005a). It is in these areas that arroyo toads typically forage, aestivate, and reproduce. Breeding sites are typically located adjacent to sandy terraces (USFWS 1994); at or near the edge of shallow pools, low-flow stream channels, and ox-bows; and along in-stream sand bars with minimal current (0 to 2 kilometers per hour) and little or no emergent vegetation.

Non-Breeding Habitat

Non-breeding habitat for arroyo toads is often referred to generally as "upland habitat", which may include a non-vegetated sandy terrace within the floodplain, riparian vegetation, and a range of upland (non-wetland/riparian) vegetation communities. For habitat mapping purposes and ease of distinction, we refer to "upland habitat" as being above (outside) the narrow floodplain of the river, an area of land adjacent to the river that stretches from the banks of the channel to the base of the enclosing walls of the valley. The sandy terraces and vegetated areas within the narrow floodplain, outside of the wetted channel, is referred to as "non-breeding river habitat".

Arroyo toads have been documented in a variety of upland habitats during the non-breeding component of their life cycle, including sage scrub, grassland, mixed chaparral, and oak woodland. A more detailed discussion of upland habitat use can be found in the Movement section below.

L.1.2.4 Behavior

Foraging

Larvae (tadpoles) are highly specialized feeders on loose organic material such as detritus, interstitial algae, bacteria, and diatoms (Sweet 1992). Subadult and adult arroyo toads are opportunistic feeders, foraging on immediately available prey located throughout both their breeding and upland habitats. Adults feed on a variety of invertebrates, including snails, Jerusalem crickets, beetles, ants, caterpillars, moths, and occasionally newly metamorphosed individuals. They usually feed at night (Zeiner et al. 1988). Juvenile and newly metamorphosed toads, which are mostly diurnal feeders for their first 4-5 weeks, feed mostly on ants and small flies, with larger juveniles eating a wider range of invertebrates (Cunningham 1962, Sweet 1992). Adult toads feed predominantly on ants, especially nocturnal, trail-forming tree ants (*Liometopum occidentale*). Ant foraging columns follow the same trails for many weeks, and most individual arroyo toads will return to the same site each night, consuming up to 25% of their body mass in 1–1.5 hours of feeding (Sweet 1992, 1993).

Reproduction

Arroyo toad breeding period occurs from late January or February to early July, although it can be extended in some years depending on weather conditions (USFWS 1999). Breeding at high elevation habitats may commence later (May–June) and last longer (to August) than in the coastal portion of the range. Breeding occurs in quiet, clear backwaters of streams as waters recede from the higher flows of the wet season. Adult males advertise at night with a soft, high-whistled trill from breeding habitat. Receptive females seek out calling males based on the size of the male and the sound of the call.

Although males may breed with several females in a season, females release their entire clutch of eggs in a single breeding effort and have not been documented to produce a second clutch during the season. Eggs are usually deposited in tangled strings of 1 or 2 rows, on the bottom of shallow pools with minimal current (0 to 2 kilometers per hour), little or no emergent vegetation, and sand or pea gravel substrate. The eggs are sensitive to siltation and require good water quality. Because the eggs are laid in very shallow water and are not anchored or attached, rapid changes in stream flow can wash them away or leave the eggs stranded to dry out. Embryos usually hatch in 4 to 6 days; the larval period lasts approximately 65 to 85 days. The tadpoles reach a maximum length of about 1.5 inches and are solitary and extremely cryptic, typically mottled or spotted with blackish to brown colors. After metamorphosis from June to August, the juveniles remain on the bordering gravel bars until the pools no longer persist. Sexual maturity is reached in 1 to 2 years.

Dormancy

Outside of the breeding season, arroyo toads burrow into the friable soils of upland terraces and are also known to seek temporary shelter under other debris or in mammal burrows (Table L-2) (Ramirez 2003). Arroyo toads are known to be active at all times of year, but may enter into a state of dormancy in their burrows during the non-breeding season, starting in the late summer from about August and extending to about January (Ramirez 2000, 2002a, 2002b, 2002c, 2003). Dormancy in arroyo toads is often referred to as aestivation, which is similar to hibernation to prevent dehydration during hot or dry times of the year. However, arroyo toads may also exhibit brumation, which is a type of dormancy in reptiles and amphibians in response to colder temperatures (and the decrease in daylight hours) in the late fall. Brumation differs from hibernation in the metabolic processes involved. For the purpose of this report, we generally assume the toads may exhibit one or both types of dormancy in any given year and do not distinguish between the two.

Table L-2. Key Seasonal Periods for Arroyo Toad

	Jan	Feb	March	April	May	June	July	Aug	Sep	Oct	Nov	Dec
Breeding	✓	✓	✓	✓	✓	✓	✓	✓				
Aestivation								✓	✓	✓	✓	✓
Source: Ramirez 2003												

Movement

The extent of perpendicular arroyo toad movements away from the stream channel is influenced by rainfall amounts, availability of surface water, width of streamside terraces and floodplains, vegetative cover, and topography (Griffin et al. 1999; Ramirez 2000, 2002a, 2002b, 2002c, 2003). Table L-3 provides a summary of movement distances. In broad, sandy floodplains, arroyo toad often move across parallel stream channels in search of suitable sites to lay eggs. In their study of arroyo toad movement patterns, Griffin et al. (1999) observed female arroyo toads using riparian and upland habitats an average maximum distance of 443 feet with a maximum of more than 984 feet perpendicular to streams, while males moved an average maximum distance of 240 feet from the streams. Within-stream movement was documented up to 492 feet. The study found that both male and female arroyo toads moved into upland habitats after completing individual breeding activity. Female arroyo toads become more sedentary as they mature, while males tend to move up and downstream fairly often during the breeding season (Sweet 1993). Holland (USFWS 1999) found that arroyo toads are capable of moving 0.5 to 2.0 kilometers into suitable adjacent habitats. In a study using pitfall traps, Holland and Sisk (2001) captured arroyo toads in upland habitats

averaging more than 980 and 1,640 feet from two coastal streams; one arroyo toad was captured 3,940 feet beyond the edge of the riparian habitat bordering the stream.

Table L-3. Movement Distances for Arroyo Toad

Type	Distance	Citation
Adult female upland dispersal	Average max 443 feet (max 984 feet)	Griffin 1999
Adult male upland dispersal	Average max 240 feet	Griffin 1999
Juvenile Dispersal	2,624-3,280 feet (0.8–1kilometer)	Sweet 1993
Upland aestivation	Average 52 feet from stream (max 1,062 feet)	Ramirez 2002a, 2002b, 2002c, 2003

An important factor to consider here is that in addition to lateral movement there are movements up slopes. In the model used to delineate the final critical habitat for the species it was determined that areas up to 25 m in elevation above the stream channel were most likely to contain the riparian and upland habitat elements essential to arroyo toads (USFWS 2011a). In areas where large floodplains exist the maximum distance was set at 1,500 m from the stream channel if the 82-foot elevation limit had not been reached. Four separate studies of inland populations by Ramirez (2002a, 2002b, 2002c, 2003) showed that arroyo toads burrowed no farther than 1,062 feet from the edge of a stream, with an overall average of approximately 52 feet between a burrow and the edge of the stream. The extent of movement away from the stream channel is influenced by climatic conditions, availability of surface water, floodplain width, vegetative cover, and topography (Griffin et al. 1999, Ramirez 2002a). Moderate, stable temperatures and high humidity facilitate longer-distance movements into upland habitats (USFWS 1999). Juvenile arroyo toads disperse away from their natal pools about 1 year after metamorphosis (Sweet 1993).

Although arroyo toads usually enter aestivation during the non-breeding season (August–January), they are known to be active during all times of the year during rainfall events and moderate temperatures (above 7°C (45°F)). All age classes of post-metamorphic toads may be active on rainy nights and on some nights of very high relative humidity (USFWS 1999).

L.1.2.4 Surveys and Status at Detachment Fallbrook

Surveys

On Detachment Fallbrook the arroyo toad is found only along the Santa Margarita River and all life forms have been detected. No streams or drainages within the interior of the installation have been found either incidentally or during formal herpetological surveys to harbor this species (see Appendix M for list of general herpetological surveys). Detachment Fallbrook has performed numerous surveys and studies for arroyo toads along the Santa Margarita River (Appendix M).

Population Numbers

For surveys conducted in 2001, the breeding surveys resulted in detections of two advertising males, two developing egg masses, and four larval masses were observed and the upland surveys resulted in detections of 29 arroyo toads. For surveys conducted in 2002, 14 male arroyo toads, three arroyo toad pair in amplexus, and two adult females and three larval masses and the upland surveys resulted in detections of 38 arroyo toads. For surveys conducted in 2003, a range of 41 to 74 arroyo toads were detected. For the 2006-2008 upland survey, eight toads were observed. For the 2010 surveys, all life stages of arroyo toad were detected, approximately 40 adults, 300 juveniles and 31 potential breeding pools.

Habitat Suitability

In 2010/2011, the majority of the River Habitat (the low flow channel of the river and its narrow floodplain, extending to the base of the valley walls) was characterized as either having suitable breeding or suitable non-breeding habitat. The primary factors inhibiting suitability were extremely heavily vegetated areas or areas where water velocity was too rapid, pools were too deep or were heavily occupied by bullfrogs, and/or the channel substrate was predominantly boulders or cobble. During the course of the survey season, many areas that initially appeared to have water levels that were too deep, or lacked exposed sands would later be included as suitable breeding habitat as water levels dropped. The steep topography on either side of the river creates a very narrow floodplain within this stretch of the SMR, so that the availability of lower gradient, potentially suitable non-breeding ("upland") habitat is limited, close to the river, and within the floodplain.

The majority of the Upland Habitat outside of the narrow floodplain along the Detachment Fallbrook boundary does not appear provide suitable habitat for arroyo toads, due predominantly to the steep topography of the river valley. One suitable movement corridor was identified in 2010 near River Road (and was identified in the model). This site was found to have the potential to support upland foraging or aestivating arroyo toads; however, limited signs of arroyo toad breeding were detected within the stretch of river adjacent to this movement corridor in 2010 and no toads were detected using the corridor. Two isolated suitable upland habitat areas were identified in 2010. These areas were suitable; however, they are considered isolated as steep slopes prevent toads from moving too far outside the flood plain. Three unsuitable corridors were identified in 2010 and these areas were not suitable due to the lack of sandy soils and presence of dense vegetation. The barriers (excessive slope) identified in the model were corroborated during the 2010 survey.

Predictive Model

In 2006, a predictive model of arroyo toad distribution at Detachment Fallbrook was developed. Detailed documentation of the development of the Varanus model for potential arroyo toad habitat suitability and use (distribution and density) on Detachment Fallbrook is lacking. Originally produced in 2001 by Varanus (2004a), a draft version appears to have been included in the WFMP (USDON 2003a) and a later revision in the INRMP (USDON 2006). All versions appear to have been modified in collaboration with W.E. Haas (Varanus Monitoring Services). Reference to the "Varanus model" or the "predictive model" in this discussion implies the most recent (USDON 2006) version, unless otherwise indicated.

The foundation of the model originated with the 2001 habitat suitability mapping, predominantly within the "riparian zone", of the Santa Margarita River by Varanus (2004a). A suite of factors associated with the ecology and behavior of the arroyo toad were considered during the suitability mapping. Suitable habitat was classified into five categories, ranging from "highest" to "very low" quality; however, the distinction between the categories was not defined. Unsuitable habitat was depicted on the map (Figure 9 in Varanus 2004a) by steep slopes (>25%) and "dense chaparral". Prior to finalization of Varanus (2004a), an apparent draft version of the model with six habitat suitability categories was included in the WFMP (USDON 2003a). Table 2-15 in the WFMP (USDON 2003a) provided ecological factors associated with the six habitat suitability categories; however, the suitability categories do not appear to be mutually exclusive nor are they consistent with the unsuitable classification of habitat (e.g., slopes above 25% appear to be both "unsuitable" as well as "suitable" at Low, Very Low, or Trace levels).

The revised version of the Varanus model presented in the 2006 INRMP is described as a "mosaic of empirically derived survey data in the riparian zone with model predictions for the distribution of arroyo toads into movement corridors and onto uplands" (p. 3-106; USDON 2006). The Varanus model presented replaced habitat suitability categories with arroyo toad density categories. The

2006 INRMP version of the Varanus model also refers to "potential upland movement corridors" (slopes of 15-30%) and "movement barriers" (slopes >30%), and no longer depicted dense chaparral as unsuitable habitat. The purpose of this revised model was to predict the "dispersion density" of arroyo toads on Detachment Fallbrook, starting from areas of presumed high population density (e.g., high suitability breeding pools) into areas of presumed low population density (lower suitability upland habitat) (USDON 2006).

Other than the initial habitat suitability mapping (Varanus 2004a), the Varanus model was largely a Geographic Information System (GIS) exercise with slope and distance from potential breeding habitat being the primary factors considered in model development. Soil type was not factored into the model because of the high degree of similarity in sand content across the area of interest. Accessibility based on vegetation density was also not incorporated into the model because it was thought that these factors would be subject to high temporal variability. Overall, the model predicts arroyo toad movement, barriers to movement, and toad density on Detachment Fallbrook. This model, however, has never been validated or rigorously tested in the field. The value of the model has therefore been limited.

In 2010, the 2006 model was reviewed by Brad Hollingsworth of the San Diego Natural History Museum (ICF and BEC 2013). His conclusions were that the lack of both arroyo toad observation point data and the lack of knowledge on the source of the geographical slope layer used for the model make the Varanus model difficult to evaluate. Additional data are needed to assess how these values and their distributional polygons were created. Based on the available reports and the presence/absence surveys conducted, it is not evident how population densities were determined. Surveys from 2001-2003 were conducted without mark and recapture procedures, which are used to develop population density models. It is not understood how toad densities were calculated per given area since the observation data collected is not suited for calculating density estimations. As such, the Varanus model is not a true (statistical) predictive model based on the correlation of empirically derived toad encounters with environmental variables and cannot be used for the purpose of predicting the density of a population over the landscape. The mark and recapture program conducted from 2006 to 2008 (Bloom et al. 2010) did not produce useable numbers (e.g., low sample size, lost transmitters) for a statistical analysis of upland use.

Based on information provided in 2001-2003 survey reports, the WFMP (USDON 2003a), and the INRMP (USDON 2006), the development of the Varanus model combined the 2001 habitat suitability map with two reasonable environmental parameters (slope and distance from breeding habitat) to predict where toads should occur and how dense those toad populations will be. No indication is given in the GIS system evaluated that any geostatical spatial analysis was conducted to derive density estimates, but instead, appears to have relied on an informal expert-based predictive model or evaluation.

Despite the lack of documentation and apparent subjectivity in model development, the accumulation of historical field survey data and the 2010-11 seasons suggest that the Varanus model has merit at least with respect to the general depiction of barriers to toad movement into upland habitats on Detachment Fallbrook. Arroyo toad presence in predicted potential movement corridors has not been corroborated except at the River Road site. At the River Road site, the Varanus model may be a reasonable predictor of presence, but not necessarily density, of toads depending on vegetation conditions. Within the potential movement corridors downstream of the River Road site, it is possible the Varanus model could be applicable as the model was intended to accommodate possible future changes in vegetation; however, when considering the USFWS model (USFWS 2011a), arroyos toads would not be expected to occur more than 900 feet from the floodplain within the two potential corridors regardless of vegetative conditions.

L.1.3 California Least Tern (*Sternula antillarum*)

L.1.3.1 Description

Least terns are the smallest members of North American terns (family - Laridae, subfamily - Sterninae), measuring about 22.9 cm long with a 50.8 cm wingspan. The least tern has a distinctive black cap and loral (space between the eyes and bill) stripe contrasting a white forehead. The remaining upperparts are gray with white underparts. In flight, a black wedge on the outer primaries is prominent, as well as the short, deeply-forked tail. It has a dark-tipped, orange-yellow bill and orange-yellow legs. The sexes are similar except the loral stripe is wider in the male. (USFWS 1985)

L.1.3.2 Regional Distribution

The California least tern is a migratory bird that historically nested in large beach colonies along the coastline from southern Baja, Mexico to coastal central California. Over time, California least tern nesting habitat has been drastically reduced as a result of regional urbanization. Nesting is currently limited to San Francisco Bay and areas along the coast from San Luis Obispo County to San Diego County. Migration routes and wintering range for the California least tern are not well known; it is thought that this species winters along the Pacific Coast of Central America. (USFWS 2006a)

L.1.3.3 Habitat Requirements

The California least tern breeding and foraging habitat is generally on the beaches, bays, estuaries, and lagoons of the coast. Favored nesting habitat for the least tern includes wide, sparsely vegetated beaches which are also prized for human recreation and residential development. Habitat for the species is also altered by water diversions.

L.1.3.4 Behavior

Foraging

The California least tern hunts primarily in shallow estuaries and lagoons, or beyond the breakers, even beyond 24 km offshore in areas of upwelling, and where smaller fishes are abundant. They hover until spotting prey, and then plunge into the water without full submersion to extract prey. In the bays and lagoons of Southern California and northern Mexico, the favored prey include anchovy, smelt, silversides, shiner surfperch and small crustaceans. The terns often feed near shore in the open ocean, especially in proximity to lagoons or bay mouths (Baird 2010). Adults do not require cover, so they commonly roost on the open ground. After young chicks are three days old, they are brooded less frequently by parents and require wind blocks and shade. Notable disruption of colonies can occur from predation by burrowing owls, Peregrine falcons, Cooper hawk, and American kestrels (Collins & Bailey 1980).

Reproduction

California least tern nesting typically occurs between 1 March and 15 September in southern California. Courtship typically takes place removed from the nesting colony site, usually on an exposed tidal flat or beach. Only after courtship has confirmed mate selection does nesting begin by mid-May and is usually complete by mid-June. Nests are situated on barren to sparsely vegetated places near water, normally on sandy or gravelly substrates. In the San Francisco Bay region, breeding typically takes place on abandoned salt flats. Where the surface is hard, this species may use an artificial indentation (such as a deep dried footprint) to form the nest basin. The

breeding colonies are not dense and may appear along marine or estuarine shores in areas free from humans or predators. The nest density may be as low as several per acre, but in San Diego County, densities of 200 nests per acre have been observed. Most commonly the clutch size is two or three, but it is not rare to consist of either one or four eggs. Both female and male incubate the eggs for a period of about three weeks, and both parents tend the semi-precocial young. Young birds can fly at age four weeks. After formation of the new families, groupings of birds may appear at lacustrine settings in proximity to the coast. Late season nesting may result from renests or late season arrival. In any case, the bulk of the population has left California by the end of August.

L.1.3.5 Surveys and Status on Detachment Fallbrook

No surveys are conducted for California least terns on Detachment Fallbrook as there is no breeding habitat, and limited foraging habitat, on the installation. During surveys for other species, California least terns have occasionally been seen circling over Depot Lake and Lower Lake. These terns may be juveniles or dispersing individuals. It is unknown if they successfully forage in the lakes and ponds but they appear to potentially provide some type of foraging habitat for the species.

L.1.4 Southwestern Willow Flycatcher (*Empidonax traillii extimus*)

L.1.4.1 Description

The southwestern willow flycatcher is a small (15 cm, 11–14 g), Neotropical migratory bird. It has a grayish-green back and wings, whitish throat, light grey-olive breast, and pale yellowish belly. Two parallel wingbars are visible and the eye-ring is faint or absent. The upper mandible is dark and the lower is light with a yellowish or orange tone. The southwestern willow flycatcher is one species in a group of closely related songbirds of the genus *Empidonax* that are very difficult to distinguish by visual characteristics alone. Their distinctive “fitzbew” call identifies them from similar species.

This species is a breeding migrant and in San Diego County, only those individuals exhibiting territorial behavior outside of the migration period (i.e., after June 21) or individuals for which breeding is confirmed, are definitively considered southwestern willow flycatchers (Unitt 2004). Their migration routes and wintering range is not well known; it is thought that this species winters in Mexico, Central America, and perhaps northern South America (Sogge et al. 2010).

L.1.4.2 Regional Distribution

The historical breeding range of the southwestern willow flycatcher included: southern California, southern Nevada, southern Utah, Arizona, New Mexico, western Texas, southwestern Colorado, and extreme northwestern Mexico (Sogge et al. 2010). The flycatcher’s current range is similar to its historical range, but the quantity of suitable habitat within that range is much reduced from historical levels. The flycatcher occurs from near sea level to over 2,600 m (Sogge et al. 2010). Historically, the southwestern willow flycatcher was common in all lower elevation riparian areas of the southern third of California, including the Los Angeles basin, the San Bernardino/Riverside area, and San Diego County (Sogge et al. 2010). Drainage systems where the flycatcher persists include: the Colorado, Owens, Kern, Mojave, Santa Ana, Santa Margarita, San Luis Rey, San Diego, Santa Clara, Santa Ynez, Sweetwater and San Dieguito rivers; the Temecula, Pilgrim, and San Mateo creeks; and the San Timoteo wash (USFWS 2002a).

L.1.4.3 Habitat Requirements

Nesting southwestern willow flycatchers prefer willow (*Salix* spp.), mule fat (*Baccharis salicifolia*), boxelder (*Acer negundo*), stinging nettle (*Urtica* spp.), blackberry (*Rubus* spp.), cottonwood, arrowweed (*Pluchea sericea*), tamarisk (*Tamarix ramosissima*), and Russian olive (*Eleagnus angustifolia*) (USFWS 2002a). They invariably nest in riparian ecosystems in the arid southwestern U.S. and possibly extreme northwest Mexico. These riparian habitats are associated with rivers, swamps, and other wetlands, including lakes and reservoirs. Most of these habitats are legally classified as wetlands: palustrine and lacustrine forested wetlands and scrub-shrub wetlands; however, some are non-wetland riparian forests. Surface water or saturated soil are typically, but not always, present year-round or seasonally, and ground water is generally at a depth of less than 2 or 3 m within or adjacent to nesting habitat (USFWS 2002a). Territory size tends to be larger when a male first arrives, then gets smaller after a female pairs with the male (Sogge et al. 2010). Studies have reported estimated territory sizes ranging from 0.06 to 2.3 ha (Sogge et al. 2010).

L.1.4.4 Behavior

The southwestern willow flycatcher may arrive in breeding habitat as early as March and may be present until September. The male tend to arrive before the females (Sogge et al. 2010). Although the Willow Flycatcher as a species is considered predominantly monogamous during the breeding season (Sedgwick 2000), some Southwestern Willow Flycatcher populations have a relatively high degree of polygyny whereby one male can have more than one breeding female in its territory. Polygynous males generally have two females in their territory, but up to four have been recorded (Sogge et al. 2010).

Nest building within the territory usually begins within one week of pairing (Unitt 2004). Egg laying can begin as early as mid-May, but more often starts in late May to mid-June with the older bird breeding first (Unitt 2004). Young typically fledge from nests from mid-June through mid-August and breeding adults generally depart from their territories in early to mid-August (Sogge et al. 2010).

They build open cup nests that are attached at the top to slender stems or twigs and are often built over water (Unitt 2004). Females build the nest with little or no assistance from the males. Nests typically are placed in the fork of a branch with the nest cup supported by several small-diameter vertical stems. Nest height is highly variable and ranges from 0.6 m to approximately 20 m above ground (Sogge et al. 2010). Clutch size is usually three or four eggs for first nests and only the female incubates the eggs (Sogge et al. 2010). Incubation lasts 12–13 days from the date the last egg is laid, and all eggs typically hatch within 24–48 hours of each other. Flycatcher chicks are altricial and are ready to leave the nest at 12–15 days of age (Sogge et al. 2010). The female provides most or all initial care of the young, although the role of the male increases with the age and size of nestlings. The chicks fledge at 12–15 days of age and adults continue feeding the fledged young for approximately 2 weeks (Sogge et al. 2010).

L.1.4.5 Surveys and Status on Detachment Fallbrook

Due to the very rare occurrence of the southwestern willow flycatcher on Detachment Fallbrook, focused surveys for this species are not conducted; however, this species is surveyed for during the least Bell's vireo surveys (Section L.1.5). All biologists who conduct surveys for vireo are required to know the vocalizations of the willow flycatcher and any sighting is required to be re-visited to determine if this is a breeding location.

Southwestern willow flycatchers have not been confirmed on Detachment Fallbrook during any survey effort; however, willow flycatchers of undetermined subspecies have been observed and it

is presumed that southwester willow flycatchers disperse and migrate through suitable habitat on the Detachment (Section L.1.5, Map L-1). Historically, six observations of willow flycatchers of unknown subspecies have been documented between 25 June and 17 July, the time period when confirmation as the southwestern subspecies can occur; one each in 1997, 2000, and 2001, and two in 2002 (Chapter 3, Map 3-8) (T. Burr pers. comm., Unitt & Haas 2002). Four individuals were captured and banded in May 2002 and one individual was observed in May 2011 (Jones & Stokes 2008, ICF 2013). None of the observations were of breeding pairs and as such, confirmation as the southwestern subspecies was not possible.

As there have been sightings of willow flycatchers of unknown subspecies, and the southwestern willow flycatcher (endangered subspecies) is known to breed on the adjacent MCB Camp Pendleton, this species is discussed in this section as there is potential for it to occur as a breeding resident in the future.

L.1.5 Least Bell's Vireo (*Vireo bellii pusillus*)

L.1.5.1 Description

The least Bell's vireo is a small (12 cm, 10 g), Neotropical songbird that is a summer migrant that breeds at Detachment Fallbrook. There are four subspecies of Bell's vireo (*Vireo bellii*) and the westernmost subspecies, least Bell's vireo (*V.b. pusillus*), is found breeding within California and northern Baja California, Mexico. This species winters in southern Baja California, Mexico (Kus 2002).

They have short rounded wings, short straight bills, and a faint white eye-ring. Least Bell's vireo feathers are mostly gray above and pale below; seen from below the bird blends into the clouds, and from above, they blend into the land-cover (USFWS 1986).

L.1.5.2 Distribution

Historically, least Bell's vireo was a common to locally abundant species in lowland riparian habitats from northern California to coastal southern California. Loss of riparian habitats and the effects of brown-headed cowbird parasitism led to a decline in the population (USFWS 1986, Kus et al. 2010). The population was estimated at 300 pairs in 1986 when it was listed by the USFWS. Currently the population largely extends from central Baja California to southern California with the majority found in San Diego County. The northernmost recent sighting occurring in Gilroy in 1997 (Robertson et al. 1997, Kus 2002) and the northernmost successful breeding by a pair occurred in the Central Valley (Stanislaus County) in 2006 (Wood et al. 2006). In 1998, the least Bell's vireo population was estimated at 2,000 pairs (Kus 2002), and the 2006 USFWS five-year review estimated that numbers had increased tenfold since listing (USFWS 2006b).

L.1.5.3 Habitat Requirements

Vireos primarily inhabit dense willow-dominated riparian habitats with lush understory vegetation. A diverse canopy height is typically required for foraging, with willows often dominating the canopy layer (Salata 1983). In southern California, least Bell's vireo nest sites were most frequently located in riparian stands between 5 and 10 years old (SANDAG & RECON 1990). Based on rigorous statistical analysis of least Bell's vireo habitat structure and composition, this species appears to preferentially select sites with large amounts of shrub and tree cover, a large degree of vertical stratification, and small amounts of aquatic and herbaceous cover (SANDAG & RECON 1990). Home ranges of vireos in the Santa Margarita River habitat varied from 0.5 acres to 7.5 (Kus 2002).

L.1.5.4 Breeding

Least Bell's vireos usually arrive on their breeding grounds from mid- to late March and may begin to depart by late July; most have left by September, with birds occasionally remaining until late September or even early October (Kus 2002). The males tend to arrive first and establish territories with the females arriving within a few days. Site fidelity is high among adult least Bell's vireos, with many birds returning to the same territory each year and even using the same shrub as previous years (Greaves 1987, Kus 2002, Kus et al. 2010).

The Least Bell's vireo builds an open-cup nest typically out of pieces of bark, fine grasses, plant down, and mammal hair. Nests are often placed on a slender branch of a small tree or shrub typically 1 m above the ground (Kus 2002). Peak egg laying is April into early July; clutch size averages 3 to 4 eggs and the incubation period is typically 14 days, shared by both sexes (Kus 2002). Both sexes care for altricial young, which usually fledge 11-12 days after hatching (Kus 2002). Fledglings are cared for by adults for at least two weeks after leaving the nest (Kus 2002).

L.1.5.5 Surveys and Status on Detachment Fallbrook

Least Bell's vireos are known to regularly occur in and breed along the Santa Margarita River with fewer breeding individuals at Depot Lake, along Fallbrook Creek, and along the southeastern boundary of the installation with Fallbrook (Map L-1). There have been several sightings of transitory vireos along other riparian stretches on the installation.

Surveys and Monitoring

Surveys for the least Bell's vireo on Detachment Fallbrook, with a brief description of the type and extent of the effort (e.g., point counts versus directed searches; station-wide versus interior drainages), are listed in Appendix M. From 1993 to 2002, least Bell's vireos were surveyed at up to 30 annual point count stations throughout the interior of the Detachment (Burr 2002, Unitt and Haas 2002). Although the point count stations were generally at permanent locations, of the 25 stations established in 1993, one station (#A2) was moved in 1996 (becoming #A3) and five more stations (#s D4, DLB1, DLB4A, E1A, and F1) were added in subsequent years (Burr 2002, Unitt and Haas 2002). These point counts did not track the number of least Bell's vireo individuals nor did they distinguish between breeding vireos and migrant/transient vireos. In 2002, stationwide directed surveys for least Bell's vireos were conducted in addition to point count surveys, at which time three pairs were identified in the interior and ten pairs along the Santa Margarita River (Unitt and Haas 2002). Subsequent to 2002, only directed search methods were used to survey the least Bell's vireo on the installation. In 2003 and 2004, least Bell's vireo surveys were conducted by Varanus on the interior of the Detachment (Varanus 2003, Varanus 2004b), and no vireo surveys were conducted in 2005 and 2006.

Stationwide surveys were conducted in both 2007 and 2008. The 2007 survey was conducted as part of a breeding site fidelity and juvenile dispersal study (Niemela & Bloom 2009). Breeding site fidelity in least Bell's vireo is thought to be strong (Pike & Hays 2000). With relatively few vireos nesting within the interior of the Detachment, understanding site fidelity could provide insight into how the population utilizes the habitat on the installation. Data from the 1993-2001 point count stations suggest that no single territory was used consistently in the 10 years of point counts (Burr 2002). Unfortunately, in 2007, no least Bell's vireos were detected breeding on the interior of the Detachment; therefore, all 35 banded birds (23 adult males, 3 adult females, and 9 juveniles) of that year were from along the Santa Margarita River (Niemela & Bloom 2009).

In 2008, the installation-wide 5-year protocol survey was conducted by TDI (2013) for the dual purpose of fulfilling the nondiscretionary requirements of the WFMP BO and to follow-up on the 2007 banded birds. Five vireos banded in 2007 were detected again in 2008. All were along the

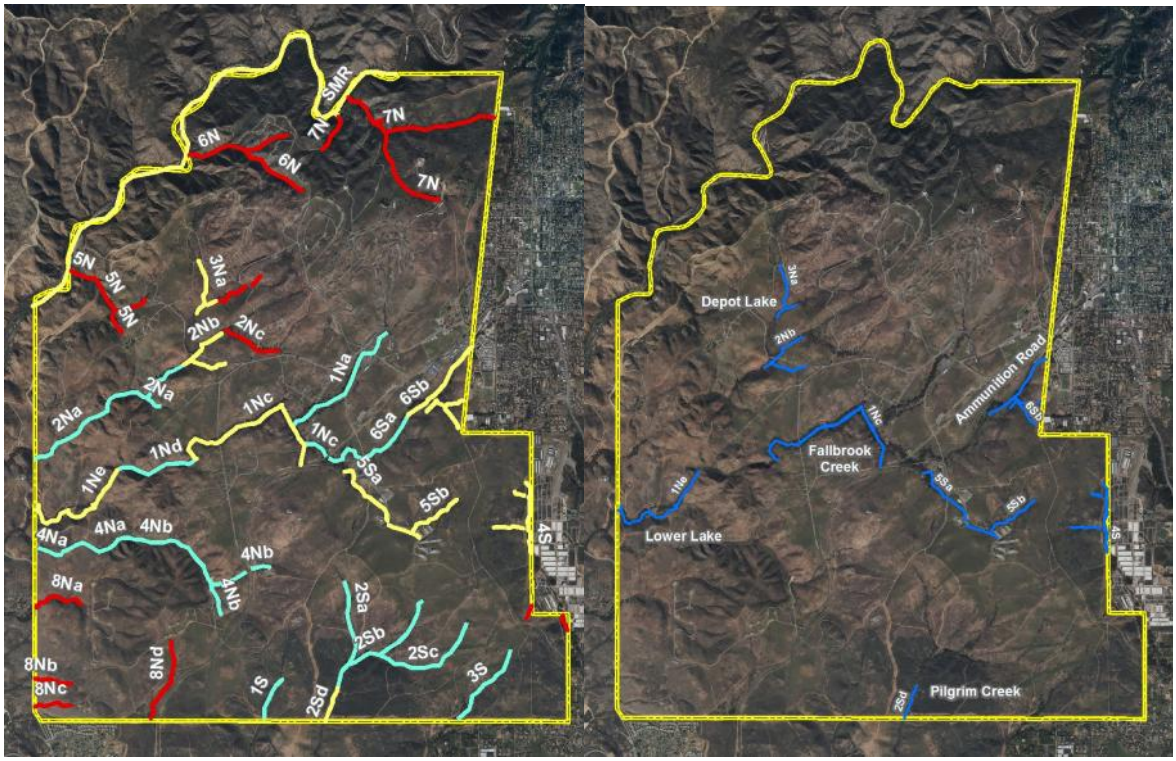
Santa Margarita river except one, an adult male was observed as part of a pair at Depot Lake (survey segment 2Nb) (TDI 2013). That same male was again observed within the same territory in 2009 (Niemela et al. 2012). A separate male vireo that had been banded as a nestling in the Santa Margarita River in July 2007 was observed on 14 May 2008 by John Martin (USFWS) on the San Diego National Wildlife Refuge (C.M. Wolf, pers. com.). Conversely, a female vireo that was banded as a fledgling on the San Diego River in 2011 was part of a breeding pair within the interior of the Detachment (segment 1Nc) in 2012 (ICF 2014).

For the 2008 survey effort, a Detachment-specific protocol was developed by the Conservation Program Manager, Christy M. Wolf, to ensure conformance with the WFMP BO and to standardize the methods for the 5-year stationwide survey and annual abbreviated surveys that focus on interior drainages with the highest potential to support the species (USDON 2014). The protocol incorporated recommendations in Niemela and Bloom (2008) and input provided by Peter Beck of the U.S. Fish and Wildlife Service. The protocol follows a tiered approach of directed searches along pre-determined drainages with a higher number of survey passes for areas with a greater quality and quantity of suitable habitat. Map L-1 illustrates drainages covered and number of passes each for the 5-year and annual protocols.

Although the Detachment-specific protocol for monitoring least Bell's vireo is periodically updated (it is cited with the revision date), the intent of the protocol is to standardize data collection and maintain comparability through time. Therefore, key elements of the protocol have not changed after the first couple of years of implementation when the methods were being refined. Since the implementation of the 5-year and annual survey protocols, the usage of the installation by the least Bell's vireo has been better documented (e.g., distribution, location of territories, number of pairs) and allows for a more robust comparison of the population over time (Appendix M).

Monitoring surveys have found that cowbird parasitism of least Bell's vireos occurs, but is not exceptionally common on Detachment Fallbrook. Direct evidence of parasitism on least Bell's vireos has been documented during annual surveys (e.g., in 2001, 2007, 2011, and 2012).

The 2003 WFMP BO (USFWS 2003) addressed the need to monitor cowbird parasitism on Detachment Fallbrook in response to the presence of cattle as a method to reduce the fuel load and the cowbirds propensity be attracted to cattle and other domesticated livestock. Cowbirds tend to be attracted to feedlots or areas with large numbers of domesticated livestock in a confined area as they provide a food source. In the non-breeding season, cowbirds will gather in these areas, sometimes in very large numbers then during the breeding season, they move out into the riparian habitat looking for host nests to parasitize (Shaffer et al. 2003, K. Fischer, personal observation). Grazing on Detachment Fallbrook is not similar to these areas as the animals are not forced to concentrate in one area (a fenced cattle pen or feedlot) for any length of time. The animals do tend to gather in riparian drainages for water and shade but they move around and are more nomadic than animals found at a dairy or other confined area. On Detachment Fallbrook, the cattle don't serve as an attractant for cowbirds. The cowbirds observed on Detachment Fallbrook are most likely following the riparian stream courses looking for host nests to parasitize.



Map L-1. Drainage segments and number of survey passes for the 5-year stationwide (left) and abbreviated annual (right) least Bell's vireo surveys at Detachment Fallbrook.

Results – Stationwide and Annual Abbreviated Surveys

Historical surveys have identified anywhere from four to seven breeding pairs on Detachment Fallbrook's interior (non-Santa Margarita River) drainages (Table L-4). These surveys have also documented the presence of transient vireos in these interior drainages. The survey results show that the highest number of breeding pairs in the interior drainages was found in 2010. Future surveys completed using the same protocol will reveal if this is an anomaly. For the Santa Margarita River, data has been patchy and does not give a complete picture. It is obvious given the numbers detected during Station-wide surveys that the river supports a large population of vireos (Table L-4).

Table L-4. Comparison of Historical Number of Least Bell's Vireos within Drainages on Detachment Fallbrook

Year	Number of Vireos by Drainage [b] # Pairs (# Transient/Unknown)																	
	1N	**2N**	**3N**	**4N**	**5N**	**6N**	**7N**	**8N**	**1S**	**2S**	**3S**	**4S**	**Near 4S**	**5S**	**6S**	**Interior Subtotal**	**SMR**	**Total**
1993 to 2002	10/10 yrs	4/10 yrs	3/10 yrs	3 yrs	-	-	-	-	-	0/7 yrs	-	-	-	6/10 yrs	-	**-**	-	**-**
2000	0 (0)	0 (1)	0 (1)	-	-	-	-	-	-	0 (0)								
2002	1 (7)	-	0 (0)	-	-	-	-	-	-	0 (0)	-	1 (0)	-	1 (2)	-	**3 (9)**	10 (0)	**13 (9)**
2003	3D	-	0 (0)	-	-	-	-	-	-	0 (0)	-	1D	-	0 (0)	-	**4 (0)**	-	**4 (0)**
2004	2 (2)	1 (0)	1 (0)	-	-	-	-	-	-	-	-	1 (0)	-	-	1 (0)	**6 (2)**	-	**6 (2)**
2007	0 (1)	1 (1)	0 (0)	-	-	-	0 (0)	-	-	0 (1)	0 (1)	-	-	0 (0)	0 (1)	**1 (5)**	28 (0)	**29 (5)**
2008	0 (0)	1 (0)	2 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	1 (0)	0 (0)	0 (0)	0 (0)	**4 (0)**	17 (2)	**21 (2)**
2009	3 (1)	3 (1)	1 (0)	-	-	-	-	-	-	0 (0)	-	1 (1)	-	0 (0)	3 (1)	**11 (4)**	-	**11 (4)**
2010	2 (6)	2 (2)	1 (0)	-	-	-	-	-	-	0 (0)	-	1 (0)	-	0 (0)	1 (0)	**7 (8)**	-	**7 (8)**
2011	2 (2)	1 (3)	0 (1)	-	-	-	-	-	-	0 (0)	-	1 (2)	-	0 (0)	0 (1)	**4 (9)**	-	**4 (9)**
2012	2 (1)	1 (1)	0 (0)	-	-	-	-	-	-	0 (0)	-	1 (1)	-	0 (0)	0 (0)	**4 (3)**	-	**4 (3)**
2013	2 (1)	1 (0)	2 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	1 (0)	0 (0)	0 (0)	0 (0)	**6 (1)**	36 (8)	**42 (9)**
2014	1 (0)	0 (0)	0 (0)	-	-	-	-	-	-	0 (0)	-	1 (0)	-	0 (0)	0 (0)	**2 (0)**	-	**2 (0)**
2015	0 (0)	0 (0)	0 (0)	-	-	-	-	-	-	0 (0)	0 (0)	0 (1)	0 (0)	0 (0)	0 (0)	**0 (1)**	-	**0 (1)**

* From historical GIS layers, the 2007 survey results presented in the protocol (USDON 2009), the INRMP (US DON 2006), 2010 survey results (ICF 2012a), 2011 draft survey results (ICF 2012b), 2012 draft survey results (ICF 2013), 2013 draft survey results (ICF 2014), 2014 draft survey results (MultiMAC in prep)

D = Detected but results unknown; - = no survey conducted

Habitat Suitability

Habitat suitability for the least Bell's vireo has been a focus of several survey efforts. In an effort to produce spatially explicit habitat suitability maps, a classification system that could quickly be used in the field to rate habitat potential for the least Bell's vireo was developed in 2003 through a collaborative effort among Navy biologists and included input from USFWS Biologist, Peter Beck (USDON 2003b). Table L-5 depicts the five-tiered ranking (0-4) of habitat quality and their associated definitions and suitability criteria as presented in USDON (2003b). In 2013, the classification system was modified to include a step-by-step check-list that generates a score with each element (ICF 2016). The cumulative scores range from one to 11 and correspond to the five USDON (2003) rankings (Table L-5).

Table L-5. Least Bell's vireo habitat suitability classification system based on USDON (2003b) collaborative effort for mapping riparian areas on Naval Weapons Station Seal Beach Detachment Fallbrook; a cross-referencing with the 2013 cumulative scores is also presented.

2003 Class	2013 Cumulative Score (ICF 2016)	Definition	Vegetation and Structure	Corridor Width
0	1 to 4	Not Suitable - not likely to be utilized by least Bell's vireo for foraging or nesting.	a) Oak dominated with little (<30%) to no willow component; or b) scattered willow or mulefat without correct structure (e.g., no overstory, little over 3 m tall); or c) Dominated by exotics (e.g., eucalyptus, pepper tree)	< 5 m
1	5 to 6	Potentially Usable - contains some habitat elements usable by least Bell's vireo but do not contain all necessary components suitable for nesting.	a) Willows present, including some taller trees, but too narrow or low volume in understory; or b) Moderate to high density of mulefat or willow, but little growth over 3 m; or c) oak dominated stands with pockets of willow 5-10 m	>20 m
2	7 to 8	Usable - contains proper species composition but lacking at least one structural component (e.g., overstory, understory, width).	Willows or mulefat present but lacking in overstory or understory	10-20 m
3	9	Good - Dense vegetation with proper structure but too narrow to be considered ideal.	Willow over 70% or no more than 1/3 of composition in oaks	20-50 m
4	10 to 11	Very Good - Dense vegetation of correct composition, structure, and volume. Width > 50m.	Dominated by willows and mulefat	> 50 m

L.1.6 Coastal California Gnatcatcher (*Polioptila californica californica)*

L.1.6.1 Description

There are three subspecies recognized of the California gnatcatcher based on subtle morphological differences (*californica, pontilis, margaritae*; Atwood and Bontrager 2001; Mock 2004). The subspecies found in southern California is recognized as the coastal California gnatcatcher (*P.c. californica*).

The coastal California gnatcatcher is a small (11 cm, 6 grams), long-tailed member of the gnatcatcher family Polioptilidae. This species is a year-round resident species in southern California. The bird's plumage is dark, blue-gray above and grayish-white below, with the female having more brown feathers than the male (Pyle and Unitt 1998). The tail is mostly black above and below with a narrow white edge on the outer tail feathers. The male has a distinctive black cap, which is absent during the winter.

L.1.6.2 Distribution

Historically, the coastal California gnatcatcher's range extended from southern Ventura County southward through Los Angeles, Orange, Riverside, San Bernardino, and San Diego counties, and into Baja California, Mexico, to approximately 30 degrees north latitude near El Rosario (Atwood 1990, USFWS 2010a). Habitat destruction, fragmentation and modification have led to this species' decline (USFWS 1993a). Loss of habitat to agriculture and urban development were leading challenges to conserving the species until the interval between 2003 and 2007 when widespread fires consumed one-third of the habitat in the U.S range of the species that the U.S. Fish and Wildlife Service believed to be suitable for the coastal California gnatcatcher (USFWS 2010a).

L.1.6.3 Habitat Requirements

Coastal California gnatcatchers generally prefer open sage scrub with California sagebrush (*Artemisia californica*) as a dominant or co-dominant species (summarized in Atwood and Bontrager 2001; Mock 2004). Although gnatcatchers have a close association with sage scrub, this species has also been documented using coastal sage-chaparral scrub, chamise chaparral and other scrub habitat types (Campbell et al. 1998, Bontrager 1991, K. Fischer pers. obs.). Home range size is highly variable and is directly correlated with distance from the coast, with home ranges size increasing as the birds are farther from the coast (Preston et al. 1998). During the breeding season, territories range from 2 to 14 acres (USFWS 2010a) and during the non-breeding season can be as big as 35 acres (Preston et al. 1998). Non-breeding season home ranges are approximately 80% larger than breeding season home range (Preston et al. 1998).

L.1.6.4 Breeding

The gnatcatcher breeding season extends from mid-February through mid-August, although earlier starts and later seasons have been observed (USFWS 1993a). Males start to molt in their breeding cap approximately six to seven weeks after the first significant rainfall in December (Grishaver et al 1998). The pair begins to build nests two to four weeks after the completion of the molt (Grishaver et al 1998). The male typically selects the nest site, and for approximately four to ten days both sexes build a cup-shaped nest located approximately one meter (three feet) off the ground (Atwood and Bontrager 2001, USFWS 2010a). Clutch size is typically four eggs but can range from three to five eggs (Atwood and Bontrager 2001). Both sexes incubate the eggs for approximately 14 days and, once hatched, the chicks fledge from the nest around day 14 (Atwood

and Bontrager 2001). Fledglings will stay with adults from two to five weeks post-fledging (Atwood and Bontrager 2001, K. Fischer, personal observation).

L.1.6.5 Surveys and Status on Detachment Fallbrook

Surveys

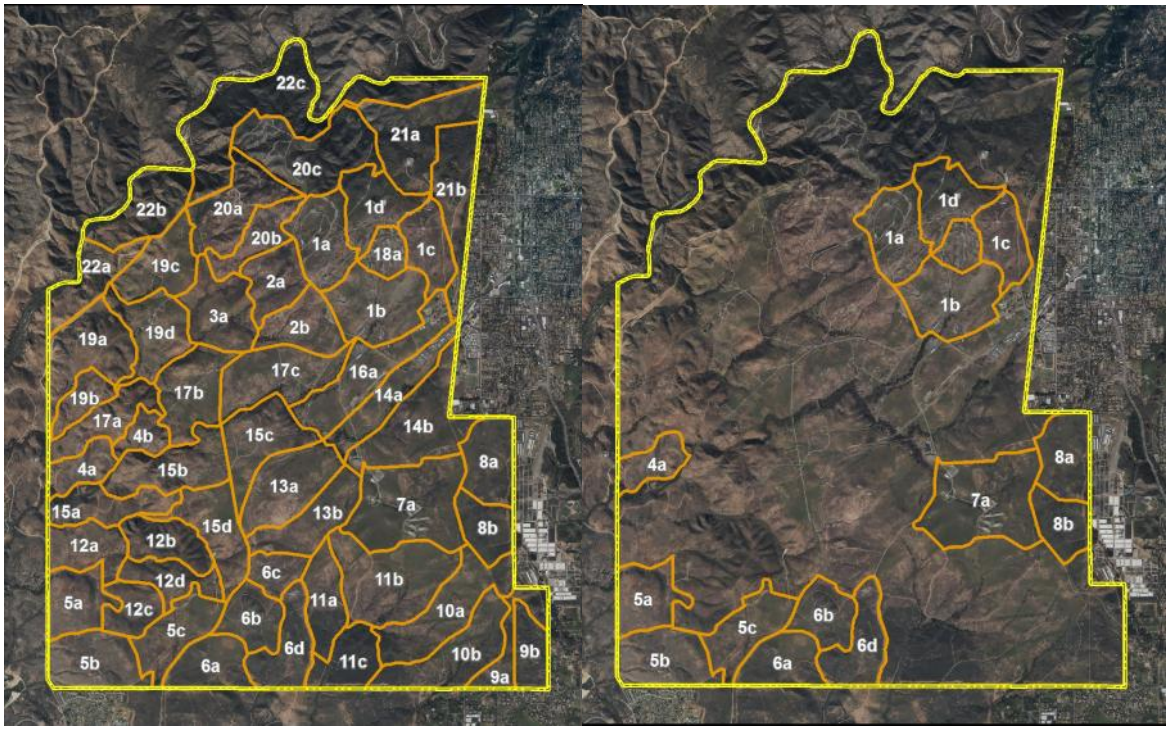
From 1990 to 2008, several survey efforts were undertaken to survey the coastal sage scrub on Detachment Fallbrook for coastal California gnatcatchers (Appendix M). In 2008, a standardized protocol was developed outlining the methods for the 5 year stationwide survey and the annual abbreviated surveys. The annual abbreviated surveys focus on polygons with the highest density of pairs or on areas with an increased potential for conflict with the Detachment's mission. Since the implementation of these survey protocols, the usage of the installation by this species has been better documented than before and allows for comparison of numbers of breeding pairs.

Results

The 1994 stationwide population census noted approximately 88 pairs/family groups or 166 adults in total (Varanus 1994). The 2000 Station-wide survey estimated the population at approximately 50 pairs or at least 105 adults (Varanus 2002). The 2009 Station-wide survey estimated the population at 126 pairs (GANDA & Cadre 2010). The 2014 Station-wide survey estimated the population at 85 pairs prior to the Tomahawk Fire in May 2014 (Kidd Biological 2016), which burned through core areas of gnatcatcher habitat. Post-fire numbers are currently unknown, but are expected to be dramatically reduced. Continuation of the monitoring program will help document recovery.

Annual Abbreviated

When comparing the total number of gnatcatcher pairs observed in Survey Areas 1, 4, 5, 6, 7, and 8 (the survey areas and subareas that were surveyed all years from 2008 through 2013, plus CAGN points from 2000 that fell within the same survey polygons), the data reveal a highly fluctuating, but generally stable, CAGN population on Detachment Fallbrook (Map L-2, Figure L-1). The fluctuations in numbers between years likely reflects natural cycles characteristic of CAGN populations. The above-average number of pairs in the 2009 and 2011 breeding seasons are preceded by a calendar year that had higher rainfall levels. The further increase in 2012 is potentially due to a mild winter with a high survival rate for the fledglings produced during 2011. There was a decline in 2013, most notably in 7a. The vegetation in this polygon did not appear to get the moisture required for the plants to leaf out and in turn support an abundant prey base of insects. Anecdotally, the biologist noted that during the 2013 survey season the fog bank that usually provides moisture to the vegetation was not as prevalent as during other years. This could also contribute to the poor condition of the vegetation during 2013.



Map L-2. Survey polygons for the 5-year stationwide (left) and abbreviated annual (right) coastal California gnatcatcher surveys at Detachment Fallbrook. Annual polygons are nested within the more expansive stationwide survey polygons. Polygons were drawn to follow habitat features and other readily observable features in the field (e.g., roads, fences). Larger polygons typically have fewer acres of coastal sage scrub.

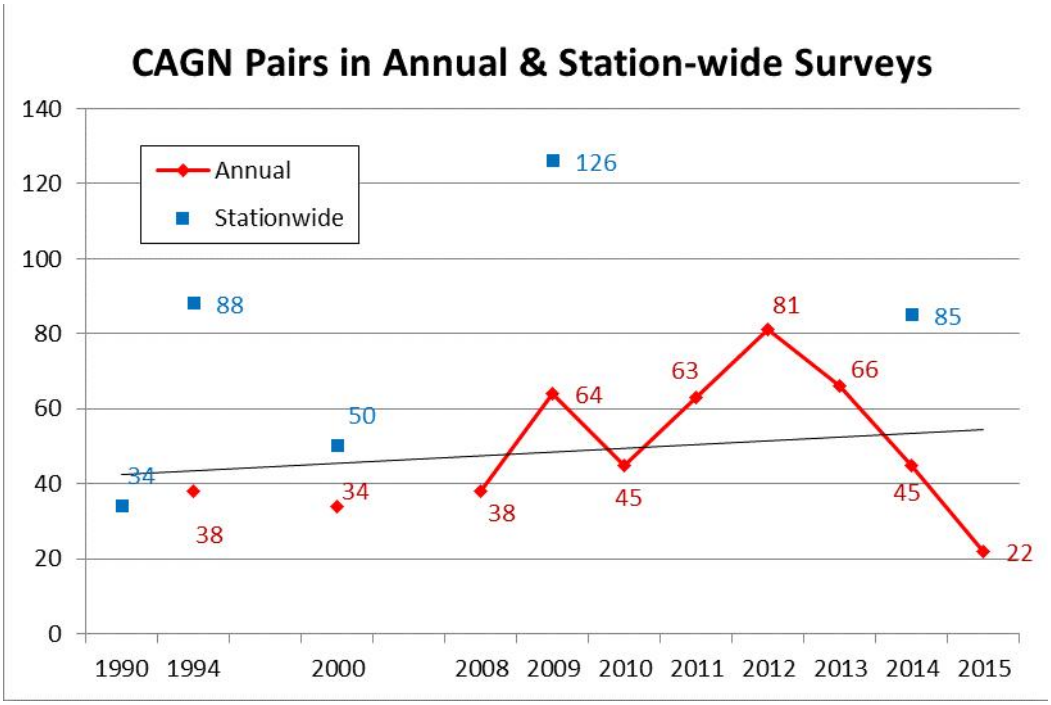


Figure L-1. Estimated number of California gnatcatcher pairs within the annual survey polygons and stationwide. The current 5-year and annual monitoring protocol was adopted in 2008; prior estimates of gnatcatcher pairs within the annual survey polygons was extracted from GIS of stationwide surveys (GIS was not available for the 1990 season). See Appendix H

for citations for each survey year; 2014 is based on draft data. The Tomahawk Fire occurred after the majority of the surveys were completed in 2014; reduced numbers that year are likely due to the severe drought conditions.

L.1.7 Stephens' Kangaroo Rat (*Dipodomys stephensi*)

L.1.7.1 Description

The Stephens' kangaroo rat (SKR) is a small mammal of the rodent family Heteromyidae. It has a large head, external fur-lined cheek-pouches used for transporting seeds to safe caches, elongated rear-legs used for hopping and relatively small front legs (Animal Info 2009). In addition to different habitat requirements, the Stephens' kangaroo rat is distinguished from the non-endangered Dulzura kangaroo rat (*Dipodomys simulans*; DKR) as it generally larger, has a wide, blunt head, smaller ears, no light spot behind the ears, and the pelage is relatively light. DKR has a longer head, larger ears, a light patch behind the ears, and the pelage is relatively dark (Table L-6).

Table L-6. Morphological and behavioral differences between the Stephens' kangaroo rat (SKR) and Dulzura kangaroo rat (DKR).

Character	SKR	DKR	Source
Head shape	"Blunt"	"Pointed"	Amec, pers com
Pelage color	Buffy brown ("warm") Relatively light.	Grayish brown ("cool") Relatively dark.	Amec, pers com
Color of tops of hind feet	As above – "light"	As above – "dark"	Amec, pers com
White tail stripe	Less distinctly demarcated	More sharply demarcated	Bleich (1977)
Ear length at notch	11-13 mm	13-16 mm	
	12-14 mm	15-20 mm	Kays & Wilson (2009)
White patch of fur at posterior base of ears	Absent or <2 mm	>2 mm, often on outer side as well as inner	Amec, pers com
Disposition	Mellow, calm	Active, squirmy	Amec, pers com

Another similar species is the agile kangaroo rat (*Dipodomys agilis*) and this is distinguished from SKR by a lateral white tail band that is one half or less (rather than one half or more) times the width of the dorsal tail stripe, dusky (rather than dark) soles on the hind feet, a more grizzled appearance to the dorsal tail stripe due to many white hairs, a darker tail tuft due to fewer white hairs, a smaller ear (averaging 15 millimeters in length), and a relatively broad head (USFWS 1988). The average adult SKR is 27 to 30 cm in length and weighs 2.3 ounces (Bleich 1977). This species is nocturnal, spending the day in underground burrows and foraging on the surface at night when the humidity is highest, which serves to conserve water since it seldom drinks water, and hydrates primarily through the chemical breakdown of food (USFWS 1988, Animal Info 2009).

L.1.7.2 Distribution

The SKR is endemic to the Perris and San Jacinto Valleys in western Riverside County and the San Luis Rey and Temecula Valley's in northern San Diego County (USFWS 1997a). The species is distributed across a range of approximately 2,849 square kilometers (km^2), in numerous small fragmented populations, where suitable habitat remains; 5% of its original habitat remains range-wide (USFWS 1997a, Animal Info 2009). The SKR is found from approximately 55 to 1,250 m above sea level with most populations occurring below 610 m.

L.1.7.3 Habitat Requirements

The USFWS states that the SKR is frequently found in close association with dirt roads, previously and currently disturbed areas, and/or other sites with a high percentage of bare-ground (USFWS 1997a). It is not found on extremely hard or sandy soils; gravel is a common component of soils where the animal is found (USFWS 1997a).

Occupied SKR habitats are usually described as sparse, slightly disturbed CSS or annual grassland on level or low-rolling terrain. The actual distribution of suitable habitat is normally mixed with other habitat types in a natural mosaic. The populations with the highest densities have been found in areas where the herbaceous layer still contains California native annuals, and where perennial cover is less than 30% (USFWS 1988). The SKR is most commonly identified as being associated with California sagebrush and California buckwheat because these shrubs are often the most obvious elements of the habitat; however, the animals are actually using the herbaceous understory for forage (USFWS 1988).

The SKR reaches its highest densities in intermediate successional stage grassland communities characterized by moderate to high amounts of bare-ground, high forb cover, moderate slopes, and well-drained soils (USFWS 1997a). This species prefers grassland communities dominated by herbaceous plants rather than by annual grasses because annual herbs rapidly breakdown after drying, which results in substantial patches of bare-ground and suitable conditions for its specialized mode of locomotion of hopping (USFWS 1997a). Moderate human disturbances (e.g., certain grazing regimes, farming, off-road vehicle use, brush removal, mowing, and fires) can benefit SKR habitat by maintaining sparse shrub growth. When these factors are removed, habitat on-site may transition to denser CSS or introduced European grassland conditions which are not favorable to the SKR. However, too much disturbance may also be detrimental to the species if too excessive or intense, resulting in burrow destruction and possible changes to the vegetation community. Further research is needed to determine at what levels and intensities these disturbances become detrimental to the species (USFWS 2004). Population densities fluctuate greatly from year-to-year and location-to-location, and can vary more than tenfold in response to rainfall patterns (USFWS 1997a). Reported densities of SKR range between 3 and 23.7 individuals per acre during summer months; however, densities decrease to 2 to 6 individuals per acre in fall and winter (USFWS 1997a).

L.1.7.4 Breeding

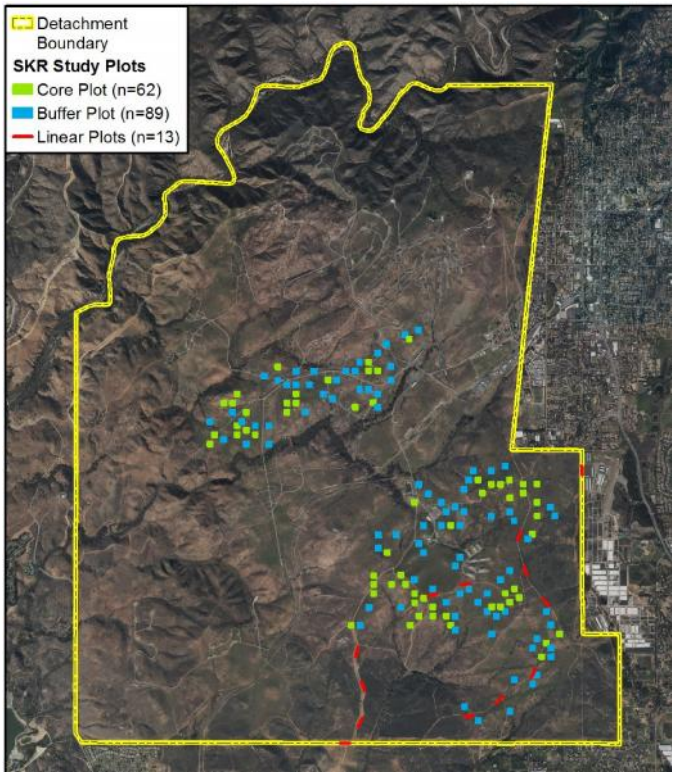
Adults are solitary, strongly territorial (one adult per burrow) and are characterized by a promiscuous mating system, establishing no persistent pair bonds. Reproductively active individuals have been observed year-round, although onset of estrus (in females) appears to be triggered by the onset of winter rains, and estrous cycling ceases after plants disperse seeds. Average gestation period is 30 days, and the average number of young per litter is 2.5 (Animal Info 2009). The young are then weaned from the nest between 18 and 22 days after birth. In prosperous years, females born in the spring may reproduce their first year. Primary stressors to survivorship and reproduction may include: (1) low seed production due to drought (decreased food supply); (2) excessive predation pressure from owls, snakes, coyotes, fox, feral cats and/or invasive ants; (3) excessive competitive pressure from other rodents and/or ants who share the same resource base; (4) small and/or low density populations, which may result in reduced mating and reproduction due to Allee effects, where widely dispersed, low-density populations are less likely to find mates (small populations have increased susceptibility to environmental and demographic stochastic events); and (5) direct mortality from consumption of pesticides, trampling and road kill (Brehme et al. 2010).

L.1.7.5 Surveys and Status on Detachment Fallbrook

Surveys

From 1994 to 2001, several survey efforts were undertaken to survey the grasslands on Detachment Fallbrook for Stephens' kangaroo rat (Appendix M). In 2001-2002 a standardized methodology involving the monitoring of fixed sampling plots was developed to facilitate detection of major changes in the Stephens' kangaroo rat population between the required 5-year stationwide mapping efforts (Map L-3; Montgomery et al. 2008). This methodology has allowed for comparison of data between years.

The 5-year stationwide survey protocol for SKR has been problematic in that field conditions (e.g., species detectability, presence of sympatric DKR), subjectivity in mapping, etc. make it difficult to generate repeatable depiction of geospatially explicit SKR occupancy and distribution. The most current stationwide SKR survey was conducted in 2007. In lieu of a stationwide survey, more labor intensive surveys have been conducted within smaller areas of the installation (panel mapping) since 2013 (see Section 4.13.7 for additional discussion). One advantage of panel mapping is that it provides greater survey coverage of specific area that stationwide mapping, and is less likely to miss potential species occupancy. Panel mapping also provides more direct support of the Navy's mission by providing spatially explicit surveys for avoidance/minimization, as opposed to fixed plot monitoring for tracking population dynamics. One drawback to the panel mapping is that it does not allow for trend monitoring of stationwide occupancy (total acres of occupied SKR habitat).



Map L-3. Annual monitoring plots for the Stephens' kangaroo rat surveys at Detachment Fallbrook.

Results

Annual monitoring includes burrow counts and verification trapping at plots that require species identification. Annual occupancy ranges from 31 to 87 of the 164 plots (Figure L-2). During the 2002–2004 period, plot occupancy appeared to be relatively stable, varying only by approximately 1% over the three years of monitoring. A distinct decline in the number of occupied plots (approximately 45%), across all plot types, is seen between 2004 and 2006 surveys, which is followed by another drop (26%) in 2008. The rate of plot occupancy appears to remain relatively stable between 2009 and 2011, and then an increase started in 2012 and continued through 2015.

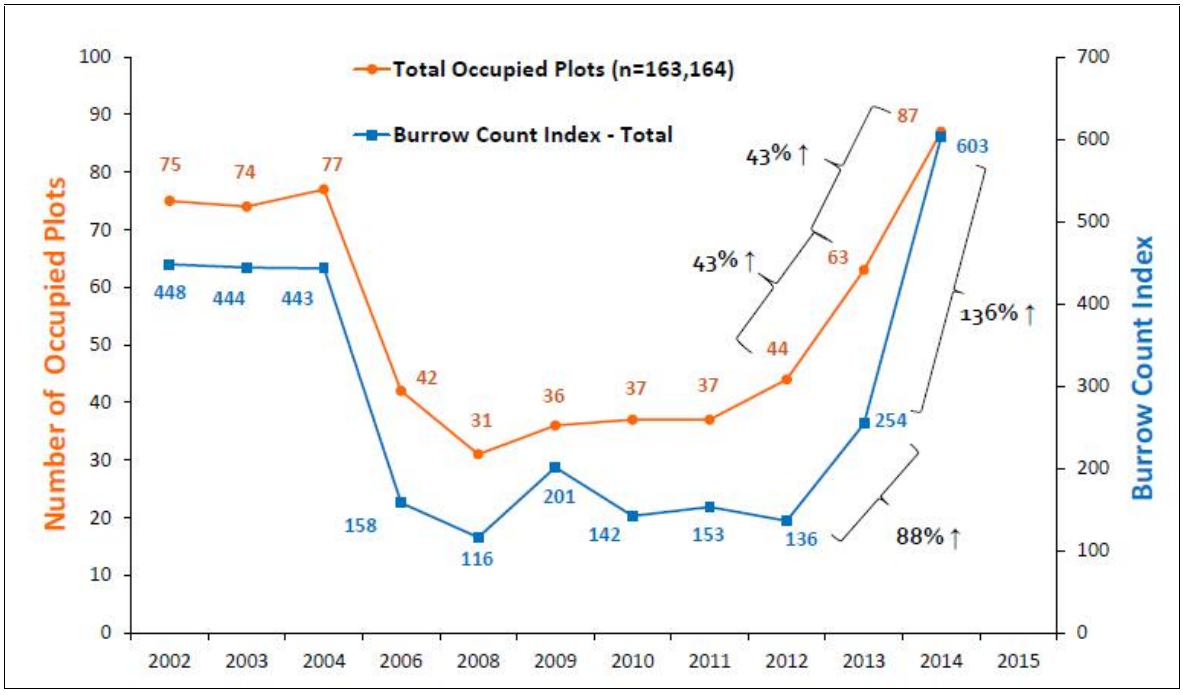


Figure L-2. Burrow Count Index (total number of burrows on plot) and number of SKR occupied plots (Burrow Count Index > 0) from Fall 2002- Fall 2015. All values are rounded; recent data are draft and subject to change.

L.2 FEDERALLY LISTED SPECIES WITH POTENTIAL TO OCCUR ON DETACHMENT FALLBROOK

L.2.1 San Diego Button-Celery (*Eryngium aristulatum* var. *parishii*)

Status: Federally Endangered, State Endangered, CRPR 1B.1

San Diego button-celery was listed as federally endangered in 1993 (USFWS 1993b), by the state in 1979, and is a CRPR 1B.1 species. At the time of federal listing, this species was found from the Santa Rosa Plateau in Riverside County, west to MCB Camp Pendleton and south to northern Baja California. At the time of the 5-year review, the species range was similar with 14 geographic areas in Riverside and San Diego Counties. MCB Camp Pendleton is one of the ten regions that support the majority of the species occurrence. (USFWS 2010b)

San Diego button-celery is a small, low-spreading, green-flowered herb that grows to 40 cm in height and is associated with vernal pools on clay soils. It blooms every other year in April to June. (USFWS 2010b)

This species is known to occur on MCB Camp Pendleton but it has low potential to occur on Detachment Fallbrook. This species has not be observed during rare plant surveys of Detachment Fallbrook and most of the vernal pools on the installation are manmade and were subject to a high level of historical disturbance. It is unlikely that San Diego button-celery occurs Detachment Fallbrook.

L.2.2 Spreading Navarretia (*Navarretia fossalis*)

Status: Federally Endangered, CRPR 1B.1

Spreading navarretia was listed as federally endangered in 1998 (USFWS 1998b) and is a CRPR 1B.1 species. The range of this species extends from northwestern Los Angeles County to western Riverside County, and coastal San Diego County in California, to San Quintin in northwestern Baja California, Mexico. At the time of listing, there were 34 populations in the United States with nearly 60 percent of these populations concentrated at three locations: Otay Mesa in southern San Diego County, alongside the San Jacinto River in western Riverside County, and near Hemet in western Riverside County. It has since increases to 48 extant populations within the same spatial range. (USFWS 2009b)

Spreading navarretia is a low, mostly spreading or ascending annual plant, 10 to 15 cm tall, found in vernal pools or within the alkali vernal plain habitat. It blooms from April through June and depended on the inundation and drying cycle of the vernal pool for survival. It can occur in manmade depressions and ditches. (USFWS 2009b)

This species is known to occur on MCB Camp Pendleton, but it has low potential to occur on Detachment Fallbrook. This species has not be observed during surveys of Detachment Fallbrook (Cobb 2009) and most of the vernal pools on the installation are manmade and were subject to a high level of historical disturbance. Even though this species can occur in manmade depressions

such as the ones found on Detachment Fallbrook, it is unlikely that spreading navarretia occurs on the installation as it would have been recorded during surveys.

L.2.3 Encinitas Baccharis (*Baccharis vanessae*)

Status: Federally Threatened, State Endangered, CRPR 1B.1

Encinitas baccharis was listed as federally threatened in 1996 (USFWS 1996a), as endangered by the State in 1987, and is a CRPR 1B.1 species. Its range at the time of federal listing was from 19 known populations distributed from Carlsbad to Poway, entirely in San Diego County (USFWS 2011b). As of the 5-year review, there are 45 historical occurrences from the northern boundary of San Diego County in the San Mateo Wilderness, south to Otay Mountain and inland to Alpine (USFWS 2011b). The bulk of the observations of the species are still in the area identified in listing. Aline, Otay Mountain, and San Mateo Wilderness are outlying smaller populations. This shrub species is found in chaparral below 3,000 feet and is almost always found growing with a *Ceanothus* species including wart-stemmed ceanothus (*Ceanothus verrucosus*), coast greenbark ceanothus (*C. spinosus*), lakeside ceanothus (*C. cyaneus*), or Otay ceanothus (*C. otayensis*) (USFWS 2011b).

Encinitas baccharis is a slender-stemmed shrub that typically grows to 2 to 4 feet tall. It is dioecious, meaning there are separate male and female plants and they must be near each other for pollination. The blooming period is between August and November. As with other *Baccharis* species, Encinitas baccharis thrives is areas with disturbance; however for this species the preferred disturbance is fire. It is a pioneer species that increases in numbers after habitat is opened up by fire. (USFWS 2011b)

There is only a limited amount of chaparral on Detachment Fallbrook and this species has not been observed. It has been confirmed on MCB Camp Pendleton, approximately 9 miles from the boundary with Detachment Fallbrook.

L.2.4 Thread-leaved Brodiaea (*Brodiaea filifolia*)

Status: Federally Threatened, State Endangered, CRPR 1B.1

Thread-leaved brodiaea was listed as federally threatened in 1998 (USFWS 1998c). This species is found in Los Angeles, Orange, Riverside, San Bernardino, and San Diego counties. It is a perennial bulb that blooms from March to June (Beauchamp 1986; Skinner and Pavlik 1994). It has purple-blue petals and grows from 20-30 cm high (Hickman 1993). This species is inconspicuous unless it is flowering. Most sources (Munz 1959; Skinner and Pavlik 1994; USMC 1999) report *B. filifolia* inhabiting clay soils in grasslands, vernal pools, coastal sage scrub, and chaparral. Additional data suggest that this species may prefer recently burned habitat (USDON 1998) and may not persist in areas which do not burn frequently.

There are no known locations of this plant on Detachment Fallbrook. The nearest location of this species to Detachment Fallbrook is on MCB Camp Pendleton, approximately one mile from the boundary between the two installations. Even though focused surveys for this species using a protocol similar to that used on MCB Camp Pendleton have been not been conducted, it is always a focal species for general rare plants surveys of Detachment Fallbrook and it was specifically targeted in a project level survey within the Santa Margarita River Conjunctive Use Project footprint.

L.2.5 Quino Checkerspot Butterfly (*Euphydryas editha quino*)

Status: Federally Endangered

The Quino checkerspot butterfly ((*Euphydryas editha quino*, Quino) was listed as federally endangered in 1997 (USFWS 1997b). Quino have a one inch wingspan checkered in patterns of dark brown with reddish and yellowish spots, and a medial orange band on the hind wings. Its abdomen is orange banded (Ballmer et al. 1998). Quino occurs at altitudes from just above sea level to 5,000 feet in a variety of habitats (meadows, coastal sage scrub, grasslands, chaparral, chaparral and semi-desert scrub) (Ballmer et al. 1998).

Female Quino usually mate only once, laying several egg masses of 120 to 180 eggs on their primary host plant, the dot-seed plantain (*Plantago erecta*). Other plants used by Quino include dark-tipped bird's beak (*Cordylanthus rigidus*) and owl's clover (*Castilleja exserta*) (USFWS 2000). The eggs hatch within seven to ten days and the larvae generally undergo two or three molts during their first season. They enter a diapause phase to wait out the dry season, and when winter rains renew the vegetation they will go through up to seven more molts before pupating (Mattoni et al. 1997). They have been known to remain dormant for several years during drought years (Ballmer et al. 1998). The butterfly emerges approximately ten days later. The adults are generally active from February through April.

Quino was one of the most abundant butterflies in southern California (Ballmer et al.1998); however, habitat destruction or degradation has eliminated an estimated 50-75% of their former range (Brown 1991 in Federal Register, 1997). Invasion of exotic grasses and forbs has results in the displacement of dot-seed plantain, the primary larval host plant. The spread of exotic predators (e.g., sow bugs and earwigs) has also likely led to the decline of the Quino.

Quino has never been detected on Detachment Fallbrook, which is outside of the USFWS mandatory survey area (USFWS 2002b). Detachment Fallbrook does not contain critical habitat for this species as designated by the USFWS (67 FR 18355-18395, April 15, 2002). Results of several presence or absence surveys for Quino conducted on adjacent MCB Camp Pendleton between 1996 and 1999, and in 2015 determined this species is not known to occur on MCB Camp Pendleton (Redak et al. 1997, 2000, ICF 2015). Quino Checkerspot was specifically targeted during a 2013-1015 Lepidoptera survey (Osborne and Amec Foster Wheeler 2016) on Detachment Fallbrook because of the proximity of the mandatory survey area on neighboring MCB Camp Pendleton and because of presence of the host plant species. The species was not found. Therefore, the species is not expected to occur within Detachment Fallbrook boundaries.

L.2.6 Riverside Fairy Shrimp (*Streptocephalus woottoni*)

Status: Federally Endangered

Riverside fairy shrimp (*Streptocephalus woottoni*) was listed as a federally endangered species in the California and Nevada region in 1993 (USFWS 1993b). No critical habitat is designated or proposed for this species on Detachment Fallbrook (USFWS 2011c). Riverside fairy shrimp are covered under the Vernal Pools of Southern California Recovery Plan (USFWS 1998b). This small (13 – 25 mm long) freshwater crustacean is found in deep, cool water pools and depressions, including road ruts, swales and ditches, as well as vernal pools and vernal ponds. It is completely dependent upon vernal pools to survive (USFWS 2005b). The northern range of the Riverside fairy shrimp is defined by Skunk Hollow and the Santa Rosa Plateau in Riverside County and coastal

sites in San Diego and Orange counties. It is documented throughout MCB Camp Pendleton (USFWS 1998b). They have a highly restricted distribution and are only found in a few pools at lower elevations in the Southern California coastal range that are inundated for a longer duration and usually deeper that 12 inches (30 cm) than pools that support San Diego fairy shrimp (*Branchinecta sandiegonensis*). Riverside and San Diego fairy shrimp are known to co-occur in a few deep pools; however, they generally do not co-exist (USFWS 2005b).

Riverside fairy shrimp has not been detected during focused fairy shrimp surveys on Detachment Fallbrook. This species is considered absent from Detachment Fallbrook. Lindahl's fairy shrimp (*Branchinecta lindahli*), which is not listed by either California state or federal governments, was confirmed in the vernal pools and ephemeral ponds on Detachment Fallbrook (Cobb 2009).

L.2.7 San Diego Fairy Shrimp (*Branchinecta sandiegonensis*)

Status: Federally Endangered

The San Diego fairy shrimp (*Branchinecta sandiegonensis*) is a federally endangered species found in vernal pools of the coastal mesas of San Diego County. It is the most common fairy shrimp within a 50-km coastal strip of vernal pools that mostly range in elevation from 15-125 m. Disjunct populations of this species occur in northern Baja and southern Orange County (Eriksen and Belk 1999). However, coastal mesas are also one of the most popular sites for development and consequently this species has declined dramatically. It was originally identified as the relatively common Lindahl's fairy shrimp and was not described as a separate species until 1993.

San Diego fairy shrimp are minute (< 3 cm) crustaceans found in vernal pools and other seasonally filled water holes. These shrimp may appear after late fall, winter, or spring rains sufficiently fill their small, shallow pools (<30 cm deep). Fairy shrimp are filter feeders that digest microscopic particles of plant and animal detritus. Predators include birds and larger invertebrates that develop in their pools if water persists. One of the most unique features of fairy shrimp biology is their ability to remain in soil, as egg-like cysts, for many years without hatching and then under appropriate conditions hatch and reproduce.

All reproductive information on the species is from laboratory conditions where hatching occurred at temperatures of 5-15ºC, moderate pH (6.5-8), and low alkalinity (40-50 ppm) and total dissolved solids (mean of 75 ppm). Hatching can take from 3-8 days depending on water temperature. However, because of the unpredictability of rainfall in southern California, San Diego fairy shrimp have evolved so that only a few hatch at any given time and attempt to grow to maturity before pools dry. Once hatched, the fairy shrimp mature in 10-20 days, depending on water temperature, and can live for over one month.

San Diego fairy shrimp has not been detected during focused fairy shrimp surveys on Detachment Fallbrook. This species is considered absent from Detachment Fallbrook. Lindahl's fairy shrimp, which is not listed by either California state or federal governments, was confirmed in the vernal pools and ephemeral ponds on Detachment Fallbrook (Cobb 2009.).

L.2.8 California Red-legged Frog (*Rana draytonii*)

Status: Federally Threatened, California Species of Special Concern

California red-legged frog found primarily in wetlands and streams in coastal drainages of central California as it has been extirpated from 70 percent of its former range (USFWS 1996b). The species requires fairly distinct habitat, combining both specific aquatic and riparian components (Hayes and Jennings 1986). The adults require dense, shrubby or emergent riparian vegetation

closely associated with deep (>0.7 m) still or slow moving water (Hayes and Jennings 1986). The largest densities are associated with deep-water pools with dense stands of overhanging willows and an intermixed fringe of cattails (USFWS 1996b). Threats to the species include urban encroachment, construction of reservoirs and water diversions, introduction of exotic predators and competitors, livestock grazing, and habitat fragmentation (USFWS 1996b).

The closest sighting of this species was 9.5 miles away in Cole Canyon, Riverside Co. (CNDDB 2014). This species is unlikely to occur on Detachment Fallbrook as they are found within deep pools and there is not a connection between the sightings and the Santa Margarita River to allow for the species to move into the Detachment.

L.2.9 Yellow-billed cuckoo (*Coccyzus americanus*), Western Distinct Population

Status: Federally Threatened, State Endangered

The USFWS listed the western distinct population of the yellow-billed cuckoo as threatened on 3 October 2014 (USFWS 2014a). They first proposed listing on 3 October 2013 and then the USFWS extended the comment period on this proposed listing two times, once on 26 December 2013 and again on 10 April 2014 (USFWS 2013 and USFWS 2014a). The USFWS proposed critical habitat for the yellow-billed cuckoo on 15 August 2014 (USFWS 2014a). This has not been finalized; however, critical habitat for the yellow-billed cuckoo, as identified in the proposed rule, does not occur at Detachment Fallbrook (USFWS 2014a). A recovery plan for the yellow-bill cuckoo has not been developed.

The geographical breeding range of the yellow-billed cuckoo in western North America includes suitable habitat within the low- to moderate-elevation areas west of the crest of the Rocky Mountains in Canada, Mexico, and the United States, including the upper and middle Rio Grande, the Colorado River Basin, the Sacramento and San Joaquin River systems, the Columbia River system, and the Fraser River. In Mexico, the range includes the Cape Region of Baja California Sur, and river systems in the Mexican States of Sonora, Sinaloa, western Chihuahua, and northwestern Durango.

Yellow-billed cuckoos are found in mature riparian woodlands. They breed in riparian habitat along low-gradient rivers and streams with a surface slope less than 3%, and in open riverine valleys that provide wide floodplain conditions, typically greater than 325 ft (USFWS 2014b).

Yellow-bellied cuckoo individuals were observed in the upper Santa Margarita River in 1947, 1948, and 1950 and near Gird Road on the San Luis Rey River in 2011 and 2015 (CNDDB 2015, eBird 2015). Since 1980, there have only been a few recorded observations of yellow-billed cuckoo individuals along Santa Margarita River on MCB Camp Pendleton, downstream of Detachment Fallbrook, and no evidence of breeding (S. Sullivan, pers. com. 2015). This species has a remote potential to occur on the installation in the future (Section 3.10.8, Additional Federally Listed Species with the Potential to Occur at Detachment Fallbrook). The most suitable habitat for the species on Detachment Fallbrook is within the Santa Margarita River. Annual monitoring surveys for least Bell's vireo conducted by MCB Camp Pendleton, and 5-year surveys conducted by the Navy, within the river may provide opportunities for incidental detections of potential breeding yellow-billed cuckoos; however, this species is a late migrant to the region, arriving in mid-June to early July and may be missed (Halterman et al. 2015).

L.3 OTHER SPECIAL-STATUS SPECIES DETECTED ON DETACHMENT FALLBROOK

In this section, species that have been observed on Detachment Fallbrook are discussed. For plants, all CRPR species are discussed. For animals, only species with the elevated status of protected by the Bald and Golden Eagle Protection Act or California Species of Concern are discussed. There are several animal species that may only be a Bird of Conservation Concern (BCC), a covered species by the Multiple Species Habitat Conservation Plan (MSHCP), or a Department of Defense Partners in Flight (DOD PIF) species that are not discussed in detail. Typically, if a species has only the BCC, MSHCP or DOD PIF status but no additional status with the State or federal government then it is a species that is still commonly found in the region but are a focus species of these regional or federal plans. A detailed discussion of their presence on Detachment Fallbrook is not warranted.

L.3.1 Plants

L.3.1.1 San Diego County Viguiera (*Bahiopsis laciniata*)

Status: CRPR 4.2

San Diego County viguiera (formerly *Viguiera laciniata*) is typically found in arid sage scrub or chaparral habitat and is often a co-dominant with California sagebrush (Reiser 1994). It is found in higher densities in southern San Diego County and northwestern Baja California than in northern San Diego, Orange, and Riverside Counties. San Diego County viguiera is a yellow-flowered xerophytic shrub. Its blooming period is February through June (CNPS 2014).

On Detachment Fallbrook, San Diego County viguiera was detected during surveys in 2013 (Tierra data, Inc. 2003).

L.3.1.2 Small-flowered Microseris (*Microseris douglasii* ssp. *platycarpha*)

Status: CRPR List 4.2

Small-flowered microseris is an annual herb that is native to California and Baja California. It occurs in San Diego, Riverside, Orange and Los Angeles counties. Small-flowered microseris occurs on clay lenses in valley grassland, foothill woodland, and coastal sage scrub habitats, and on the periphery of vernal pools or in broad openings in sage scrub. Leaves are linear, lobed and clustered around the base. Flowers are yellow to white, and fruits are 3 – 10 mm gray to brown or blackish, often spotted and hairy, and strongly barbed (Hickman 1993). Blooming period occurs from March through May (CNPS 2014).

On Detachment Fallbrook, small-flowered microseris was detected during surveys in 2006 (TDI 2007).

L.3.1.3 White Rabbit-Tobacco (*Pseudognaphalium leucocephalum*)

Status: CRPR 2B.2

White rabbit-tobacco (formerly *Gnaphalium leucocephalum*) is a perennial herb found in chaparral, coastal sage scrub, riparian woodland and cismontane woodlands (CNPS 2014). It blooms between August and November.

On Detachment Fallbrook, white rabbit-tobacco was detected during surveys in 2006 (TDI 2007).

L.3.1.4 Engelmann Oak (*Quercus engelmannii*)

Status: CRPR List 4.2

Engelmann oak is an important tree component of Detachment Fallbrook that is characteristic of oak woodland communities, but can also be found in southern mixed chaparral communities (Sawyer and Keeler-Wolf 1995). It is found in areas with deep soils along gentle slopes, valley bottoms and raised stream terraces along stream corridors. It is a large evergreen oak that grows between 5 and 18 m tall with grayish, scaly bark. Its leaves are grayish-green in color and generally flat and ovular with entire margins (Hickman 1993). Engelmann oaks are distributed throughout coastal southern California, San Bernardino and Riverside counties and into Baja California. It is also found on the southern Channel Islands (Reiser 1994).

Lawson (1993) examined the effects of fire on Engelmann and coast live oaks in mixed oak woodland stands on neighboring MCB Camp Pendleton. Her data showed that Engelmann oak seedlings and saplings respond less poorly to fire than do coast live oak seedlings and saplings. Engelmann oaks were able to resprout from aboveground buds more readily than coast live oaks when severely damaged and also gained more or lost less height after controlled burns. She pointed to thicker bark in Engelmann oaks as a possible mechanism for this.

Engelmann oaks are distributed throughout much of the oak woodland habitat in the northern portion of Detachment Fallbrook (Dudek 1995, TDI 2007, TDI 2013b). They occur in areas that are used little by humans and are generally well protected from grazing. In riparian oak woodlands on Detachment Fallbrook, grazing does not appear to be limiting recruitment of oak seedlings. A recent study, conducted by US Navy Southwest Division (SWDIV) and Detachment Fallbrook Environmental personnel, found oak seedlings and saplings that varied in size, indicating recruitment over time (US Navy SWDIV, Exotic Pepper Tree Removal Program – unpublished data 2001).

L.3.1.5 Southern California Black Walnut (*Juglans californica*)

Status: CRPR 4.2

Southern California black walnut (formerly *Juglans californica var. californica*) is a deciduous tree that is found in chaparral, coastal sage scrub and cismontane woodlands (CNPS 2014). Its blooming period is March through August. It is typically found in open savannah and is more tolerant of clay in the soil than other trees and woody shrubs (Resier 1994).

On Detachment Fallbrook, Southern California black walnut was detected during surveys in 2013 (TDI 2013b).

L.3.1.6 Parish's Checkerbloom (*Sidalcea hickmanii* ssp. *parishii*)

Status: California Rare, CRPR List 1B.2

Parish's checkerbloom is a perennial herb that is native and endemic to California. It can be found within Santa Barbara, San Bernardino, and San Luis Obispo counties. This uncommon plant prefers chaparral, cismontane woodland and lower montane coniferous forest. Parish's checkerbloom has a rough-haired stem up to 1 m tall and woody at the base. Flowers are pinkish to purplish and leaves have a wide, fan shaped blades with rippled edges or divided into narrow lobes. Blooming period occurs from June through August (CNPS 2014).

On Detachment Fallbrook, Parish's checkerbloom was detected during surveys in 2006 (TDI 2007).

L.3.1.7 Nevin's Gilia (*Gilia nevinii*)

Status: CRPR List 4.3

Nevin's gilia is native to California and Guadalupe Island, Baja California. It can be found within the Channel Islands, and Los Angeles, Santa Barbara, San Bernardino and Ventura counties. This uncommon plant prefers coastal bluff scrub, valley and foothill grassland, and coastal sage scrub habitats. It is erect with a hairy stem up to about 40 cm tall lined with deeply lobed leaves. The glandular inflorescence has yellow-throated lavender flowers 8 to 14 mm wide. Nevin's gilia blooms March through June (CNPS 2014).

On Detachment Fallbrook, Nevin's gilia was detected during surveys in 1995 (Dudek 1995).

L.3.1.8 Fish's Milkwort (*Polygala cornuta* var. *fishiae*)

Status: CRPR List 4.3

Fish's milkwort is a shrub found in chaparral and oak woodland habitats in southern California and northern Baja California at elevations from 100-110 m (Reiser 1994). Its pink flowers can be seen from May- August (Reiser 1994, CNPS 2014). Populations of this plant are currently believed to be relatively stable, and have been documented as occurring on Detachment Fallbrook, as well as at MCB Camp Pendleton and in the community of Fallbrook (Reiser 1994).

On Detachment Fallbrook, Fish's milkwort was detected during surveys in 1995 (Dudek 1995).

L.3.1.9 Vernal Barley (*Hordeum intercedens*)

Status: CRPR List 3.2

Vernal barley is an annual grass typically occurs in saline flats and depressions in grasslands or with vernal pool basins (Reiser 1994). Its blooming period is March through June (CNPS 2014). This species has been collected on MCB Camp Pendleton as recently as 1995 (Calflora 2014).

On Detachment Fallbrook, this species was detected in surveys completed in 2006 (TDI 2007).

L.3.2 Invertebrates

No invertebrates on the California Species of Concern list are known to occur on Detachment Fallbrook. One species with regional sensitivity has been detected.

L.3.2.1 Monarch Butterfly (*Danaus plexippus*)

Status: None

The monarch butterfly is one of the most recognized and studied insects in North America. The species is known to migrate great distances and the monarch regularly uses habitats in southern Canada, United States and Mexico (Jepson et al. 2015). The primary host plant for the monarch larvae are plants in the milkweed genus (*Asclepias* sp.). During the summer months monarchs can live from 2-6 weeks during which they mate and lay eggs (Jepson et al. 2015). Migrating monarchs can live as long as 9 months (Jepson et al. 2015).

In San Diego County, monarchs can occur along the coast where over winter. They typically arrive in mid-October and can form dense clusters on branches, leaves and trucks of trees (Jepson et al. 2015). They typically start to mate in late-February or March and then leave for the interior of California. As they disperse, they breed and produce multiple generations as they expand through their range (Jepson et al. 2015).

On Detachment Fallbrook, two individuals were observed in 2013, one in March and one in April (Osborne Biological Consulting and Amec Foster Wheeler 2016).

L.3.3 Fish

L.3.3.1 Arroyo Chub (*Gila orcutti*)

Status: California Species of Special Concern, Multiple Species Habitat Conservation Plan Covered Species

The arroyo chub is now absent from most of its home range, a majority of which coincided with the Los Angeles metropolitan area. However, native populations still occur on or near Detachment Fallbrook in the upper Santa Margarita River, its tributary De Luz Creek, and Trabuco Creek below O'Neill Park (CDFW 2015).

Adults are usually 70-100 mm in length but can reach as much as 120 mm. Body color is silver or gray to olive-green dorsally, white ventrally, and there usually is a dull gray lateral band (Moyle 1976 as referenced in CDFW 2015). The species has relatively large eyes and small mouths. Males have slightly larger fins than females, and when breeding (February through August) males have tubercles on the pectoral fin.

A study focusing on the Santa Margarita River conducted by the USGS (Warburton et al. 2000) found arroyo chubs to be most abundant in shallow riffles free from exotic fish in locales where heavy rains had removed vegetation. Exotic fish, particularly redeye bass (*Micropterus coosae*) affect a strong predation pressure on the arroyo chub in all but the largest size classes.

The species is now absent from most of its home range, a majority of which coincided with the Los Angeles metropolitan area; however, native populations are known to occur in the Santa Margarita River including northeast and west of Detachment Fallbrook (CNDDB 2014, USFWS 1998a, Warburton et al. 2000). Given the documented sightings have occurred both upstream and downstream of Detachment Fallbrook, and provided the highly dynamic nature of the river, it is assumed that this species occurs within the stretch of the Santa Margarita River along Detachment Fallbrook at least periodically.

L.3.4 Amphibians

Nomenclature and taxonomic order are based on Crother 2012.

L.3.4.1 Western Spadefoot (*Spea hammondii*)

Status: California Species of Special Concern, Multiple Species Habitat Conservation Plan Covered Species

The western spadefoot (formerly *Scaphiopus hammondii*) is a moderate-sized toad 1.5 to 3 in (3.8 to 7.5 cm) long; skin is relatively smooth; dorsum is green, brown or gray in color with tubercles tipped in orange, and the ventrum is whitish. Eyes are pale gold with vertical pupils. It gets its name from the distinctive teardrop shaped black spade on each hindfoot. It has four lightly colored irregular stripes, which vaguely form the shape of an hourglass on its back. It occurs almost exclusively in California west of the deserts and south from Shasta County to northern Baja California.

The western spadefoot occurs primarily in grasslands, scrub, and chaparral, but occasionally in valley-foothill hardwood woodlands, however, optimal habitat is grasslands with shallow temporary pools. Some populations have persisted for a few years in orchard or vineyard habitats. This toad is nocturnally active on the surface during rain events or periods of high humidity. They are rarely found on the surface and spend much of the year in underground burrows up to 3 ft (0.9 m) deep (CDFG 2000). The western spadefoot will use mammal burrows, and will also hide in drying mud cracks, under boards, and other surface objects such as cow dung. Breeding and egg laying occur almost exclusively in shallow, temporary pools formed by heavy rains from January through May. The western spadefoot enters the water only to breed, and is otherwise a completely terrestrial species. They emerge beginning in the late winter from burrows in the loose soil to breed in ephemeral rain pools. Larval development takes three weeks and requires that the water be at least 9 degrees Celsius; the rain pools also need to be free of exotic predators such as introduced fish, bullfrogs and crayfish (Jennings and Hayes 1994). Diet preferences include worms, butterfly and moth larvae, ants, termites, and beetles. Tadpoles consume planktonic organisms and algae, but also will consume dead aquatic larvae of amphibians, including their own species.

Because eggs are frequently laid in temporary pools, they are not as prone to predation from the bullfrog. However, habitat destruction due to construction has been a major contributor to their decline. Additionally, ground vibration caused by off road vehicle activity in the desert regions, which mimics the cue of the winter rains, has caused many populations to come out of hibernation and die before the winter rains start (Dimmitt and Rubial 1980; Brattstrom and Bondello 1983).

Western spadefoot has been documented on Detachment Fallbrook and is expected to occur in areas where preferred habitat is found throughout the installation.

L.3.5 Reptiles

Nomenclature and taxonomic order are based on Crother 2012.

L.3.5.1 California Legless Lizard (*Anniella pulchra pulchra*)

Status: California Species of Special Concern

The California or silvery legless lizard is a small lizard with no legs, a shovel-shaped snout, smooth shiny scales, and a blunt tail. Coloration varies on the dorsal from metallic silver, beige, dark brown, to black; and ventral coloration varies from whitish to bright yellow. There is typically a

dark line along the back and several thin stripes between scale rows along the sides. This lizard primarily lives underground, burrowing in loose sandy soil or loose moist soil with plant cover. It occupies moist areas in sparsely vegetated beach dunes, chaparral, pine-oak woodlands, desert scrub, sandy washes, and stream terraces with sycamores, cottonwoods, or oaks. They are mostly active in morning and evening, foraging beneath the surface of loose soil or leaf litter. Preferred diet includes larval insects, beetles, termites, and spiders. Breeding typically occurs between early spring and July, with 1-4 live young born between September and November (CA Herps 2011). Known predators include ringneck snakes, common kingsnakes, deer mice, long-tailed weasels, domestic cats, California thrashers, American robins, and loggerhead shrikes. Threats include habitat loss due to agriculture, housing development, sand mining, and other human land development; such as recreation, especially off-road vehicles in coastal dune areas; and exotic plant introduction such as ice plant.

The California legless lizard has been documented on Detachment Fallbrook and is expected to occur in areas where preferred habitat is found throughout the installation.

L.3.5.2 Orange-throated Whiptail (*Asipidoscelis hyperythra*)

Status: California Species of Special Concern, Multiple Species Habitat Conservation Plan Covered Species

Orange-throated whiptail (formerly *Cnemidophorus hyperythrus beldingi*) is a small lizard that reaches sizes between 50 and 94 mm. They are gray, reddish brown to dark brown or black in color with five to seven pale stripes. The top of their heads is yellow-brown to olive-gray, and their ventral sides are lighter in color with grayish blue bellies. Adults have a range of orange to red on their ventral sides, while hatchlings and juveniles have bright blue tails.

Orange-throated whiptails live on floodplains or stream terraces. Their main food source, termites, depend upon perennial vegetation for a food source, so one of their habitat requirements is the presence of perennial plants such as California buckwheat (*Eriogonum fasciculatum*), California sagebrush (*Artemisia californica*), black sage (*Salvia mellifera*), white sage (*Salvia apiana*) and chamise (*Adenostoma fasciculatum*). They tend to avoid open areas, and hibernate on covered, south-facing slopes. The orange-throated whiptail is reported to have an average home range of 364-445 meters (Jennings and Hayes 1994). Breeding occurs during June and July, at which time adult females may lay one or two clutches of eggs. Clutches range in size from 1-4 eggs.

The threats to the Orange-throated whiptails are based on loss and fragmentation of habitat. Hot fires, such as the type which regularly enter the Detachment from Camp Pendleton, can scorch the ground where the Orange-throated whiptails live, killing them and any eggs which may be deposited. In an undisturbed setting, recolonization of the habitat pocket eventually takes place. Due to fragmentation, routes of recolonization can be cut-off and populations become limited to smaller habitat patches, which are more easily lost.

Orange-throated whiptail has been documented on Detachment Fallbrook and is expected to occur in areas where preferred habitat is found throughout the installation.

L.3.5.3 Blainville's (=Coast) Horned Lizard (*Phrynosoma blainvillii*)

Status: California Species of Special Concern, Multiple Species Habitat Conservation Plan Covered Species

The Blainville's (=coast or San Diego) horned lizard (formerly *Phrynosoma coronatum blainvillii*) specific habitat requirements include loose, fine, sandy soils with limited vegetation cover. They may also be found in areas of denser shrub cover where small pockets of open habitat occur, such as those created by fire or other disturbance (Jennings and Hayes 1994). Its range extends through much of southern California west of the deserts, and into Baja California, Mexico, from sea level to 6,500 ft (2,000 m) (Smith 1946; Stebbins 1985). Historically, Blainville's horned lizard was most abundant in riparian and coastal sage habitats of the coastal plains of southern California, but has disappeared from about 45% of the areas it once inhabited (Jennings and Hayes 1994).

The Blainville's horned lizard is threatened by habitat fragmentation, nonnative ant species causing a degradation of the food base for horned lizards), off road vehicle activity, predation by domestic pets, and collecting, though commercial collecting was banned in 1981 (Schoenherr 1992; Jennings and Hayes 1994). Since horned lizards rely primarily on camouflage to avoid predators, they are very easy for humans to catch, but survival in captivity is poor and few are ever returned to the wild.

The Blainville's horned lizard has been documented on Detachment Fallbrook and is expected to occur in areas where preferred habitat is found throughout the installation.

L.3.5.4 Coronado Skink (*Plestiodon skiltonianus interparietalis*)

Status: California Species of Special Concern

The Coronado skink (formerly *Eumeces skiltonianus interparietalis*) is a smooth-scaled lizard with short limbs. It has blue coloration on the tail and a brown body with four light dorsal stripes. Sexual maturity is reached in two to three years, and a life expectancy of five to six years. They are habitat generalists, utilizing mesic pockets within coastal sage scrub, chaparral, oak woodlands, piñon-juniper, riparian woodlands and pine forests. They feed on invertebrates found in leaf litter or dense vegetation, but avoid preying upon ants. They are burrowers, creating tunnels under stones or other cover to use during hibernation and nesting (Jennings and Hayes 1994). Breeding occurs between June and July and a single clutch of 2-6 eggs may be laid. These eggs are tended by the female until hatching. Like many other species in southern California, habitat destruction due to construction is the main threat to the Coronado skink.

The Coronado skink has been documented on Detachment Fallbrook and is expected to occur in areas where preferred habitat is found throughout the installation.

L.3.5.5 Western (Coast) Patch-nosed Snake (*Salvadora hexalepis virgultea*)

Status: California Species of Special Concern

The western (=coast) patch-nosed snake is medium sized and yellow or beige mid-dorsal stripe bordered by dark tan or brown side stripes with a dull white venter, becoming orangish toward tail and rostral scale large, thick and triangular in shape (Fisher and Case 2015) . Little is known about their habitat requirements, but they are typically found in areas with the low shrub cover preferred by their major prey item, the whiptail lizard (*Asipidoscelis* sp.). They also utilize animal burrows

and woodrat nests to overwinter, so may be associated with the habitat requirements of these refuge creating mammals (Jennings and Hayes 1994).

The western patch-nosed snake has been documented on Detachment Fallbrook and is expected to occur in areas where preferred habitat is found throughout the installation.

L.3.5.6 Red Diamond Rattlesnake (*Crotalus ruber*)

Status: California Species of Special Concern, Multiple Species Habitat Conservation Plan Covered Species

The red diamond rattlesnake is found in southwestern California, from Morongo Valley west to the coast and south along the peninsular ranges to mid-Baja California. This venomous pit viper has a thin neck and a large triangular head with elliptical pupils. The body is variable in color; pink, tannish-pink, reddish-tan, reddish-brown, or brick red with dark diamond shaped markings on the dorsal side. The ventral side is usually dull yellow and unmarked. The tail is thick and has alternating black and white rings and the distinctive rattles that give this snake its name. This snake has a muscular body ranging in length from 2 – 4.5 ft (0.61 – 1.4 m).

The red diamond rattlesnake is thought to be at least somewhat active year-round, but mostly so in April and May when mating occurs. Females give live birth to young they carried for 140-150 days July through September. This species tends to occur in areas with heavy brush associated with large boulders and rocks. Adults feed on squirrels, rabbits, and the occasional fresh carrion while the juveniles also eat lizards. These snakes fall prey to red-tailed hawks (Jennings and Hayes 1994). Population levels for red diamond rattlesnakes are declining due to a number of reasons including habitat loss, illegal and over-collecting by snake breeders, and extermination wherever they are encountered by humans.

The red diamond rattlesnake has been documented on Detachment Fallbrook and is expected to occur in areas where preferred habitat is found throughout the installation.

L.3.5.7 Two-striped Gartersnake (*Thamnophis hammondii*)

Status: California Species of Special Concern, Multiple Species Habitat Conservation Plan Covered Species

The two-striped gartersnake is a diurnal medium sized snake that is non-venomous, primarily aquatic, and is 24 – 40 in (61 – 102 cm) in length. Dorsal coloration is drab olive, brown to brownish-gray or dark gray ground color, with no dorsal strip. A lateral stripe occurs on either side and may be yellowish to gray, or yellow-orange. Dark spots may occur on either side creating a checkered appearance. These snakes get their name from the lateral stripes running the length of either side of their body. The ventrum is pale yellow or orange, unmarked, or with dark smudging.

Two-striped gartersnakes live in perennial or intermittent streams with rocky beds that are lined by dense riparian vegetation. They can also utilize artificially created ponds, as long as the requirement for dense vegetation is met. They are infrequently found far from water, using it as cover to escape predators or to forage. Breeding occurs in late-March and early-April, with live young born in late-July and August. Diet consists of tadpoles, newt larvae, small frogs and toads, fish, and occasionally worms and fish eggs.

Known predators include: hawks, shrikes, herons, raccoons, coyotes and bullfrogs. Introduced animals such as largemouth bass, catfish and feral pigs are also thought to feed on this snake. Both juveniles and adults feed on fish, fish eggs, tadpoles and frog metamorphs. This species is declining throughout its range due to habitat modification, introduction of predators, loss of its anuran prey base and livestock grazing (Jennings and Hayes 1994).

The two-striped gartersnake has been documented on Detachment Fallbrook and is expected to occur in areas where preferred habitat is found throughout the installation.

L.3.5.8 Pacific (Southwestern) Pond Turtle (*Actinemys marmorata*)

Status: California Species of Special Concern, Multiple Species Habitat Conservation Plan Covered Species

The Pacific (=southwestern) pond turtle (formerly *Emys marmorata pallida* and C*lemmys marmorata pallida*) has a range that stretches from northern Baja California, Mexico up through central California. The southwestern pond turtle is moderately sized (120-210 mm) and brown to khaki in color without prominent markings (Holland 1991). Juveniles and females have light and dark mottled face and throat markings, while sexually mature males are lightly colored in these areas (Jennings and Hayes 1994).

The Pacific pond turtle is an aquatic turtle that generally leaves the water to overwinter, aestivate and reproduce, but have also been observed overwintering in the water. Their activity levels are closely tied to the temperature of the water; activity is notably increased when water temperatures reach 15 degrees C (D. Holland, pers. comm., as recorded in Jennings and Hayes 1994). Because of this, they are typically active year-round in southern California (Holland 1985, 1991; Zeiner et al. 1990; Rathbun et al. 1993). Pond turtles spend significant portions of their time in thermoregulation activities; when the air is warmer than the water, they will bask in the sun out of the water, but when the air becomes too warm, they will soak in the shallow surface layer, suspended on submergent vegetation with their heads above water (Bury 1972; Holland 1985).

They tend to live in aquatic habitats with some slack or slow water. Pacific pond turtle populations reach the highest densities in areas where there are plenty of good aerial and aquatic basking sites available. There also must be a high quality oviposition site within a suitable distance. Nests tend to be dug in soils with a high clay or silt component on unshaded, south-facing slopes. The distance of the nest to the aquatic site most likely depends on the availability of good habitat; nests typically are dug within 200 m, but have been recorded as far as 402 m away from the aquatic site. Turtles are known to move significant distances if their aquatic habitat changes (Jennings and Hayes 1994).

Mating generally takes place in late-April or early-May, but can occur throughout the year. Females can lay more than one clutch per year, depositing 1-13 eggs at a time. When it is time to oviposit, between late-April and early-August, the females will emigrate from their aquatic site to an upland site (Storer 1930; Rathbun et al. 1992, 1993, D. Holland, pers. comm., as recorded in Jennings and Hayes 1994). Most hatching and juvenile movement to the aquatic site occurs in the spring, but a few records in southern and central California show that it can also occur in the fall (Holland 1985). Pond turtles reach reproductive maturity between 7 and 11 years of age; the species is thought to be long-lived (Jennings and Hayes 1994).

Pond turtles are opportunistic eaters, and will consume almost anything they are able to catch, but because they are relatively slow movers, their diets consist mainly of carrion and slow-moving aquatic invertebrates as well as vegetation.

Major threats to the Pacific pond turtle are numerous. Streambed alteration is a major factor in the decline of the turtle because habitat is generally destroyed as the regime of scour and sedimentation is altered. Introduction of predatory species such as bullfrog, largemouth bass and bluegill have caused direct reductions in turtle populations. The introduction of the slider turtle presents the pond turtle with direct competition for habitat. Finally, as with most sensitive southern California reptiles and amphibians, illegal collection has significantly reduced the pond turtle's numbers (Jennings and Hayes 1994).

The Pacific pond turtle has been documented on Detachment Fallbrook and is expected to occur in areas where preferred habitat is found throughout the installation.

L.3.6 Birds

Nomenclature and taxonomic order are based on AOU 1998 and all updates through the 56th Supplement dated 1 July 2015.

L.3.6.1 Redhead (*Aythya americana*)

Status: California Species of Special Concern

San Diego County is the southern tip of the redhead's breeding range and breeding occurs in the northern portion of the County along the coast (Unitt 2004). They breed within dense marshes, typically over the water (Unitt 2004). It is more commonly found during the winter throughout the County, with Mission Bay being a central location for the wintering populations (Unitt 2004). This species has been observed on Detachment Fallbrook during surveys in the mid-1990s. It is not expected as a breeder or as a regular visitor to the installation.

L.3.6.2 American White Pelican (*Pelecanus erythrorhynchos*)

Status: California Species of Special Concern (Nesting Colony)

The American white pelican is a winter visitor to San Diego County (Unitt 2004). This species will opportunistically use inland lakes and high usage of O'Neill Lake on MCB Camp Pendleton has been documented (Unitt 2004). This species has been documented at Detachment Fallbrook but usage is only limited to winter when this species is not breeding.

L.3.6.3 Least Bittern (*Ixobrychus exilis*)

Status: California Species of Special Concern

Least bitterns are a rare resident of marshes dominated by cattails and tules (Unitt 2004). The species typically breeds in the coastal brackish lagoons and inland lakes, ponds, and streams (Unitt 2004). Breeding has been confirmed at O'Neill Lake on MCB Camp Pendleton and this same location is used by the species during winter (Unitt 2004). According to the animal list in Appendix J, the least bittern has been detected during winter/ migration on Detachment Fallbrook, although this sighting needs validation. No breeding pairs have been observed using Detachment Fallbrook.

L.3.6.4 White-faced Ibis (*Plegadis chihi*)

Status: Multiple Species Habitat Conservation Plan Covered Species

White-faced-ibis are mostly found in freshwater marshes foraging in the shallow water and wet grasses (Unitt 2004). They are known to breed mostly in northern San Diego County and San Pasqual Valley is the primary winter grounds for this species (Unitt 2004).

White-faced ibis have been seen foraging at the ponds of Detachment Fallbrook.

L.3.6.5 White-tailed Kite (*Elanus leucurus*)

Status: California Fully Protected Species

White-tailed kites, formerly called black-shouldered kites, are present in San Diego County year-round (Unitt 2004). They are easily identified by their white breast, grey back, and black shoulder patches. They have a long tail and forage by hovering and dropping onto their prey. They feed primarily on small mammals but will also take small birds, insects, reptiles, and amphibians.

White-tailed kites nest in riparian areas or oak woodlands, usually adjacent to open fields used for foraging (Unitt 2004). Outside of the breeding season they can be seen roosting in large groups (Unitt 2004).

White-tailed kites forage throughout the grasslands of Detachment Fallbrook and nest within the drainages typically in a large tree.

L.3.6.6 Northern Harrier (*Circus cyaneus*)

Status: California Species of Special Concern, Multiple Species Habitat Conservation Plan Covered Species

The northern harrier is a distinctive raptor both in appearance and behavior. Juveniles and females are brown above with brown heads and orange or cream colored mottled breasts. Males are gray above with a white mottled breast. All harriers have a distinctive white rump patch and forage by flying low over open fields and marshes.

Harriers nest from mid-April to July. They build a nest of sticks or grasses on the ground, usually near a wetland or in agricultural fields or grassland. They forage almost exclusively over grasslands and coastal sage scrub and feed on small mammals, birds, frogs, reptiles, crustaceans, and insects. The northern harrier was formerly fairly common in San Diego County during migration and winter months, but populations have been decimated due to urbanization (Unitt 2004).

This species is regularly seen foraging across the open habitats of Detachment Fallbrook and breeding has been confirmed in the North and South Magazines.

L.3.6.7 Swainson's Hawk (*Buteo swainsoni*)

Status: State Threatened, DOD Partner in Flight Priority Species

Swainson's hawks are rare migrants in San Diego County (Unitt 2004). Historically the species commonly bred in the County; however, several factors such as shooting, elimination of breeding habitat through urbanization and pesticides lead to the decline in breeding (Unitt 2004). This

species is more commonly seen in Anza Borrego during migration but small flocks have been documented along the coast in recent years (Unitt 2004, K. Fischer, pers. obs.).

This species has been observed during migration at Detachment Fallbrook in the mid-1990s and in 2011.

L.3.6.8 Golden Eagle (*Aquila chrysaetos*)

Status: Bald and Golden Eagle Protection Act, California Fully Protected Species, DOD Partner in Flight Priority Species, Multiple Species Habitat Conservation Plan Covered Species

Golden eagles are one of the largest raptors left in the wild with a wingspan of up to 224 cm (7.35 ft). They occur throughout California and North America, from sea level up to 3800 meters (Zeiner et al. 1990). They feed primarily on rabbits and California ground squirrels, but also hunt other small mammals, birds, reptiles, and carrion. Open areas such as grasslands, open chaparral or sage scrub and early successional stages of woodlands are important as hunting grounds (Zeiner et al. 1990).

Golden eagles form a long term pair and share most nesting responsibilities. They will nest on cliffs and large trees, often reusing previous nests. Nests can be three meters across, built of sticks and foliage. Golden eagles breed from January through August, producing clutches of 1-3 eggs in February to May (Zeiner et al. 1990). Incubation takes 43-45 days, and fledging occurs in 65-70 days. They may abandon a nest during incubation if disturbed by humans.

As a population, golden eagles in Orange and San Diego counties are acutely threatened by habitat loss, electrocution and shooting. Golden eagles that fledge from coastal southern California nests typically move less than 50 miles, and many are either electrocuted or shot directly after fledging and during dispersal (Bloom 1983). Sources of population decline are power line electrocution, inadvertent poisoning by coyote control programs and killing by ranchers.

In San Diego County, golden eagles are distributed mainly in the foothill zone and inland sections of the coastal lowland as well as along the desert-edge zone of Anza-Borrego Desert (Unitt 2004). Between 1997 and 2001, 50-55 pairs were documented in San Diego County, with four of these occurring west of Interstate 15 (Unitt 2004).

Golden eagles are known to occur at Detachment Fallbrook; however, there is minimal breeding habitat. The species uses Detachment Fallbrook for foraging.

L.3.6.9 Bald Eagle (*Haliaeetus leucocephalus*)

Status: Bald and Golden Eagle Protection Act, State Endangered

The bald eagle is a rare winter visitor to San Diego County (Unitt 2004). As their main prey is fish, they are typically found near lakes. Breeding has been documented in eastern San Diego County but is very rare in San Diego County. It has been documented as winter visitor at Lake O'Neil on MCB Camp Pendleton in 2000 (Unitt 2004).

On Detachment Fallbrook, a bald eagle was observed at bait stations set for golden eagle and turkey vulture in 2014. It was a visitor for several weeks and then moved off the Detachment.

L.3.6.10 Burrowing Owl (*Athene cunicularia*)

Status: California Species of Special Concern, DOD Partner in Flight Priority Species, Multiple Species Habitat Conservation Plan Covered Species, Bird of Conservation Concern

Burrowing owls are small (9–11 in) with a white chin strip and spots. Their heads are round, tails are stubby, and can often be seen by day, standing erect on the ground or on posts (Peterson 1990).They form loose colonies, with both resident and migratory components (E. Copper, pers. comm.). They construct their nests in abandoned ground squirrel burrows, so are strongly correlated with these burrow complexes. Eggs are produced from late March to mid-June, and fledglings are active through August (Unitt 1984). Throughout their range, burrowing owls are threatened by habitat loss, predation, vehicle impacts, and control programs for ground squirrels (Kaufman 1996).

The burrowing owl is a breeding resident of open, dry grassland and desert habitats throughout the western U.S. and Mexico (Zeiner et al. 1990). It is declining throughout its range, and nearing extirpation in coastal San Diego County (Unitt 1984; E. Copper, pers. comm.).

Burrowing owls have been detected during winter or during migration on Detachment Fallbrook. No breeding pairs have been observed using Detachment Fallbrook.

L.3.6.11 Long-eared Owl (*Asio otus*)

Status: California Species of Special Concern

The long-eared owl occurs throughout much of the U.S. and Canada. In San Diego County, it is rare resident of oak woodlands and broad riparian forests (Unitt 2004). They mostly feed on small mammals, birds, and reptiles, hunting in open areas near woodlands. Long-eared owls breed from March through July, producing one brood per year of 3-8 eggs in April and May. Incubation lasts from 21-28 days, and the young fledge in approximately 50 days (Zeiner et al. 1990). Few breeding colonies remain of this often colonial species (Unitt 2004). It was regularly documented on MCB Camp Pendleton from 1974 to 1992 (Unitt 2004).

This species has been observed on Detachment Fallbrook during raptor survey efforts in the mid-1990s and during California gnatcatcher surveys in 2009.

L.3.6.12 Vaux's Swift (*Chaetura vauxi*)

Status: California Species of Special Concern

Vaux's swift is more commonly a migrant to San Diego County but a wintering population is known to occur near Oceanside (Unitt 2004). This species moves through the coastal lowlands on their trip to their breeding grounds (Unitt 2004).

This species is regularly documented as a migrant moving through Detachment Fallbrook.

L.3.6.13 Costa's Hummingbird (*Calypte costae*)

Status: Bird of Conservation Concern

Costa's hummingbirds are known to be prevalent wherever ephemeral resources, such as flower blooms, are abundant (Unitt 2004). They move with the resources. The species is present in the desert for the late winter and spring bloom and then the sage brush and chaparral for the spring and

summer bloom (Unitt 2004). They are abundant throughout San Diego County but threats to this species include habitat fragmentation from development and the increase in Anna's hummingbird's (*Calypte anna*) who are better adapted to the urban environment and can outcompete Costa's hummingbirds in these areas (Unitt 2004).

This species is regularly documented breeding in the coastal sage scrub of Detachment Fallbrook.

L.3.6.14 Allen's Hummingbird (*Selasphorus sasin)*

Status: Bird of Conservation Concern

Allen's hummingbirds are mostly a migrant through San Diego County with a small breeding population present in Orange County that is expanding into northern San Diego and western Riverside Counties (Unitt 2004).

This species is regularly documented as a migrant moving through Detachment Fallbrook.

L.3.6.15 Nuttall's Woodpecker (*Picoides nuttallii)*

Status: Bird of Conservation Concern

Nuttall's woodpecker is a widespread resident of San Diego County found in riparian, oak and coniferous woodlands (Unitt 2004). This cavity nester prefers native trees such as willow, sycamore, and oak but will use non-native trees (Unitt 2004).

This species is regularly documented breeding in the riparian and oak woodland habitats of Detachment Fallbrook.

L.3.6.16 Prairie Falcon (*Falco mexicanus)*

Status: DOD Partners in Flight Priority Species

Prairie falcons forage over open terrain and nest in canyons, cliffs, escarpments, and rock outcrops (Dudek 2000). They prefer annual grasslands, alpine meadows, perennial grasslands, savannahs, rangeland, some agricultural fields, and desert scrub areas. The species requires sheltered cliff ledges for cover and nesting. In California, the prairie falcon is an uncommon permanent resident and migrant that ranges from southeastern deserts northwest along the inner Coast Ranges and Sierra Nevada. The largest threat to prairie falcons is disturbance at the nest site. This species is a rare breeder in San Diego County but the numbers have remained relatively stable (Unitt 2004).

This species is documented as a migrant moving through Detachment Fallbrook in surveys in the 1990's.

L.3.6.17 Olive-sided Flycatcher (*Contopus cooperi*)

Status: California Species of Special Concern, DOD Partners in Flight Priority Species

The olive-sided flycatcher is an uncommon migrant to the lower elevations of San Diego County (Unitt 2004). This species is a rare breeder in the mountains of San Diego County and only one coastal breeding location was documented in 1998 (Unitt 2004).

A migrant of this species was observed in 2011on the hillside near Lower Lake.

L.3.6.18 Vermillion Flycatcher (*Pyrocephalus rubinus*)

Status: California Species of Special Concern

Vermillion flycatchers breeding habitat, open riparian woodlands or mesquite bosques in desert floodplains, is not commonly found in San Diego County (Unitt 2004). The species is mainly seen as a migrant in the coastal zone of the County and the only incident of breeding in this zone was documented in Bonsall in 2000 (Unitt 2004).

This species has been observed once as a migrant on Detachment Fallbrook.

L.3.6.19 Loggerhead Shrike (*Lanius ludovicianus*)

Status: California Species of Special Concern DOD Partner in Flight Priority Species, Bird of Conservation Concern

The loggerhead shrike is uncommon, but widely distributed throughout much of San Diego County and the state (Unitt 1984, 2004; Unitt and Haas 2002; Small 1994). This species, along with other shrikes, has been on the decline for some time. Although the reasons for this decline are not clearly known, they may be related to the bioaccumulation of pesticides from its prey (Small 1994; Kaufman 1996). Changes in habitat may also be contributing to this decline (Kaufman 1996).

The shrike requires dense shrubs for concealing its nests, with ample open ground nearby for foraging (Unitt 2004). Eggs are typically laid from early March through mid-June, and chicks are fledged by late July (Unitt 2004). Loggerhead shrikes prey upon insects and vertebrate species (E. Copper, pers. comm.).

Loggerhead shrikes have been documented on Detachment Fallbrook and the installation provides suitable breeding habitat for the species. However, breeding has not been confirmed.

L.3.6.20 Bank Swallow (*Riparia riparia*)

Status: State Threatened

The bank swallow is currently a very rare migrant in San Diego County and historical nesting locations in San Diego County were along coastal bluffs (Unitt 2004). This species has been extirpated from the County as a breeder since 1925 (Unitt 2004). This species has been documented at Detachment Fallbrook during point counts, but only as a migrant.

L.3.6.21 Oak Titmouse (*Baeolophus inornatus)*

Status: Bird of Conservation Concern

The oak titmouse is mostly commonly found in oak woodlands as a year-round resident (Unitt 2004). It is a cavity nester with oaks and sycamores as the usual host tree (Unitt 2004).

This species is regularly documented breeding in the woodlands of Detachment Fallbrook.

L.3.6.22 Clark's Marsh Wren (*Cistothorus palustris clarkae*)

Status: California Species of Special Concern

Clark's marsh wrens are a resident species found in freshwater marshes in southern California (Unitt 2008). This species was originally found in Los Angeles and Orange Counties and then with the introduction of agricultural and urban development, the species spread into San Diego County (Unitt 2008). The species is restricted to freshwater and brackish marshes dominated by bulrushes and cattails (Unitt 2008).

Clark's marsh wrens have been documented at Lower Lake and Depot Lake.

L.3.6.23 Coastal Cactus Wren (*Campylorhynchus brunneicapillus sandiegensis*)

Status: California Species of Special Concern, DOD Partner in Flight Priority Species, Multiple Species Habitat Conservation Plan Covered Species, Bird of Conservation Concern

Coastal or San Diego cactus wrens are large, noisy and conspicuous wrens with a white-streaked back, black and white barred tail and wings, and cinnamon-buff on the belly and flanks. They feed on insects, seeds, cactus fruit and occasionally small reptiles or amphibians (Proudfoot et al. 2000).

Coastal cactus wrens are year-round residents of coastal lowlands, where they inhabit thick stands of cholla cactus within coastal sage scrub habitat. They build nests throughout the year, and males often build secondary nests for adult roosting, fledgling and secondary broods (Proudfoot et al. 2000). They lay eggs from early April to late May, and fledge from May to July. They are recorded as having been common in San Diego in the late 1800's, but urban development has removed much of the appropriate habitat since, and the coastal cactus wren is now locally considered rare (Unitt 1984, Unitt and Haas 2002).

In recent years, there has been a more concerted effort to document coastal cactus wren observations during California gnatcatcher monitoring efforts. As is seen in Figure L-3, the cactus wrens appear to follow a similar population trend since 2010, with a peak in 2012, as with the California gnatcatcher (Figure L-1). The 2014 Station-wide survey estimated the population at 35 pairs prior to the Tomahawk Fire in May 2014 (Kidd Biological 2016), which burned through core areas of cactus wren habitat. Post-fire numbers are currently unknown, but are expected to be dramatically reduced. Continuation of the monitoring program will help document recovery.

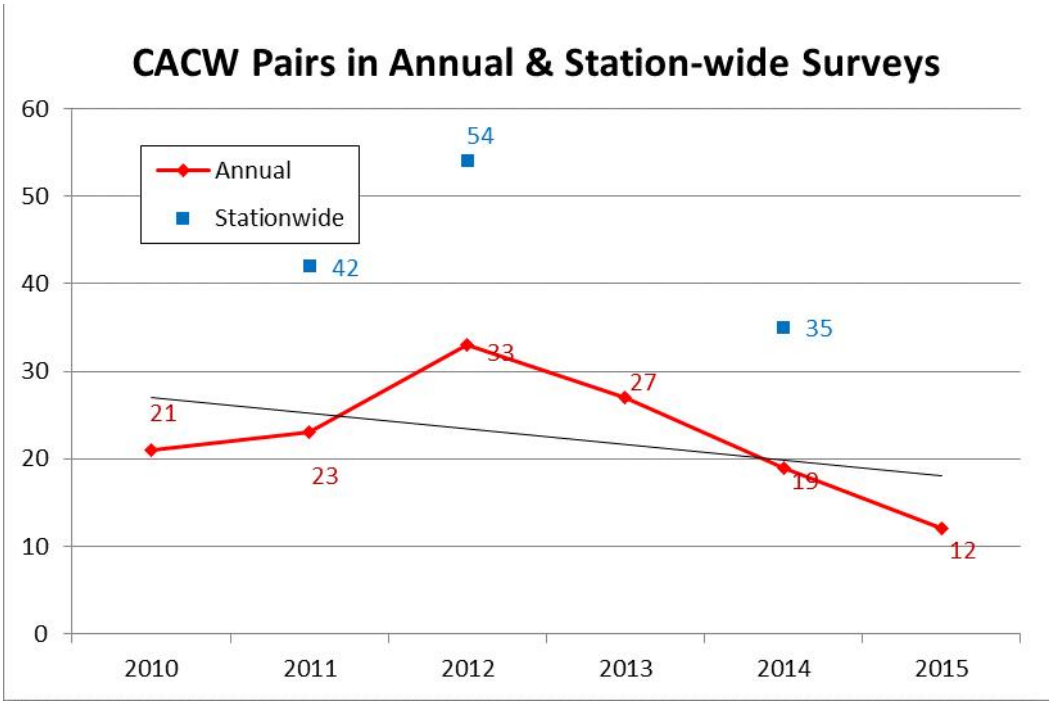


Figure L-3. Estimated number of coastal cactus wren territories within the annual survey polygons and stationwide as estimated during the California gnatcatcher surveys. Although there was not a stationwide gnatcatcher survey in 2012, the coastal cactus wrens were surveyed under a separate effort by the USGS that year. See Appendix H for citations for each California gnatcatcher survey year. The Tomahawk Fire occurred after the majority of the surveys were completed in 2014; and the reduced number that year is likely due to the severe drought conditions.

L.3.6.24 Yellow Warbler (*Setophagia petechia*)

Status: California Species of Special Concern, Bird of Conservation Concern

The yellow warbler (formerly *Dendroica petechia*) is a small insectivorous migratory passerine that inhabits lowland and foothill mature riparian woodlands (Unitt 2004; Dudek 2000). Preferred plant species include cottonwoods (*Populous* spp.), willows (*Salix* spp.), and other small trees and shrubs typically found in open-canopy riparian woodlands. Yellow warblers are usually on their breeding grounds from late March to mid-October. Destruction and degradation of riparian habitat and brood parasitism by the brown-headed cowbird led to the decline of this species (Unitt 2004). Cowbird trapping has led to an increase in the San Diego County population of yellow warblers (Unitt 2004).

Yellow warblers are commonly found breeding within the riparian habitat on Detachment Fallbrook.

L.3.6.25 Yellow-breasted Chat (*Icteria virens*)

Status: California Species of Special Concern, Multiple Species Habitat Conservation Plan Covered Species

The yellow-breasted chat is a common summer breeding visitor that prefers to nest in extensive dense thickets of riparian habitat (Unitt 2004). This species is very secretive so finding their nests is a challenge. The decline of this species is due to the loss of riparian woodlands in the coastal lowland as a result of development, agriculture, and channeling rivers (Dudek 2000).

Yellow-breasted chats are found breeding within the riparian habitat on Detachment Fallbrook.

L.3.6.26 Southern California Rufous-crowned Sparrow (*Aimophila ruficeps canescens)*

Status: Multiple Species Habitat Conservation Plan Covered Species

The southern California rufous-crowned sparrow is a resident species that is closely associated with coastal sage scrub, steep rocky hillsides, burned chaparral, and openings in mature chaparral (Unitt 2004). Preferring open habitat with approximately 50% shrub cover, this species seeks cover in shrubs, rocks, grass, and forb patches (Dudek 2000, Unitt 2004). The southern California subspecies is restricted to semiarid coastal sage scrub and sparse chaparral from Santa Barbara south to the northwestern corner of Baja California (Dudek 2000). Southern California rufous-crowned sparrows are declining due to loss of appropriate habitat and their sensitivity to habitat fragmentation (Unitt 2004).

This species is regularly documented breeding in the open habitats of Detachment Fallbrook.

L.3.6.27 Brewer's Sparrow (*Spizella breweri)*

Status: DOD Partner in Flight Priority Species

Brewer's sparrows are a winter visitor and migrant through San Diego County (Unitt 2004). It is typically a desert species but has been seen along the coastal slope (Unitt 2004).

This species is documented as a migrant moving through Detachment Fallbrook.

L.3.6.28 Black-chinned Sparrow (*Spizella atrogularis)*

Status: DOD Partner in Flight Priority Species, Bird of Conservation Concern

Black-chinned sparrows are typically found in rugged terrain on chaparral-covered slopes throughout San Diego County's foothills and mountains (Unitt 2004). It is mostly a summer visitor breeding species that is very sensitive to habitat fragmentation (Unitt 2004).

This species is documented at Detachment Fallbrook.

L.3.6.29 Bell's Sage Sparrow (*Amphispiza bellii bellii)*

Status: DOD Partner in Flight Priority Species, Multiple Species Habitat Conservation Plan Covered Species

The Bell's sage sparrow is a resident species that is usually found in chaparral and coastal sage scrub in southern California into Baja California. This mostly ground-dwelling species prefers open chaparral and sage scrub and is one of the first species to inhabit recently burned habitat (Unitt 2004). The subspecies Bell's sage sparrow occurs along the coastal lowlands, inland valleys, and in the lower foothills of the local mountains in southern California into Baja California (Dudek 2000). The decline in this species can be attributed to fire suppression, exotic plant species, loss of habitat to agriculture and urban development, and population isolation due to habitat fragmentation (Unitt 2004, Dudek 2000).

This species is documented regularly in the open chaparral and sometimes the coastal sage scrub of Detachment Fallbrook.

L.3.6.30 Grasshopper Sparrow (*Ammodramus savannarum*)

Status: California Species of Special Concern, Multiple Species Habitat Conservation Plan Covered Species

The grasshopper sparrow is a grassland bird named for its song, which seemingly mimics a grasshopper's call. It is a small sparrow with a dark head streaked with buff and a back streaked with chestnut and black. This sparrow's breast is light colored, and yellow colors the edges of its wings. Grasshopper sparrows breed across most of the United States. This species has been chosen as a focus species because it prefers a distinct type of grassland than does the Stephens' kangaroo rat and may be excluded with a management direction geared only for the endangered Stephens' kangaroo rat.

Grasshopper sparrows lay eggs from April to May and fledge from May to June. Clutch sizes fall between three and six eggs which are incubated by the female alone for eleven to thirteen days while the male perches at the edge of the territory. Both sexes are responsible for feeding the young various invertebrate species. Grasshopper sparrow nests are vulnerable to brood parasitism by the brown-headed cowbird, although parasitism rates for this species are thought to be relatively low compared with other grassland birds (Vickery 1996).

Grasshopper sparrows typically select lush grasslands with some shrub cover typical of coastal sage scrub plants, such as California buckwheat (*Eriogonum fasciculatum*). In San Diego, they scatter themselves throughout the inland valleys of the coastal lowland. Extensive stands of *Stipa* sp. with blue-eyed grass (*Sisyrinchium bellum*) and the yellow flowered onion (*Bloomeria crocea*) are good indicators of grasshopper sparrow habitat. Females build cup-shaped ground nests at the base of *Stipa* clumps with grass overhanging them for visual protection. The birds are active from late March through Mid-July and can be seen singing from tall grasses. When they are not singing, they hide in dense grasses and are very difficult to detect. It is unknown whether the local population is fully resident or partially migratory (Unitt 1984).

Grasshopper sparrows are found throughout the grasslands on Detachment Fallbrook.

L.3.6.31 Tri-colored Blackbird (*Agelaius tricolor*)

Status: California Species of Special Concern, DOD Partner in Flight Priority Species, Multiple Species Habitat Conservation Plan Covered Species, Bird of Conservation Concern

Tri-colored blackbirds nest in dense colonies of 50 to 1000 pairs in freshwater marshes, where they can be found on cattail, tule, willow, mulefat and tamarisk. They forage in agricultural areas, damp turfgrass and on lakeshores. They are typically seen in coastal lowland, but sometimes disperse to other areas. They produce eggs from late March to late May, and fledging occurs from May into June.

Tri-colored blackbirds were common to abundant in San Diego County until about the mid-1980s, when there began a sharp drop in their population numbers (Unitt 2004). Tri-colored blackbirds are sensitive to crop harvesting activities and loss of habitat due to land conversions (Beedy and Hamilton III 1999). The closest breeding colony to Detachment Fallbrook is in Bonsall (Unitt 2004).

This species has been observed at Detachment Fallbrook in the mid-1990s and in 2010. A breeding colony has not been detected.

L.3.6.32 Yellow-headed Blackbird (*Xanthocephalus xanthocephalus*)

Status: California Species of Special Concern

Yellow-headed blackbirds are mostly seen as a rare migrant or winter visitor in San Diego County (Unitt 2004). One breeding colony is known to exist near Boulevard (Unitt 2004). This species only nests in deeply flooded freshwater marshes (Unitt 2004).

Migrants have been observed at nearby MCB Camp Pendleton and the species has been documented at Detachment Fallbrook as a migrant as recently as 2009.

L.3.6.33 Lawrence's Goldfinch (*Carduelis lawrencei*)

Status: DOD Partner in Flight Priority Species, Bird of Conservation Concern

Lawrence's goldfinches are found in San Diego County year-round but are considered a nomadic species in that they move where the food resources are (Unitt 2004). Like other goldfinches, this species needs to drink regularly so it makes flights to local water sources (Unitt 2004).

This species is a rare visitor to Detachment Fallbrook as it has only been observed once in 2012.

L.3.7 Mammals

Nomenclature and taxonomic order are based on Wilson and Reeder 2005.

L.3.7.1 Western Red Bat (*Lasiurus blossevillii*)

Status: California Species of Special Concern

Western red bats are considered a tree bat as they only roost in trees (BCI 2015). This species is solitary and is found with others only during mating and migration (BCI 2015). The species is

usually found in dense foliage in forests and wooded areas (Zeiner et al. 1990). They forage over a variety of habitats including grasslands, shrublands, open woodlands and forests, and croplands and are not found in desert areas (Zeiner et al. 1990).

On Detachment Fallbrook, western red bats were detected during surveys conducted in 2013 and 2014 at 14 of the sampling locations (Stokes 2015).

L.3.7.2 Pallid Bat (*Antrozous pallidus*)

Status: California Species of Special Concern, Multiple Species Habitat Conservation Plan Covered Species

Pallid bats are widely distributed in the southwestern U.S. and northern Mexico (BCI 2015). They are locally common across most of California except in the far northwest and in higher portions of the Sierra Nevada. Habitats utilized include a wide variety of grasslands, shrublands, woodlands, and forests, including mixed conifer forest (Zeiner et al. 1990). They appear to be most common in open, dry, rocky lowlands and they roost in caves, mines, as well as crevices in rocks, buildings and trees. This is a colonial species that forages low over open ground, often picking up beetles and other species of prey off the ground (Zeiner et al. 1990). Flight is slow and maneuverable, and they are able to take a wide variety of prey, including large, hard-shelled insects (Zeiner et al. 1990). They have separate night and day roosts, hibernate in winter, and the sexes segregate in summer.

On Detachment Fallbrook, pallid bats were detected during surveys conducted in the mid-1990s but were not detected during the 2013 and 2014 survey (Stokes 2015). The pallid bat was once present on Detachment Fallbrook based on observations of guano and acoustic detections at various locations including building 216 where there was once a large roost of mixed bat species (Brown 1995). There were no obvious signs of this species during a bat survey and building roost exclusion project several years later (The Environmental Trust 2002).

L.3.7.3 Pocketed Free-tailed Bat (*Nyctinomops femorosaccus*)

Status: California Species of Special Concern

The pocketed free-tailed bat is found in Riverside, San Diego, and imperial Counties and is considered rare in California (Zeiner et al. 1990, species profile updated 2000). It is mostly found in desert regions where they forage in flight over ponds, streams, and arid desert habitat and roost in rocky crevices (Zeiner et al. 1990).

On Detachment Fallbrook, pocketed free-tailed bats were detected during surveys conducted in 2013 and 2014 at 17 of the sampling locations (Stokes 2015).

L.3.7.4 Western Mastiff Bat (*Eumops perotis*)

Status: California Species of Special Concern

Western mastiff bats are the largest native bats in the U.S. This subspecies occurs from the western foothills of the Sierra Nevada and the coastal ranges (south of San Francisco Bay) southward into Mexico (BCI 2015). In southern California, they are found throughout the coastal lowlands up to drier mid-elevation mountains, but avoid the Mohave and Colorado deserts (Zeiner et al. 1990). Habitats include dry woodlands, shrublands, grasslands, and occasionally even developed areas. This bat forages in flight and most prey species are relatively small, low to the ground, and weak-flying.

For roosting, western mastiff bats appear to favor rocky, rugged areas in lowlands where abundant suitable crevices are available for day roosts (BCI 2015). Roost sites may be in natural rock or in tall buildings, large trees or elsewhere. The reasons for this species' decline are poorly understood but probably are related to disturbance, habitat loss, and perhaps widespread use of pesticides.

On Detachment Fallbrook, western mastiff bats were detected during surveys conducted in 2013 and 2014 at 13 of the sampling locations (Stokes 2015).

L.3.7.5 San Diego Black-tailed Jackrabbit (*Lepus californicus bennettii*)

Status: California Species of Special Concern, Multiple Species Habitat Conservation Plan Covered Species

The black-tailed jackrabbit (*Lepus californicus*) inhabits a wide range of habitats, including deserts, irrigated croplands, high mountains to 2,500 m (8,200 ft), and is commonly found in the western U.S. to Mexico and Baja California. The San Diego subspecies (*L.C. bennettii*) is found mostly on the coastal side of the local mountains in open habitats, usually avoiding dense stands of chaparral or woodlands (Stephenson and Calcarone 1999). The San Diego black-tailed jackrabbit is a large, long legged hare, with distinctive long ears and a blackish tail (Whitaker 1996). This species has been declining due to urban development, habitat loss, and fragmentation leading to population isolation (Dudek 2000).

Black-tailed jackrabbits prefer to eat grasses and forbs but will eat other vegetation as well. They do not require access to drinking water because they take in enough moisture from the plants they eat. Young jackrabbits are born under shrubs, but no special nest structure is built. They are active during the day and do not act territorially and tend to be solitary except when breeding. They will breed throughout the year and produce up to four litters a year. Population size is cyclic and fluctuates in 3–6-year intervals. They have numerous predators including coyotes, raptors, and snakes (CDFG 1990).

The San Diego black-tailed jackrabbit has been detected on Detachment Fallbrook in numerous years, mostly in the South Magazine.

L.3.7.6 Dulzura Pocket Mouse (*Chaetodipus californicus femoralis*)

Status: California Species of Special Concern

Dulzura pocket mouse (*Chaetodipus californicus femoralis*) is mainly active on the ground, but also climbs shrubs and small trees when feeding (CDFG 1990). This species can become torpid by day at any time of the year, and is inactive in cold wet weather. It breeds in spring to early summer and occurs from sea level to approximately 2,408 m (7,900 ft) AMSL (CDFG 1990). This species prefers dense chaparral and is less common in dry grassland and desert scrub. The adult Dulzura pocket mouse ranges from 81-91mm in length. It is olive brown, with 20 teeth, and spinelike hairs on its rump (Burt and Grossenheider 1976). Bleich (1973) found the Dulzura pocket mouse to inhabit both the riparian and coastal sage shrub habitats on Detachment Fallbrook.

This species has been documented during survey efforts in the early 1990s and early 2000s.

L.3.7.7 Northwestern San Diego Pocket Mouse (*Chaetodipus fallax fallax*)

Status: California Species of Special Concern

The northwestern San Diego pocket mouse (*Chaetodipus fallax fallax*) is typically found in coastal sage scrub, sage scrub/grassland ecotones, and chaparral (Dudek 2000). It inhabits open, sandy areas of both the Upper and Lower Sonoran areas of southwestern California and northern Baja California (Dudek 2000). This species is sensitive to habitat fragmentation and degradation, which has led to its decline.

This species has been documented during survey efforts in the early 1990s.

L.3.7.8 Southern Grasshopper Mouse (*Onchomys torridus ramona*)

Status: California Species of Special Concern

The southern grasshopper mouse is typically found in grasslands and sparse coastal sage scrub habitats where they nest in burrows (Dudek 2000). They may dig their own burrows in sandy or other friable substrates but often they will use burrows dug by other rodents such as pocket gophers (*Thomomys* sp.) and kangaroo rats (*Dipodomys* sp.) This subspecies is restricted to coastal Southern California (Whitaker 1996). Loss and fragmentation of grassland and sparse sage scrub habitats have led to the decline of this species.

The southern grasshopper mouse has been detected on Detachment Fallbrook but the sighting needs validation.

L.3.7.9 San Diego Desert Woodrat (*Neotoma lepida intermedia*)

Status: California Species of Special Concern

San Diego desert woodrat requires large amounts of water, which it obtains from fleshy plants such as *Yucca* species and prickly pear cactus (*Opuntia* sp.). It usually makes a stick house under one of these food plants, or may den among rocks (CDFG 1990). House materials include cacti, sticks, bones and a variety of debris. Houses provide insulation against excessive heat as well as protection from predators. This species breeds in late winter or spring, occurs from sea level to approximately 2,591 m (8,500 ft) AMSL in deserts and coastal sage scrub, and prefers areas with rocky outcrops and plentiful succulents (CDFG 1990).

The San Diego desert woodrat has been detected on Detachment Fallbrook as recently as 2010.

L.3.7.10 American Badger (*Taxidea taxus*)

Status: California Species of Special Concern, Multiple Species Habitat Conservation Plan Covered Species

The American badger is an uncommon permanent resident found in open stages of most shrub, forest, and herbaceous habitat in areas with friable coils (Zeiner et al. 1990). Badgers are carnivorous and eat small mammals, especially ground squirrels and pocket gophers (Zeiner et al. 1990). Their home range can be from approximately 300 to 1,500 acres in size (Zeiner et al. 1990).

One American badger has been observed south of the public works building in the South Magazine. It is unknown if this animal is still present. Skeletal remains of a badger have been found since the sighting.

L.3.7.11 Mountain Lion (*Felis concolor*)

Status: Multiple Species Habitat Conservation Plan Covered Species

Mountain lions prefer rocky areas, cliffs, and ledges that provide cover within open woodlands and chaparral (Dudek 2000). Riparian areas also provide protective habitat connections for movement between fragmented habitats. This species is widespread in North and South America and occupy a broad variety of habitats from the northern limit of the Canadian forests to Patagonia in South America. Populations of this species require large areas to sustain themselves, requiring at least 850 square miles to remain stable (Dudek 2000). Habitat fragmentation, loss of large areas of undeveloped land, road kills, indiscriminate shootings, animal control measures, and loss of natural prey base have led to the decline of this species.

Mountain lions or their sign are seen regularly on Detachment Fallbrook. Sign is most commonly seen along the Santa Margarita River and to a lesser extent at Lower Lake. Radio collars have been put on mountain lions and they have been documented moving through the Detachment.

L.4 OTHER SPECIAL-STATUS SPECIES WITH HIGH POTENTIAL TO OCCUR ON DETACHMENT FALLBROOK

L.4.1 Plants

L.4.1.1 Chaparral Sand Verbena (*Abronia villosa* var. *aurita*)

Status: CRPR List 1B.1

Chaparral sand verbena is found on the coastal side of the southern California mountains in chaparral and coastal sage scrub plant communities. This plant is one of nine species in the *Abronia* (sand verbena) genus. This diminutive herb has bright and fragrant magenta flowers and gray foliage. Sand-verbena likes full sun, and sandy soil. It does not tolerate weeds and requires bare ground for germination and growth.

A.v. var. *aurita* has a larger perianth tube than *A.v.* var. *villosa*, with lengths of 2.0-3.5 cm and 1.3-2.0 cm respectively (Hickman 1993). An additional distinction can be observed in the fruit of these two varieties, the *aurita* variety having nearly smooth fruit bodies, while *villosa* fruits are prominently wrinkled (Hickman 1993).

Chaparral sand verbena is not known to occur on Detachment Fallbrook. The species has been detected in the Santa Margarita River north of Detachment Fallbrook (CNDDB 2014). This population is presumed extant, and this species may potentially occur on the installation.

L.4.1.2 Orcutt's Pincushion (*Chaenactis glabriuscula* var. *orcuttiana*)

Status: CRPR List 1B.1

Orcutt's pincushion is an annual, with fleshly lower leaves on its basal rosette (Hickman 1993). There are usually few inflorescences per stem and the peduncles are less than 4.5cm, with bright yellow flowers (Hickman 1993). Orcutt's pincushion is distributed along the Southern California coast from northwest Baja California to Santa Barbara (Hickman 1993).

An 1885 herbarium specimen from Fallbrook documents its location to within mile of Detachment Fallbrook's boundary (CNDDB 2014). This species is presumed to be extant and may potentially occur on Detachment Fallbrook.

L.4.1.3 Parry's Tetracoccus (*Tetracoccus dioicus*)

Status: CRPR List 1B.2

Parry's tetracoccus is found from Riverside County to Baja California. This rare shrub is associated with low growing chamise chaparral and according to Reiser (1994) is found in xeric conditions with a preference for Las Posas soils less than 1000 m (Hickman 1993).

No records exist for Parry's tetracoccus occurring on Detachment Fallbrook. Sightings exist from De Luz Road northwest of Detachment Fallbrook (CNDDB 2014). These populations are presumed extant, and this species may potentially occur on Detachment Fallbrook.

L.4.1.4 Rainbow Manzanita (*Arctostaphylos rainbowensis*)

Status: CRPR List 1B.1

Rainbow manzanita inhabits southern mixed chaparral with a relatively dense canopy from six to eight feet (Reiser 1994). This species range is restricted to extreme northern San Diego and southwestern Riverside Counties (Reiser 1994). This burl-forming perennial shrub grows to one to four meters in height (Keeley and Massihi 1994). It blooms in December through March (Calflora 2015

This species has not been recorded on Detachment Fallbrook; however, it is known to occur north of the installation and on adjacent MCB Camp Pendleton (CNDDB 2014).

L.4.1.5 Sticky Dudleya (*Dudleya viscida*)

Status: List 1B.2

Sticky dudleya is distributed from San Diego County and into Baja California. Reiser (1994) states that this conspicuous succulent perennial grows predominantly on very steep north-facing slopes, and is amenable to shade and mesic conditions. Typically, sticky dudleya is situated on exposed gabbroic rock, growing on very shallow soils or from cracks on vertical rock slabs (Reiser 1994). The sticky dudleya is named for its leaves that secrete a sticky resinous substance. Leaves are 6-15cm long and 5-15mm wide (Hickman 1993). Tips are abruptly pointed and the flowers are white with red lining (Hickman 1993).

There are records of this plant growing within one mile of the Detachment Fallbrook in Roblar Canyon on MCB Camp Pendleton as of 1994 (CNDDB 2014). While this species is not recorded for Detachment Fallbrook, it may occur along the installations northern boundary.

L.4.2 Invertebrates

No invertebrates on the California Species of Concern list are known to have the high potential to occur on Detachment Fallbrook.

L.4.3 Fish

No invertebrates on the California Species of Concern list are known to have the high potential to occur on Detachment Fallbrook.

L.4.4 Amphibians

L.4.4.1 Coast Range Newt (*Taricha torosa torosa*)

Status: California Species of Special Concern

The Coast Range newt is a subspecies of the California newt (*Taricha torosa*). The distribution of the Coast Range newt is highly fragmented and is restricted to between the Santa Ana River and south to the Santa Margarita River. The Coast Range newt is relatively large salamander from 40-185 mm in length. Terrestrial adults are yellowish-brown to dark brown above, pale yellow to orange. This newt breeds in aquatic habitats, however adults frequent terrestrial habitats and can be

found as much as 1.6 km from a watercourse (Holland and Goodman 1998; Jennings and Hayes 1994). In terrestrial environments, Coast Range newts feed on earthworms, insects, and other small invertebrates, but during the breeding season they may additionally feed upon the larvae of other amphibians including the eggs of con-specifics (Jennings and Hayes 1994). Adult males undergo physiological changes during the breeding season; the tail becomes more flipper-like, the skin becomes smooth and vascularized, and the areas around the cloaca become enlarged. During reproduction more than 20 males may entangle a single female. Eggs are placed on aquatic substrates. The skin of the Coast Range newt is extremely toxic, and after handling, hands should be washed immediately.

The major threats to this species are the introduction of exotic competitors, including crayfish (*Procambarus clarkii*) and mosquitofish (*Gambusia affinis*), and heavy sedimentation as a result of large scale wildfires. A survey by Holland and Goodman (1998) revealed the presence of the Coast Range newt on MCB Camp Pendleton. It is not known whether this species occurs on Detachment Fallbrook; however, it has the potential to occur along the Santa Margarita River and associated upland vicinity.

L.4.5 Reptiles

No reptiles on the California Species of Concern list are known to have the high potential to occur on Detachment Fallbrook.

L.4.6 Birds

No birds on the California Species of Concern list (other than those that have been observed on Detachment Fallbrook and discussed above) are known to have the high potential to occur on Detachment Fallbrook. The spotted owl is discussed below it has been historically detected on MCB Camp Pendleton but it does not have high potential to occur.

L.4.6.1 Spotted Owl (*Strix occidentalis occidentalis*)

Status: California Species of Special Concern

The spotted owl lives year-round in shady oak and conifer woodlands in San Diego County (Unitt 2004). They breed above 2,500 feet are most often seen in the eastern part of San Diego County between 4,000 and 6,000 feet, and the only costal sightings are at MCB Camp Pendleton (Unitt 2004). Spotted owls breed from March through July, typically nesting in old raptor nests, in a tree cavity, on accumulated debris in a crotch of an oak or broken trunk, and they are known to use cliffs (Unitt 2004). Estimates at the population size in San Diego County are 25-50 pairs (Unitt 2004).

This species has not been observed on Detachment Fallbrook but has been sporadically detected on the adjacent MCB Camp Pendleton (Unitt 2004) and in upper Trabuco canyon in Orange County (Hamilton and Willick 1996). The MCB Camp Pendleton sightings consist of egg collection along the Santa Margarita River in 1984 and San Onofre Canyon in 1908, and an individual was observed in 1997 along a tributary to San Onofre Creek (Unitt 2004). In Orange County, the closest sighting was in upper Trabuco Canyon and the pair was last heard in 1994 (Hamilton and Willick 1996).

L.4.7 Mammals

No mammals on the California Species of Concern list are known to have the high potential to occur on Detachment Fallbrook.

L.5 PROBLEM SPECIES

L.5.1 Plants

L.5.1.1 Barb Goatgrass (*Aegilops triuncaialis*)

Status: Cal-IPC High, California Department of Food and Agriculture Noxious Weed List B

Barb goatgrass is an annual grass native to Mediterranean Europe and western Asia. It was identified in California in the early 1900s, but its rapid spread is relatively recent. It is becoming a dominant grass in central California foothill grasslands (Cal-IPC 2016). This weed grows in rangelands, grasslands, and oak woodlands. The USDA has labeled barb goatgrass as a B-rated noxious weed, which indicates that goatgrass is a species that has detrimental economic importance in California (University of California 2008).

This invasive grass is a winter annual approximately 8 to 20 inches tall. Young leaves appear rolled when protruding from older leaves. Fine hairs are present on leaf and sheath margins, and sparsely cover the upper and lower leaf. Four to six seeds are produced per plant. The spike is compact and breaks into joints at the node. There are three barbed awns from each glume, which can cause eye injury to grazing livestock and wildlife. When the seeds mature, the entire spike drops from the stem and remains intact on the soil surface, eventually breaking into four joints that each contain a spikelet. It germinates with the onset of fall rains, and matures between May and August. Large and small seeds are produced. The large seed usually germinates the first season; however, the small seed can remain dormant for up to 5 years. The plant is easily identified by uprooting and inspecting the base of the plant, since most plants still have the spikelet attached that contained the seed. Barb goatgrass creates dense stands with a deep and rapidly established root system. It is extremely competitive on annual rangelands crowding out native perennial species. Creating monotypic stands it can quickly infest and entire ranch (University of California 2008).

Control methods are most effective with early detection of barb goatgrass. Prescribed burning is effective if utilized with multiple burn applications. Manual/mechanical removal such as, early growing season mowing, has limited effect. However, heavy defoliation at and just prior to seed head emergence is effective in limiting seed protection. Chemical removal for small patches detected early is effective, but requires at least two years of application to ensure the seed bank is exhausted (University of California 2008).

Detachment Fallbrook is the only known population of barb goatgrass in San Diego County. Management of this species on Detachment Fallbrook has been aggressive. The entire area and a buffer has gone through extensive treatments to kill the plant and a long-term study on the survival of the seed bank was initiated in 2011. By 2014, just prior to the Tomahawk Fire, the vast majority of seeds in the seedbank study no longer appeared to be viable. Preliminary results from laboratory seed germination testing have indicated that the seeds from Detachment Fallbrook (southern California) have lower dormancy than those from northern California. This bodes well for the eradication of the species on the installation.

L.5.1.2 Bridal Veil Broom (*Genista monosperma*)

Status: Cal-IPC Moderate

Bridal veil broom (formerly *Retama monosperma*) is native to the Mediterranean region and is considered an invasive species where it has been introduced. This woody perennial shrub is a legume approximately 3 m or more in height when full grown. The plant is gray-green and is almost entirely leafless, with slender branches dropping in a weeping willow fashion (Cal-IPC 2014). Flowers are white and pea-like and there is one seed per pod (Cal-IPC 2014). This plant is considered invasive due to its capability to outcompete native plants, often forming dense fields where other species are crowded out. Stands can become so thick rendering grasslands and shrublands useless for wildlife. Control methods include manual/mechanical removal or chemical removal using a solution with an added surfactant for improved effectiveness. However, chemical removal only kills plants leaving the seed bank still intact. There are currently no USDA approved biological control agents. An integrated approach for treatment and removal is most effective (Cal-IPC 2014).

Management of this species on Detachment Fallbrook consists of removal of individuals when detected. Biologists for all surveys occurring on the installation are given information of the species and asked to report incidental observations for removal. In addition, Detachment Fallbrook has teamed with off-installation property owners and the County of San Diego to remove off-installation source populations.

L.5.1.3 Hottentot Fig (*Carpobrotus edulis*)

Status: Cal-IPC High

Hottentot fig is a perennial ground-hugging succulent. Native to coastal areas of South Africa, this plant was widely planted for soil stabilization and landscaping. It was brought to California in the early 1900s for stabilizing soil along railroad tracks, then later used by Caltrans for similar purposes. It has shallow fibrous roots and has every node in contact with the soil. This species forms deep mats that cover large areas with a monospecific stand. In California, it blooms throughout the year, peaking in late spring and early summer. Leaves are three-sided and flowers are large yellow or light pink 2.5 to 6 inches in diameter. Flowers do not appear to require specific pollinators (Cal-IPC 2012).

Hottentot fig spreads both vegetatively and by seeds. Individual clones can grow to at least 165 ft in diameter and shoot segments can continue to grow if they are isolated or separated from the parent plant. Seeds are abundant and dispersed by generalist mammalian frugivores, such as deer, rabbits, and rodents. It easily spreads beyond landscape plantings invading foredune, dune scrub, coastal bluff scrub, and maritime chaparral habitats. Intolerant of frost and in not found at elevations greater than 500 ft. It forms nearly impenetrable mats that dominate resources and tolerating a range of soil moisture and nutrient conditions. Hundreds of seeds are produced in each fruit. Germination of the seeds is enhanced by passing through an animal's digestive system upon eating the fruit (Cal-IPC 2012).

Control methods include manual/mechanical removal or chemical removal using a solution with an added surfactant for improved effectiveness. Hand pulling is effective, however, all plant parts must be pulled to prevent clones from resprouting where nodes touch the soil. Mechanical removal is effective any time of year where there are no sensitive resources occur. Chemical control is more effective if an acidifier is added to hard water. Prescribed burning is not effective due to the high water content in the shoot tissues. There are currently no biological control agents for hottentot fig.

grazing is also ineffective, due to the salty and astringent quality of the leaves and fibrous woody quality of the stems (Cal-IPC 2012).

Management of this species on Detachment Fallbrook consists of removing hottentot fig when it is observed in native areas and not allowing this species to be planted for landscaping.

L.5.1.4 Giant Reed (*Arundo donax*)

Status: Cal-IPC High

Giant reed is an extremely aggressive, non-native invasive grass that is one of the primary threats to riparian habitats of Southern California (Bell 1997). Proliferating by vegetative propagation during flood events, *Arundo* forms dense monospecific stands up to 30 feet tall on the edges of streams and rivers. Stands of *Arundo* can occur as small clumps or as large stands of hundreds of acres (Dudley 2000, Cummins and Zedler 1998 as referenced in Lawson et al. 2005). These stands crowd out native riparian plant species and are thought to provide little or no habitat for animal species (Bell 1998).

In an aggressive attempt to eradicate giant reed on neighboring MCB Camp Pendleton, treatments were established and are in progress along 27 miles of the Santa Margarita River since the fall of 2000. Both foliar spraying and mechanical removal were experimented with, and found to be similarly effective in achieving the goal of less than five percent cover in five years. It was found that the foliar treatments were less costly and easier to conduct in areas with limited access than mechanical removal, but that the latter achieved the Navy's policy of minimizing pesticide use. However, mechanical removal was problematic in that it resulted in large piles of biomass that are susceptible both to spontaneous combustion and resprouting. It was found that the foliar spray method resulted in very few resprouts that were easily killed by a second herbicide application in one year. Resprouts from cut stems took several years to eradicate (Lawson et al. 2005).

Management of this species on Detachment Fallbrook consists of removal of individuals and follow-up treatment to prevent infestations. Biologists for all surveys occurring on the installation are given information of the species and asked to report incidental observations for removal. This species is currently not known to occur on the Detachment due to the prior success of eradication treatments.

L.5.1.5 Fennel (*Foeniculum vulgare*)

Status: Cal-IPC High

Fennel is an invasive weed in grasslands and to a lesser extent, coastal sage scrub habitats in southern California. Fennel can reach heights of over 2 meters. The plant grows from a basal clump which increases in size with age. Flowering in the summer with onset of seed during late summer and early fall. Seeds are dispersed by gravity, animals, water, and humans (Parsons, as referenced in SDSU 2003).

Recent eradication studies by SDSU (2003) on Camp Pendleton have evaluated the effectiveness of aerial spraying versus hand spraying in burned and unburned areas. Manual application of a mixture of Garlon 3A and Roundup was found to be most effective, and there was no significant difference in plant response between burned and unburned areas. Aerial application was not effective. There are two hypothesis as to why aerial application did not work well. The first was that fennel dies back each year, leaving a large dead stalk under which new growth sprouts up. It is

possible that this dead biomass intercepted much of the herbicide sprayed from above. The second was related to the fact that the herbicides were applied in August. The work report recommends testing the aerial application again during the wet season for efficacy, because it would be a much easier technique to use in dense monocultures than manual spraying (SDSU 2003). Fennel continues to be targeted on MCB Camp Pendleton for control.

There are no specific management activities for control of this species on Detachment Fallbrook. This species is not as widespread on the Detachment as on neighboring MCB Camp Pendleton. If this species becomes widespread, management may be researched at that time.

L.5.1.6 Tamarisk (*Tamarix* sp.)

Status: Cal-IPC High

Tamarisk is an aggressive invasive shrub occurring throughout much of the riparian habitat in the southwestern United States. These deciduous shrubs can reach heights of 6 meters, and tend to form dense monospecific stands. Tamarisk stands crowd out native trees and devalue riparian habitat for most wildlife species. In addition to altering the biodiversity of riparian areas, Tamarisk can alter ecosystem properties by increasing evapotranspiration, lowering water tables and increasing salinity (Carpenter 1998).

Tamarisk is the common name for at least two species in the *Tamarix* genus in the family Tamaricaceae: *T. parviflora*, and *T. ramossisima*. These two species differ in floral morphology but function similarly, so little distinction is necessary for management purposes (Carpenter 1998). Leaves are small and scale-like, while seeds are minute, copious, and wind-borne. Flowers are whitish to pinkish and emerge from April – August.

Management programs for tamarisk have included a variety of methods. These include biological control, and herbicide treatments in conjunction with prescribed burning, cutting, and crushing (Carpenter 1998). The effects of the release of the biocontrol agent, the Chinese leaf beetle (*Diorhadba elongata*), are still very preliminary and the efficacy of this method remains unresolved, especially in the Southwest and California where the USFWS has restricted research because of concerns over the endangered southwestern willow flycatcher, which has taken up roost in the Tamarisk stands (D. Eberts, pers. comm. 2003).

Management of this species on Detachment Fallbrook consists of removal of individuals when detected. Biologists for all surveys occurring on the installation are given information of the species and asked to report incidental observations for removal.

L.5.1.7 Fountain Grass (*Pennistetum setaceum*)

Status: Cal-IPC Moderate

Fountain grass is a coarse tufted perennial grass in the Poaceae family that primarily grows along the southern California coast (Cal-IPC 2015a). It is native to Africa and the Middle East and is popular as an ornamental plant. This species is easily dispersed by vehicles, humans, livestock, wind, water, and possibly by birds (Cal-IPC 2015a). It has a densely clumped growth form with erect stems and is usually one and a half to five feet tall. The flowerheads are prominent, nodding, and feathery, resembling bottlebrushes (Cal-IPC 2015a). Thick infestations of fountain grass interfere with regeneration of native plant species after fires or disturbance. This species is being kept at relatively low levels of infestation on Detachment Fallbrook through the invasive species control program.

L.5.1.8 Pepper Tree (*Schinus* sp.)

Status: Cal-IPC Limited

Brazilian pepper tree (*Schinus terebinthifolius*) and Peruvian pepper tree (*Schinus molle*) are evergreen shrubs or trees found along the southern California coast (Cal-IPC 2015b). They prefer riparian areas, canyons, fields, and roadsides where some water is available throughout the year (Cal-IPC 2015b). The branches form a nearly impenetrable tangle down to ground level and also produce allelopathic chemicals in the soil that inhibit growth of other plants (Cal-IPC 2015b). Pepper trees spread aggressively, typically, in dense monospecific stands that create a canopy that can shade out most competing vegetation (Cal-IPC 2015b). This poses a serious threat to natural vegetation and organisms that depend on them. It can also resprout and grow rapidly after disturbance which can be a problem in burned areas. This species is being kept at relatively low levels of infestation on Detachment Fallbrook through the invasive species control program.

L.5.1.9 Castorbean (*Ricinus communis*)

Status: Cal-IPC Limited

Castorbean (*Ricinus communis*) is a perennial shrub that sometimes grows to be tree-like, and is in the family Euphorbiaceae. It is extremely toxic to humans, cattle, horses, rabbits, sheep, pigs, goats, gophers, cats, dogs, and poultry (Cal-IPC 2015c). It contains ricin, an extremely toxic chemical that can kill an adult who consumes only two seeds and handling the leaves and seeds can cause severe dermatitis (Cal-IPC 2015c). Plants colonize disturbed areas, and they grow rapidly, shading out native seeds and seedlings and producing monospecific stands (Cal-IPC 2015c). Castorbean typically grows in riparian areas and drainages and its seeds are among the first to germinate following fire (Cal-IPC 2015c). This quick response to fire has been observed on Detachment Fallbrook after the FY14 fires. Aggressive post-fire treatments are occurring until it is eradicated or it can go back to the pre-fire occurrence levels. Prior to the fires, spot treatments were conducted when patches were discovered. This was keeping the species in low numbers but it is hard to completely eradicate as seeds can be carried onto Detachment Fallbrook from upstream where management of the species may not be occurring.

L.5.2 Invertebrates

L.5.2.1 Argentine Ant (*Linepithema humile*)

Argentine ants are an easily identifiable member of the family Formicidae. They live in large colonies with many queens that are typically 1/4 inch long, millions of dull brown sterile female workers that are typically 1/8 inch long, and winged fertile males (UCIPM 2003). Argentine ants move rapidly in distinctive trails along sidewalks, up sides of buildings, along branches of trees and shrubs, along baseboards, and under edges of carpets. They emit a musty odor when crushed.

Argentine ants feed on sugar-laden food sources such as sweets, fresh fruit, and buds of some plants. They will also tend honeydew-producing species of herbivorous insects such as aphids. Management for these inside buildings is best achieved by following deliberate and consistent sanitation practices (UCIPM 2003).

Argentine ants tend to establish colonies in moist areas in the vicinity of food sources. Colonies outdoors are often found in first two inches of soil, under wood, slabs, debris, mulch, or in branches and cavities of trees and shrubs. Indoor colonies can be found near sources of water and

food. Argentine ants relocate seasonally. Queens will establish new colonies in the spring and summer, and in warmer weather may move nests to hidden areas such as under houses. In the fall, smaller colonies merge into larger colonies with hundreds of queens and remain large throughout the winter. During the winter months, ants may move indoors (UCIPM 2003).

Argentine ants have been introduced to six continents and have become a severe pest throughout the southern United States, including California. They lack natural parasites and enemies, even in their native range. They compete through aggressive behavior and excel at resource discovery. In their native range, they compete with neighboring colonies, but in California they form a giant supercolony throughout the state within which fighting doesn't occur (Hollway 2003). Its behavioral dominance has led to the decimation of many native ant species and their predators (such as the coast horned lizard) throughout its introduced range (Gullan and Cranston 1994). This displacement also results in disrupted natural processes such as seed dispersal by larger native ants (Hollway 2003). By displacing native ant, or other insect, species, argentine ants can greatly impact wildlife species which feed on ants. On Detachment Fallbrook, the coast horned lizard is threatened by a reduction in its main prey item, the native harvester ant, which is outcompeted by Argentine ants (K.R. Faulkner, pers. comm. and SDSU 1994).

There are no specific management activities for control of this species on Detachment Fallbrook.

L.5.2.2 Red Swamp Crayfish (*Procambarus clarkii*)

"Crayfish are opportunistic feeders, eating both plants and animals, and can quickly outgrow predation by most fishes," bottom dwellers less than 7 centimeters long, are more vulnerable to crayfish predation than other species. High crayfish densities were associated with decreases in large, slow-moving invertebrates, such as snails and mollusks, and a common aquatic plant species, the water buttercup (*Ranunculus flabellaris*) (Nagy et al. 2015).

There are no specific management activities for control of this species on Detachment Fallbrook. Removal of individuals occur along the Santa Margarita River in conjunction with MCB Camp Pendleton's invasive species program.

L.5.2.3 Red Imported Fire Ants (*Solenopsis invicta*)

Red imported fire ants were first discovered in southern California in 1998 and is now known to occur in Orange, Los Angeles, Riverside, San Bernardino, and San Diego counties. (Kabashima et al. 2007, Greenburg and Kabashima 2013). Red imported fire ant workers are variable in size (1/16 to 1/5 inch long) and are dark reddish brown while the native southern fire ant (*Solenopsis xyloni*) is about the same size and color as the red imported fire ant (Greenburg and Kabashima 2013). Red imported fire ants are extremely aggressive when their mounds are disturbed. Undisturbed red imported fire ant mounds are usually dome shaped and can be 1 foot high (Greenburg and Kabashima 2013). In California, red imported fire ant mounds frequently resemble gopher mounds because they consist of a circular upwelling of loose soil, but they may not extend as far above the surface (Greenburg and Kabashima 2013). These mounds distinguish red imported fire ant colonies from other California ant species, for example, nests of the native southern fire ant are usually irregular in shape and consist of scattered soil with multiple obscure entrances (Greenburg and Kabashima 2013).

There are no specific management activities for control of this species on Detachment Fallbrook.

L.5.2.4 Gold-spotted Oak Borer (*Agrilus auroguttatus*)

The goldspotted oak borer (GSOB) is an invasive species in San Diego County with one known location in Riverside County. It is native to North America but not to California. It was likely introduced to California in the late 1990s in firewood from Arizona or northern Mexico (Coleman

and Seybold 2008). While the GSOB does little damage in its native habitat, the damage to oak woodlands in San Diego County, California has been severe. As of 2013, it is estimated that over 80,000 oaks have been killed on over 200,000 acres in San Diego County (U.S Department of Agriculture Forest Service and Forest Health Monitoring 2010 Aerial Survey Region 5 database, cited in Coleman et al. 2012).

In California, as in the native range of the GSOB, red oaks are more susceptible to injury than white oaks (Coleman and Seybold 2011). Red oak species greater than 13 centimeters (cm) in diameter, including coast live oak (*Quercus agrifolia*), canyon live oak (*Q. chrysolepis*), and California black oak (*Q. kelloggii*), are the preferred hosts in California and are particularly susceptible to infestation and mortality. None of these red oak species occur within the GSOB's native range. At this time, it is not clear why only larger individuals are susceptible or what specific factors make these oak species, with which the GSOB has no prior co-evolutionary relationship, susceptible to attack. The cause may be related to phloem and bark characteristics and plant chemistry, but more information is needed to evaluate these factors (Coleman and Seybold 2009). To date, no mortality has been detected on white oaks (including *Q. engelmannii*), although low levels of infestation have been detected. Within infested sites in California, over 60% of red oaks over 13 cm have been invaded by the GSOB; the longer the sites are infested, the greater the number of trees that are affected. At the site thought to be the original place of introduction, over 90% of red oaks greater than 13 cm in diameter have been infested (Coleman et al. 2012).

The GSOB is thought to have been introduced to San Diego County in firewood, which remains the likely mode of dispersal for medium to long distances. The first individuals in San Diego County were found during a California Department of Food and Agriculture (CDFA) survey in 2004 (Westcott 2005), but the GSOB was not tied to oak mortality until 2008 (Coleman and Seybold 2008). It is unlikely that populations exist on Camp Pendleton, as the U.S. Department of Agriculture Forest Service (USFS) conducted a visual survey in July 2010 of four sites across the Base and found no evidence of the GSOB (Coleman and Zambino 2010). In addition, the 2009 Forest Health Protection aerial survey included areas close to the boundary of Camp Pendleton, and no tree mortality was detected (T.W. Coleman pers. comm. [June 7, 2011]).

The primary mode of spread is thought to be firewood and studies are underway to determine the GSOB's innate dispersal distance (Coleman pers comm. [June 7, 2011]). Eradication in California is not feasible at this time however because its primary mode of spread is firewood transport access restrictions on Detachment Fallbrook and neighboring Camp Pendleton provide opportunity to prevent its introduction and spread. It is recommended that an Early Detection and Rapid Response plan be developed and implemented on the Detachment.

As the species has not yet been detected on Detachment Fallbrook, no management activities are in place. However, there is high potential for it to occur so surveys are being conducted to determine it status.

L.5.3 Fish

Several species of nonnative fish were recorded at Detachment Fallbrook during surveys at Depot Lake and Lower Lake. These species are common in local watersheds, and some are a focus for recreational fishing. However, there is a concern related to introducing nonnative fish into waterways with native fish populations.

L.5.3.1 Channel Catfish (*Ictalurus punctatus*)

The channel catfish is the most abundant catfish species in the region and is found in essentially every body of freshwater capable of sustaining fish. It is an opportunistic omnivore, eating nearly any form of living or dead material and they will prey on native fish and amphibians (Fuller and Neilson 2015a).

L.5.3.2 Western Mosquitofish (*Gambusia affinis*)

Mosquitofish is a small, live-bearing fish native to eastern/central US. This species feeds primarily on zooplankton and invertebrate prey at the top of the water column. They are aggressive and exhibit predatory behavior and may negatively affect populations of small fish through predation and competition (Nico et al. 2015). They even aggressive toward larger fish, often attacking, shredding fins, and sometimes killing other species (Nico et al. 2015).

L.5.3.3 Bluegill (*Lepomis macrochirus*)

Bluegill are native to the eastern US and are aggressive. They are known to attack frogs and salamanders (Fuller and Cannister 2015).

L.5.3.4 Sunfish (*Lepomis* sp.)

Sunfish are native to the eastern US. They are known to reduce the populations of native species, and alter population structure, relative dominance, and distribution patterns (Fuller et al. 2015). They will also prey on other fish and their large mouth allows them to compete with larger fish for prey items, and to prey on eggs and young of other fishes (Fuller et al. 2015).

L.5.3.5 Largemouth Bass (*Micropterus salmoides*)

Largemouth bass are native to the eastern US. They usually affect populations of small native fishes through predation, sometimes resulting in the decline or extinction of such species and they will prey on frogs and salamanders (Fuller and Neilson 2015b).

L.5.4 Amphibians

L.5.4.1 Bullfrog (*Lithobates catesbeianus*)

A native of the southeastern United States, the bullfrog (formerly *Rana catesbeiana)* is an invasive species in California and were introduced in the late 1800s (USFS 2003). The bullfrog not only competes with native anurans for habitat and food, but also is known to prey on sensitive native species including the federally listed arroyo toad.

Easily identifiable, the bullfrog is largest frog in North America. Males average 120mm in length, while females are slightly shorter (Holland and Goodman 1998). The dorsal surface varies in color from light yellowish-green to dark olive green (Holland and Goodman 1998). The ventral surface is usually a light cream to yellow color with occasional dark marbling (USFS 2003). Diagnostic characteristics include the absence of dorsolateral ridges and the presence of a large and conspicuous tympanic membrane or ear drum (USFS 2003). The hind feet are completely webbed except for the last joint of the largest toe.

They are active primarily from March-October but may be observed year-round when temperatures are mild. They require permanent watercourses for breeding but will move considerable distances (up to two km) between water sources. According to studies by Holland and Goodman (1998) on MCB Camp Pendleton, Males begin vocalizations after the average temperature reaches 20 degrees C. Females can begin laying eggs as early as April, and depending on their size, can deposit from

1000 – 45,000 eggs each, resulting in egg masses up to half a square meter. Larvae are generally herbivorous, and usually metamorphose after their second season in June and July. Adult bullfrogs will eat most vertebrate and invertebrate species they encounter including insects, frogs and toads, snakes, lizards, salamanders, birds, and small mammals (Holland and Goodman 1998).

Bullfrogs can be commonly seen and heard in the streams and water bodies of Detachment Fallbrook. Sensitive species on Detachment Fallbrook potentially impacted by bullfrogs include: arroyo toad (federally endangered), southwestern pond turtle (California species of special concern), two-striped garter snake (California species of special concern), and western spadefoot (California species of special concern). Management of this species on Detachment Fallbrook consists of trapping and shooting.

L.5.5 Reptiles

L.5.5.1 Red-eared Slider (*Trachemys scripta elegans*)

The red-eared slider is native to the mid-western US. It was introduced primarily through pet releases and escapes (Somma et al. 2015). They are aquatic, omnivorous generalists, which rarely leave water except to bask. Adult turtles tend to be more herbivorous than juveniles, but both will opportunistically eat aquatic invertebrates (especially insects and mollusks), fish, frog eggs and tadpoles, aquatic snakes, and a wide variety of aquatic plants and algae. Although they prefer quiet waters, *T. elegans* is highly adaptable and can tolerate anything from brackish waters, to manmade canals, and city park ponds. The level of impact to native species is unknown but they will compete with native species for food and basking sites (Somma et al. 2015). They are a potential threat to pond turtle as they adaptable to many climates. This combined with their omnivorous diet and ability to adapt to various habitats, gives them great potential for impacting native habitats should reproducing populations become established.

L.5.6 Birds

L.5.6.1 Rock Dove (*Columba livia*)

The domestic pigeon, or rock dove, was introduced to North America by European settlers during the 1600s. They can become nuisances around buildings and urban areas.

L.5.6.2 European Starling (*Sturnus vulgaris*)

The European starling was introduced to North America in the 19th century and quickly spread throughout the U.S. It poses a threat to native cavity nesting birds such as bluebirds, woodpeckers, swallows, and titmice with which they compete for nesting sites. Starlings will actively harass and evict other bird species from their nest cavities. Starlings can also damage crops, despoil buildings and other areas where they occur, and may be involved in the spread of histoplasmosis (Ehrlich et al. 1988). Several cities and counties have started eradication programs, though none has been successful because of this species' prolific breeding abilities. This species is present year-round on Detachment Fallbrook and is not protected and may be removed without a permit.

L.5.6.3 House Sparrow (*Passer domesticus*)

This species was introduced to North America in the 19th century and quickly spread throughout the U.S. House sparrows primarily remain in developed and agricultural areas thus reducing their influence on native species. However, they will compete for nesting cavities with native swallows

and bluebirds, occasionally destroying eggs or nestlings. This species is present year-round on Detachment Fallbrook and is not protected and may be removed without a permit.

L.5.6.4 Brown-headed Cowbird (*Molothrus ater*)

The invasive brown-headed cowbird occurs throughout much of North America from Canada to Mexico. It feeds in moist, open areas such as grasslands, croplands, and urban habitats, though it also roosts in riparian and other wooded habitats (Zeiner et al. 1990). They feed primarily on seeds, insects, spiders, and snails. Cowbirds are brood parasites that lay their eggs in the nests of other species, especially in riparian woodlands. More than 200 bird species have been reported as serving as hosts, raising the cowbird young as if they were their own. This significantly lowers the reproductive success of many of the host species (Zeiner et al. 1990), and is especially a threat in areas with threatened and endangered bird populations. Cowbirds have expanded their range in recent decades, seriously impacting the populations of several smaller riparian passerine bird species, most notably willow flycatchers and least Bell's vireos (Zeiner et al. 1990).

Brown-headed cowbirds were regularly seen during point counts conducted from 1993 through 2002 and adults have been detected during focused vireo surveys during all years of surveys from 2007 through present. Presence of adults has been confirmed on most drainages. Parasitism of least Bell's vireo nests has been documented along several drainages including 4S, 1Nc, 2Nb, and Santa Margarita River (drainage codes are depicted on Map L-1). Direct evidence of parasitism was found in 2001, 2007, 2011, and 2012 annual surveys.

Management of this species on Detachment Fallbrook consists of annual surveys of drainages with high potential to support least Bell's vireo, periodic nest monitoring of the least Bell's vireo, and removal of any eggs or chicks in least Bell's vireo nests by individuals permitted to do so. Although some level of parasitism occurs every year, the levels have not generally been high enough to warrant cowbird trapping on the Detachment. Cowbird trapping on neighboring Camp Pendleton likely provides some benefit to the Detachment. Higher incidences of cowbird parasitism reported in specific locations (e.g., along parts of the Santa Margarita River) may warrant consideration of increased control measures for that species in the future.

The 2003 WFMP BO (USFWS 2003) addressed the need to monitor cowbird parasitism on Detachment Fallbrook in response to the presence of cattle as a method to reduce the fuel load and the cowbirds propensity be attracted to cattle and other domesticated livestock. Cowbirds tend to be attracted to feedlots or areas with large numbers of domesticated livestock in a confined area as they provide a food source. In the non-breeding season, cowbirds will gather in these areas, sometimes in very large numbers then during the breeding season, they move out into the riparian habitat looking for host nests to parasitize (Shaffer et al. 2003, K. Fischer, personal observation). Grazing on Detachment Fallbrook is not similar to these areas as the animals are not forced to concentrate in one area (a fenced cattle pen or feedlot) for any length of time. The animals do tend to gather in riparian drainages for water and shade but they move around and are more nomadic than animals found at a dairy or other confined area. On Detachment Fallbrook, the cattle don't serve as an attractant for cowbirds. The cowbirds observed on Detachment Fallbrook are most likely following the riparian stream courses looking for host nests to parasitize.

L.5.7 Mammals

L.5.7.1 Virginia Opossum (*Didelphis virginiana*)

Virginia opossum was first introduced into California in 1910 in San Jose but is now commonly found throughout the west in riparian, moist woodlands, brushy habitats, wetlands, and agricultural and residential areas that provide abundant food and cover (CDFW 1990). They will use burrows for shelter. They are omnivores and can be predators to native species. In general, this species is

not pose a significant threat to native species so aggressive management techniques are not required. They should be watched to ensure they are not out competing native species for dens or overly predating native species. They can be considered a pest in areas with human development as they will go through trash and den in buildings.

L.5.7.2 California Ground Squirrel (*Spermophilus beecheyi*)

The native California ground squirrel is common throughout all of California with the exception of parts of the Basin Ranges and the Mojave and Colorado Deserts. They inhabit open areas and are often found in disturbed habitats. They are found in abundance on NWS Detachment Fallbrook where they often cause considerable erosion damage to bunkers, fencelines, and pipelines. They may also be pests to agricultural crops.

The California ground squirrel has a nine to eleven inch body and a long, bushy tail. They are brown in color, and sometimes are specked with white or buff. Ground squirrels' shoulders and neck are whitish, belly is buff-colored, and a dark triangle rests on their backs between their shoulders. Adults range in weight between a quarter of a pound to two pounds; females tend to be the smaller of the two sexes (Burt & Grossenheider 1976).

Ground squirrels make burrow complexes that can be quite extensive, reaching lengths of 5 – 200 feet (Burt and Grossenheider 1976) where they spend most of their time in hibernation, estivation and rearing their young. Ground squirrels are colonial dwellers, there may be several dozen animals inhabiting a complex of burrows and more than one individual per burrow. They experience two periods of dormancy per year, one deep period of hibernation in the winter, and a shorter period of inactivity through the hottest portion of the summer that lasts for a few days to a week or more. During winter hibernation the animals awake periodically to feed themselves with food caches stored in their chambers; some young squirrels may remain active in this time, especially in areas with mild winters.

Ground squirrels emerge in the spring to begin mate finding and breeding. Breeding occurs between February and April. They can produce one litter each year, with each litter yielding seven to eight young. Young squirrels are born in the burrow where they remain for six weeks (University of California Integrated Pest Management website). They live an average of three to four years in the wild (www.etc-etc.com/sqrlinfo.htm). The breeding period is the height of adult above ground movement for the year (Salmon and Gorenzel 2002). They are active during the day and can often be seen basking in the sun on a warm day. At Detachment Fallbrook, ground squirrels are most active from mid-February until early August (Bleich 1973).

California ground squirrels prefer open habitats such as grassland, pastures, rocky ridges, and slopes with scattered trees. Population numbers can increase in recently grazed areas as forb production and visibility increase (Polite and Ahlborn 1999). A rodent study conducted on Detachment Fallbrook in 1972 (Bleich 1973) found ground squirrels to be present in three habitat associations: *Artemisia-Eriogonum* association (2 plots), *Haplopappus* association (1 plot), and grassland community (1 plot). They were not trapped in sufficient quantity to estimate population densities; however, the number seen per observer-hour was highest in an *Artemisia-Eriogonum* plot with a high abundance of large boulders. Though the number of plots was limited in this study, the relatively few squirrels encountered may suggest that this species has become more common in the last few decades on the Detachment.

Ground squirrels forage close to their burrows; it is thought that they won't range outside of a 450-foot radius of their home burrows in their lifetimes, unless dispersing to a new colony location. Evans and Holdenried (1943) found that males dispersed up to 1.4 km from their natal burrow and

females 1.3 km in central California. Diet is dependent on the season. When a squirrel first emerges from its burrow, it eats mainly green grasses and herbaceous plants. As the season passes on and plants begin to set seeds, the squirrel's diet changes to consist more of nuts, grains and seeds, from which it begins to form its winter food stores. Ground squirrels may also occasionally feed on insects, carrion, fungi, and the eggs of ground-nesting birds such as quail. Prakash (1988) estimates that one ground squirrel consumes approximately 4 ounces of forage in its two daily feedings. He goes on to extrapolate that 20 ground squirrels will consume approximately the same amount as a sheep, and 200 ground squirrels will consume approximately the same amount as a steer (USDON 1995).

As a burrowing animal, they may also play a role in the succession of native/ exotic grasslands. Stromberg and Griffin (1996) found that introduced species were higher on plots with gopher tailings. These tailings suppressed the ability of native grasses to recolonize previously disturbed fields in central California by burying their relatively small seeds. They also bring nitrogen-poor soils closer to the surface, creating nutrient-poor openings in vegetation that are more like an early successional stage than a perennial grassland.

However, ground squirrels are important prey items for raptors and larger mammals. Additionally, many other wildlife species are secondary users of burrows: insects, reptiles, and other rodents, including the federally-endangered Stephens' kangaroo rat. The ecological interactions between ground squirrels and kangaroo rats are unclear. While the Stephens' kangaroo rat is known to utilize abandoned ground squirrel burrows, high densities of ground squirrels may preclude occupation of an area by kangaroo rats (S.J. Montgomery, pers. comm.).

L.5.7.2 American Beaver (*Castor canadensis*)

The American beaver is found in streams, ponds, and lake margins. They eat vegetative matter and they construct dams to create ponded areas that can be used for retreat from predators. With their dam building, beavers can dramatically modify the hydrology of the river, potentially causing infrastructure damage (considered a low risk at Detachment Fallbrook) and adversely affecting listed species such as the endangered arroyo toad by creating breeding habitat for the American bullfrog. That said, beaver dams can also create wetland habitat for many species and improve groundwater recharge. The American beaver has also been the subject of control by MCB Camp Pendleton including along the shared reach of the Santa Margarita River. Should beavers become accepted as a native species to the area (see Lanman et al. 2013), control measures may still be warranted, but the rationale needs to be revisited.

L.5.7.3 Norway Rat (*Rattus norvegicus)*

Norway rats are a large rat that originate from northern China but are now found on every continent except Antarctica (Armitage 2004). They can be found in a variety of habitat and are basically found anywhere humans are found (Armitage 2004). They breed in large groups and are omnivores that will prey upon native wildlife species (Armitage 2004). This species is very competitive and will drive out other species and they also carry diseases that can kill humans (Armitage 2004).

Management on Detachment Fallbrook includes reducing attractants near facilities and discouraging entrance into facilities. Habitat management is the preferred method of control. Ensure all outdoor trash containers are covered and that a sufficient number of them are located around Detachment Fallbrook facilities to discourage littering. Keep a clean work environment, especially kitchen facilities. Keep food covered in rodent-proof containers. Keep a tight-fitting lid on garbage. Discourage mice from entering buildings using barriers. Seal all openings larger than 1/2 inch across with rodent proof materials such as cement or metal. Use metal flashing around the base of wooden structures to provide a strong metal barrier. Install so that the flashing reaches 12 inches above the ground and six inches down into the ground. When trapping is needed, set and keep spring-loaded rodent traps. Set traps near baseboards because rodents tend to run along walls

and in tight spaces rather than out in the open. Locate garbage cans 100 feet or more from buildings and elevate to eliminate possible nesting sites.

L.5.7.4 Black Rat (*Rattus rattus*)

The black rat is a medium sized rat species found on every continent, introduced via human travels (Gillespie 2004). Norway rats are close relatives of the black rat (Gillespie 2004). It is typically found in any area that will support their vegetarian diet (Gillespie 2004). They live in polygynous groups and can be destructive to the environment they live in through their foraging techniques and they may outcompete other seed-eating mammals for food (Gillespie 2004). They also carry diseases that are dangerous to humans (Gillespie 2004).

Management on Detachment Fallbrook includes reducing attractants near facilities and discouraging entrance into facilities. Habitat management is the preferred method of control. Ensure all outdoor trash containers are covered and that a sufficient number of them are located around Detachment Fallbrook facilities to discourage littering. Keep a clean work environment, especially kitchen facilities. Keep food covered in rodent-proof containers. Keep a tight-fitting lid on garbage. Discourage mice from entering buildings using barriers. Seal all openings larger than 1/2 inch across with rodent proof materials such as cement or metal. Use metal flashing around the base of wooden structures to provide a strong metal barrier. Install so that the flashing reaches 12 inches above the ground and six inches down into the ground. When trapping is needed, set and keep spring-loaded rodent traps. Set traps near baseboards because rodents tend to run along walls and in tight spaces rather than out in the open. Locate garbage cans 100 feet or more from buildings and elevate to eliminate possible nesting sites.

L.5.7.2 Deer Mouse (*Peromyscus maniculatus*)

Deer mice have small bodies, typically between 71-102 mm long with a tail length ranging between 51 mm to 127 mm. Their tails are distinctly bicolored dark above and white below. They have a round and slender body with a pointed nose and large, black, beady eyes (Burt and Grossenheider 1976). Deer mice breed year-round, most likely peaking between March and August and produce two to four litters per year. Litter sizes range from 1 to 9, with an average of about 3.5 young. They are solitary nesters who are maternally raised until 22-37 days, and reach sexual maturity at approximately 50 days (CDFG 1990).

Deer mice will construct their nests in nearly any closed cover. They utilize slash and forest litter, rock piles, abandoned burrows and logs to form confined areas lined with soft materials such as root fibers, mosses, hair and grass. They are nocturnal creatures that defend their nests and are active year round (CDFG 1990).

The deer mouse is a generalist feeder, foraging on insects (especially at the larval and pupal stages), fungi, leaves, fruits and seeds and animal flesh. They primarily forage on the ground, but at times will climb up into shrubs to search for food. They store large caches of food for winter consumption. They are thought to play an important ecosystem role both because they are key food items for higher level predators such as large mammals and birds of prey, and because they feed on larvae and pupae of insects who prey upon plant life (CDFG 1990). However, they are of concern to humans because of their potential to transmit the hanta virus.

Deer mice are very abundant throughout all of California and are found in nearly all habitats. There is no recent information about the distribution or abundance of the deer mouse on Detachment Fallbrook, but based on a rodent survey from 1972-1973, they are thought to be the most numerous rodent species on Detachment Fallbrook, occurring in all habitats surveyed. They were found in

highest abundance in the coastal sage scrub community, and found at the lowest levels in the southern oak woodland and chaparral communities (Bleich 1973).

The biggest concern with the presence of deer mice is the potential for Hantavirus. Hantavirus causes Hantavirus Pulmonary Syndrome (HPS) in humans. For the first 3-5 days, symptoms are "flu-like" including fever, sore muscles, headaches, nausea, vomiting, and fatigue. As the disease progresses, it causes shortness of breath due to fluid filled lungs and hospital care is usually required. It is a serious disease and can be fatal. Humans are most susceptible to contract the disease from feces in enclosed areas. Abandoned buildings should be entered with care as an enclosed environment increases the potential for exposure if the virus is present.

Management on Detachment Fallbrook includes reducing attractants near facilities and discouraging entrance into facilities. Habitat management is the preferred method of control. Ensure all outdoor trash containers are covered and that a sufficient number of them are located around Detachment Fallbrook facilities to discourage littering. Keep a clean work environment, especially kitchen facilities. Keep food covered in rodent-proof containers. Keep a tight-fitting lid on garbage. Discourage mice from entering buildings using barriers. Seal all openings larger than 1/2 inch across with rodent proof materials such as cement or metal. Use metal flashing around the base of wooden structures to provide a strong metal barrier. Install so that the flashing reaches 12 inches above the ground and six inches down into the ground. When trapping is needed, set and keep spring-loaded rodent traps. Set traps near baseboards because rodents tend to run along walls and in tight spaces rather than out in the open. Locate garbage cans 100 feet or more from buildings and elevate to eliminate possible nesting sites.

L.5.7.3 Feral pigs (*Sus scrofa*)

Feral pigs are known to prefer areas with water sources, including streams, ponds, marshes, irrigated agriculture, and any damp or muddy area where they are able to wallow; however, they will use of a wide variety of available habitat (SDNHM 2010). Pigs will use all available habitats during both dry and wet seasons, and although pigs prefer cooler, moist canyon bottoms during the dry season, they actually avoid riparian habitat during the wet season (SDNHM 2010). Rooting by pigs disturbs the soil physically and destroys plants (SDNHM 2010). Feral pigs are omnivorous, the majority of their diet consisting of grasses, forbs, and mast such as shoots, roots, tubers, fruit, and seeds but they also eat invertebrates and small vertebrates (SDNHM 2010; Seward at al. 2004). In California, feral pigs are often associated with oak woodland, as acorns are an important food for pigs, but consumption of acorns can reduce the supply of acorns, inhibiting regeneration of oak woodland and reducing the food available to the many other species that rely on acorns or oaks (SDNHM 2010; Sweitzer and Van Vuren 2002).

Feral pigs tend to form semi-territorial, dynamic, mobile groups (“sounders” or “mobs”) that usually include an average of four individuals, usually of adult females and juveniles, and adult males tend to be solitary and disperse widely (SDNHM 2010; Gabor et al. 1999; Spencer et al. 2005). In California, feral pigs breed year round and produce two litters per year with an average litter size of 5.6 young (SDNHM 2010; Barrett 1978). Once established, feral pigs are difficult to eradicate, and efforts at are largely ineffective due to the long dispersal distance of pigs and quick recovery of populations following culling (SDNHM 2010). The environmental impacts and cost of these impacts favors intensive eradication efforts over sustained control programs (SDNHM 2010; Cruz et al. 2005).

There is currently no management of this species on Detachment Fallbrook as it has not been detected. If the species is detected, aggressive measures may need to be implemented.

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APPENDIX M

FOCAL SPECIES LISTS

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M.1 FOCAL/WATCH SPECIES LIST

As stated in Chapter 4, natural resources management at Detachment Fallbrook includes a multi-species strategy that employs several focal species to serve as surrogates to help monitor ecosystem "health." The term "focal species," as coined by Lambeck (1997), was framed around the concept of umbrella species, whose requirements are believed to encapsulate the needs of other species, as a means of monitoring and managing within ecosystem or landscape-level programs. In subsequent years, the term focal species became more generally applied. Chase and Geupel (2005) use the term to describe any individual species chosen for special attention in a multi-species conservation effort, and they list five classes of focal species: flagship (e.g., charismatic, publically popular), keystone (e.g., ecologically important), special-status (e.g., threatened or endangered), indicator (e.g., an index of environmental conditions), and umbrella species.

One group of species that is often considered for their trophic level representation are top predators. Hawks, owls, vultures, and other birds of prey, for example, not only help keep rodents, rabbits, and other small animal populations in check, but they are often among the first species to be affected by a range of environmental pressures (e.g., prey base decline, pollutants, habitat degradation). In addition to potentially functioning as keystone species for the cascading ecological effects in their absence (Mills et al. 1993), large carnivores have also been identified as potentially valuable focal species for their sensitivity to landscape-level changes in habitat fragmentation and other environmental stressors (Noss et al. 1996, Carrol et al. 2001, Crooks 2002).

Table M-1 presents a working list of focal species for Detachment Fallbrook. Five of the focal species are federally listed threatened or endangered species and are included mainly for the regulatory nexus as well as for their umbrella protection and potential indicator value. Many of the other focal species are also included for their special status rating so as to help maintain vigilance on their general locations and occurrences. Several species that have been identified in other studies or management plans as potential indicators of species richness/biodiversity and/or ecosystem health are also included in Table M-1. Not all focal species are currently known to occur on Detachment Fallbrook, some are included because they are sensitive species known to occur in the vicinity of the installation or are species of concern for early detection and rapid response. This is a working list that is intended to be refined over the years.

Table M-1. Working List of Management Focus Species

Species	Listing Status	Potential Indicator (+/-) &/or Umbrella (U) Species	Primary Habitat	Presence on Detachment Fallbrook	Notes; Citation(s) as Potential Focal Species
Plants					
Engelmann oak (*Quercus engelmannii*)	CRPR 4.2	+, U	Woodland	Confirmed present	
Fish's milkwort (*Polygala cornuta* var. *fishiae*)	CRPR 4.3	+	Chaparral/ woodland	Confirmed present	
Barbed goat grass (*Aegilops triuncialis*)		-		Confirmed present	Targeted for eradication
Bridal veil broom (*Genista monosperma*)		-		Confirmed present	Targeted for eradication
Giant reed (*Arundo donax*)		-	Riparian	Confirmed present	Removed and treated when found
Fennel (*Foeniculum vulgare*)		-	Scrubs/ grasslands	Confirmed present	
Tamarisk (*Tamarix* sp.)		-	Riparian	Confirmed present	Removed and treated when found
Invertebrates					
Harbison's Dunn Skipper (*Euphyes vestris harbisonii*)	MSHCP	+	Host plant *Carex*,, chaparral or riparian	Not present	
Hermes Copper (*Lycaena hermes*)	FC, MSHCP	+	Host plant spiny redberry (*Rhamnus crocea*); coastal sage scrub and southern mixed chaparral	Not present	
Argentine ant (*Linepithema humile*)		-		Confirmed present	
Amphibians					
Coast range newt (*Taricha torosa torosa*)	CSC, MSHCP	+	Riparian	Has not been confirmed on the Detachment	
Arroyo toad (*Anaxyrus californicus*)	FE, CSC, MSHCP	+, U	Riparian/ streams	Confirmed present	
Western spadefoot (*Spea hammondii*)	CSC, MSHCP	+	Vernal pools/ ponded water	Confirmed present	
American bullfrog (*Lithobates catesbeianus*)		-	Riparian/ streams	Confirmed present	
Reptiles					

Species	Listing Status	Potential Indicator (+/-) &/or Umbrella (U) Species	Primary Habitat	Presence on Detachment Fallbrook	Notes; Citation(s) as Potential Focal Species
Orange-throated whiptail (*Asipidoscelis hyperythra*)	CSC, MSHCP	+	Coastal sage scrub	Confirmed present	
Coronado skink (*Plestiodon skiltonianus interparietalis*)	CSC	+		Confirmed present	
Blainville's horned lizard (*Phrynosoma blainvillii*)	CSC, MSHCP	+	Coastal sage scrub	Confirmed present	
Red-diamond rattlesnake (*Crotalus ruber*)	CSC, MSHCP	+	Coastal sage scrub	Confirmed present	
Western patch-nosed snake (*Salvadora hexalepis virgultea*)	CSC	+		Confirmed present	
Two-striped garter snake (*Thamnophis hammondii*)	CSC, MSHCP	+	Riparian/ streams	Confirmed present	
Pacific pond turtle (*Actinemys marmorata*)	CSC, MSHCP	+	Riparian/ streams	Confirmed present	
Red-eared slider (*Trachemys scripta elegans*)		-	Riparian/ streams	Confirmed present	
Birds					
White-tailed kite (*Elanus caerulus*)	CFP	+, U	Grasslands	Confirmed present as a breeding species but not present every year	Raptor. (CPIF 2000)
Golden eagle (*Aquila chrysaetos*)	BGEPA, CFP, DOD PIF, MSHCP	+	Grasslands	Confirmed present as a rare visitor	Raptor.
Northern harrier (*Circus cyaneus*)	CSC, MSHCP	+, U	Grasslands	Confirmed present as a breeding species	Raptor. (CPIF 2000)
Burrowing owl (*Athene cunicularia*)	CSC, DOD PIF, MSHCP, BCC	+	Grasslands	Confirmed present as a rare winter visitor	Raptor. May not be a good focal species as it is not observed regularly enough to determine trends.
Long-eared owl (*Asio otus*)	CSC	+	Riparian/ woodland	Confirmed present as an occasional breeding species	Raptor. May not be a good focal species as it is difficult to detect during general surveys. Focal surveys are required.

Species	Listing Status	Potential Indicator (+/-) &/or Umbrella (U) Species	Primary Habitat	Presence on Detachment Fallbrook	Notes; Citation(s) as Potential Focal Species
Costa's hummingbird (*Calypte costae*)	BCC	+	Coastal sage scrub/ chaparral/ wild flowers	Confirmed present as a common breeding species	(CPIF 2004) Sensitive to habitat edge/fragmentation (Bolger et al. 1997).
Southwestern willow flycatcher (*Empidonax traillii extimus*)	FE, SE, MSHCP	+	Moist riparian	Confirmed present as a migrant	(CPIF 2000). May not be a good focal species as it is not detected regularly and when it has been, it is a migrant not a breeder.
Loggerhead shrike (*Lanius ludovicianus*)	CSC, DOD PIF, BCC	+	Grasslands / scrub	Confirmed present as an occasional visitor	May not be a good focal species as it is not detected regularly.
Least Bell's vireo (*Vireo bellii pusillus*)	FE, SE, MSHCP	+, U	Riparian understory	Confirmed present as a breeding species	(CPIF 2000)
Clark's marsh wren (*Cistothorus palustris clarkae*)	CSC	+	Marsh	Confirmed present as a breeding species	Prior to Tomahawk Fire this species was regularly detected.
Coastal (San Diego) cactus wren (*Campylorhynchus brunneicapillus sandiegonensis*)	CSC, DOD PIF, MSHCP, BCC	+, U	Cactus	Confirmed present as a breeding species	(CPIF 2000)
Coastal California gnatcatcher (*Polioptila californica californica*)	FT, CSC, MSHCP	+, U	Open coastal sage scrub	Confirmed present as a breeding species	(CPIF 2000). Not found to be an indicator for species richness or community composition, but may be indicator of environmental change or serve as an umbrella species (Chase et al. 2000)
Common yellowthroat (*Geothlypis trichas*)		+, U		Confirmed present as a breeding species	(CPIF 2000). Associated with higher bird species richness (Chase et al. 2000)
Yellow warbler (*Setophagia petechia*)	CSC, BCC	+	Riparian	Confirmed present as a breeding species	(CPIF 2000)
Yellow-breasted chat (*Icteria virens*)	CSC, MSHCP	+, U	Dense riparian	Confirmed present as a breeding species	(CPIF 2000)

Species	Listing Status	Potential Indicator (+/-) &/or Umbrella (U) Species	Primary Habitat	Presence on Detachment Fallbrook	Notes; Citation(s) as Potential Focal Species
Southern California rufous-crowned sparrow (*Aimophila ruficeps canescens*)	MSHCP	+	Open coastal sage scrub	Confirmed present as a breeding species	(CPIF 2000). Sensitive to habitat edge/fragmentation (Bolger et al. 1997).
Black-chinned Sparrow (*Spizella atrogularis*)	DOD PIF, BCC	+	Various forms of chaparral, including chamise chaparral	Confirmed present but limited abundance	(CPIF 2000). Sensitive to habitat edge/fragmentation (Bolger et al. 1997). May not be a good focal species as it is limited in distribution on Detachment Fallbrook.
Bell's sage sparrow (*Amphispiza belli belli*)	DOD PIF, MSHCP	+	Open chamise chaparral.	Confirmed present as a breeding species but distribution is limited due to lack of chaparral.	(CPIF 2000). Sensitive to habitat edge/fragmentation (Bolger et al. 1997). Potential indicator of species richness (Chase et al. 2000). May not be a good focal species as it is limited in distribution on Detachment Fallbrook.
Grasshopper sparrow (*Ammodramus savannarum*)	CSC, MSHCP	+	Grasslands	Confirmed present as a breeding species	(CPIF 2000)
Western meadowlark (*Sturnella neglecta*)		+, U	Grasslands	Confirmed present as a breeding species	(CPIF 2000) Response to grazing is variable, but most studies found overgrazing to be a problem. Associated nesting species sparrows and raptors.
Tricolored blackbird (*Agelaius tricolor*)	CSC, DOD PIF, MSHCP, BCC	+	Marsh	Confirmed present as a rare visitor	(CPIF 2000) May not be a good focal species as it is limited in distribution on Detachment Fallbrook.
Eurasian collared-dove (*Streptopelia fasciata*)		–	Common in developed areas.	Confirmed present as a breeding species	More of a concern in native habitats. Commonly seen in the admin area and the old housing area.
European starling (*Sturnus vulgaris*)		-	Common in developed areas.	Confirmed present as a breeding species	More of a concern in native woodland/ riparian. Commonly seen in the admin area and the old housing area.

Species	Listing Status	Potential Indicator (+/-) &/or Umbrella (U) Species	Primary Habitat	Presence on Detachment Fallbrook	Notes; Citation(s) as Potential Focal Species
Brown-headed cowbird (*Molothrus ater*)		-	Riparian edges	Confirmed present as a breeding species	
Mammals					
San Diego black-tailed jackrabbit (*Lepus californicus bennettii*)	CSC, MSHCP	+	Open grassland/ scrub	Confirmed present in South Magazine	
Stephens' kangaroo rat (*Dipodomys stephensi*)	FE, ST, MSHCP	+, U	Grasslands	Confirmed present	
Southern grasshopper mouse (*Onchomys torridus ramona*)	CSC	+	Chaparral, coastal sage scrub	Confirmed present	
Common gray fox (*Urocyon cinereoargenteus*)		+	Chaparral and open forests.	Confirmed present	Den in hollow logs, beneath boulders, or sometimes in ground burrows. Not commonly seen.
Mountain lion (*Felis concolor*)	MSHCP	+		Confirmed present	"Mammalian carnivores are good candidates for focal species because their distributional patterns often strongly reflect regional-scale population processes" (Carrol et al. 2001) and are sensitive to fragmentation (Crooks 2002). Top predators may function as keystone species (Mills et al. 1993). Sensitive to fragmentation.
Southern mule deer (*Odocoileus hemionus fuliginata*)		+		Confirmed present	
American beaver (*Castor Canadensis*)		-	Riparian	Confirmed present	
Noway and Black rat (*Rattus norvegicus*, *R. rattus*)		-	Common in developed areas.	Confirmed present	More of a concern in native habitats.

M.2 CPIF POTENTIAL FOCAL SPECIES

Table M-2 provides a complete list of species identified in the CPIF plans and discusses their occurrence at Detachment Fallbrook. This information can be used to further discussions of the watch list species in the future.

Table M-2. CPIF Potential Focal Species

Habitat Type	Common Name (*Scientific Name*)	Suitable or Unsuitable as Focal Species	Discussion
Coastal Sage Scrub and Chaparral	Black-chinned Sparrow (*Spizella atrogularis*)	Unsuitable	Species is not common enough to provide meaningful data.
	Coastal (San Diego) Cactus Wren (*Campylorhynchus brunneicapillus sandiegonensis*)	Suitable	Present in good numbers and is already tracked as it is a listed species.
	Coastal California Gnatcatcher (*Polioptila californica californica*)	Suitable	Present in good numbers and is already tracked as it is a listed species.
	Costa's Hummingbird (*Calypte costae*)	Possible	Species is fairly common breeder on the installation. Would need to determine how to track this species in a meaningful way.
	Gray Vireo (*Vireo vicinior*)	Unsuitable	Does not occur at Detachment Fallbrook. Outside of species range.
	Greater Roadrunner (*Geococcyx californianus*)	Possible	Species is found in good numbers on Detachment Fallbrook but can be fairly secretive. Would need to figure out a meaningful way to track the species.
	Lesser Nighthawk (*Chordeiles acutipennis*)	Unsuitable	Species is not common enough to provide meaningful data.
	Nuttall's White-crowned Sparrow (*Zonotrichia leucophrys*)	Unsuitable	Species is migrant/wintering species found in all habitat types. This subspecies does not breed at the Detachment.
	Mountain Quail (*Oreortyx pictus*)	Unsuitable	Does not occur at Detachment Fallbrook. Outside of the species range.
	Southern California Rufous-crowned Sparrow (*Aimophila ruficeps canescens*)	Suitable	Species is fairly common breeder on the installation. Would need to determine how to track this species in a meaningful way.
	Bell's Sage Sparrow (*Artemisiospiza belli belli*)	Unsuitable	Species is not common enough to provide meaningful data.
	Wrentit (*Chamaea fasciata*)	Unsuitable	Species is too common and is found in several types of habitat on Detachment Fallbrook.

Habitat Type	Common Name (*Scientific Name*)	Suitable or Unsuitable as Focal Species	Discussion
Oak Woodlands	Acorn Woodpecker (*Melanerpes formicivorus*)	Possible	Breeds in more than just oak woodlands on Detachment Fallbrook. Seen in developed areas with trees as much as woodlands.
	Blue-gray Gnatcatcher (*Polioptila caerulea*)	Unsuitable	Most sightings are probably of migrants so their presence/absence may not be indicative of changes occurring at Detachment Fallbrook. Found more in chaparral in southern California than woodlands.
	Lark Sparrow (*Chondestes grammacus*)	Possible	Present in good numbers; however, it is found more in grasslands/open sage scrub. Not sure at Detachment Fallbrook this would be an indicator change in oak woodlands.
	Nuttall's Woodpecker (*Picoides nuttallii*)	Possible	Present in good numbers and breeds less in developed areas than acorn woodpeckers at Detachment Fallbrook.
	Oak Titmouse (*Baeolophus inornatus*)	Possible	Present in good numbers and is typically found in woodland areas at Detachment Fallbrook.
	Western Bluebird (*Sialia Mexicana*)	Suitable	Does occur in developed areas with trees as well as oak woodland but is not as prevalent as acorn woodpeckers. Good cavity nesting species.
	Western Scrub-jay (*Aphelocoma californica*)	Unsuitable	Too common and found in too many different habitat types.
	Yellow-billed Magpie (*Pica nuttalli*)	Unsuitable	Does not occur at Detachment Fallbrook. Outside of species range.
Riparian	Bank Swallow *(Riparia riparia*)	Unsuitable	Species is not common enough to provide meaningful data and it does not breed at Detachment Fallbrook.
	Black-headed Grosbeak (*Pheucticus melanocephalus*)	Possible	Present in good numbers and is found in riparian areas at Detachment Fallbrook.
	Blue Grosbeak (*Passerina caerulea*)	Possible	Present in good numbers, however, this is also found in coastal sage scrub area at Detachment Fallbrook. May not be a good indicator of what is going on in riparian.
	Common Yellowthroat (*Geothlypis trichas*)	Possible	Present in good numbers and is found in riparian areas at Detachment Fallbrook.
	Least Bell's Vireo (*Vireo bellii pusillus*)	Suitable	Present in low numbers but it is already tracked as it is a listed species.
	Song Sparrow (*Melospiza melodia*)	Unsuitable	Species is too common and is found in several types of habitat on Detachment Fallbrook.
	Swainson's Hawk (*Buteo swainsoni*)	Unsuitable	Species is not common enough to provide meaningful data and is only seen as a migrant flying over Detachment Fallbrook. Would not indicate changes occurring on the Station.

Habitat Type	Common Name (*Scientific Name*)	Suitable or Unsuitable as Focal Species	Discussion
	Swainson's Thrush (*Catharus ustulatus*)	Unsuitable	It is a migrant so its presence/ absence would not indicate changes occurring on the Station and the species is not common enough to provide meaningful data.
	Tree Swallow (*Tachycineta bicolor*)	Unsuitable	Species is not common enough to provide meaningful data.
	Tricolored Blackbird (*Agelaius tricolor*)	Unsuitable	Species is not common enough to provide meaningful data.
	Warbling Vireo (*Vireo gilvus*)	Unsuitable	It is a migrant at Detachment Fallbrook so its presence/ absence would not indicate changes occurring on the Detachment.
	Willow Flycatcher (*Empidonax traillii*)	Suitable	Present in low numbers and it is already tracked as it is a listed species.
	Wilson's Warbler (*Cardellina pusilla*)	Unsuitable	It is a migrant so its presence/ absence would not indicate changes occurring on the Station.
	Yellow-breasted chat (*Icteria virens*)	Suitable	Present in low numbers. Is only found in denser riparian areas.
	Yellow Warbler (*Setophagia petechial*)	Suitable	Present in moderate numbers. It is mostly found in areas with a developed upper canopy.
Grasslands	Ferruginous Hawk (*Buteo regalis*)	Unsuitable	It is a migrant so its presence/ absence would not indicate changes occurring on the Station.
	Grasshopper Sparrow (*Ammodramus savannarum*)	Suitable	Present in low numbers but it is only found in the grasslands. Good indicator of possible impacts from grazing.
	Mountain Plover (*Charadrius montanus*)	Unsuitable	It is a migrant so its presence/ absence would not indicate changes occurring on the Detachment.
	Northern Harrier (*Circus cyaneus*)	Suitable	Present in low numbers but it is only found in the grasslands. Good indicator of possible impacts from grazing.
	Savannah Sparrow (*Passerculus sandwichensis*)	Unsuitable	It is a migrant so its presence/ absence would not indicate changes occurring on the Detachment. Listed subspecies does not breed at Detachment Fallbrook.
	Western Meadowlark (*Sturnella neglecta*)	Suitable	Species is fairly common breeder on the installation. Would need to determine how to track this species in a meaningful way.
	White-tailed Kite (*Elanus leucurus*)	Possible	Present in low numbers but it is only found in the grasslands and breeding in nearby tall trees. May be too sporadic in it occurrence to provide meaningful data.

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APPENDIX N

PROJECT LIST

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Environmental Program Requirements (EPRs) that help fund natural resources management projects and activities in support of the implementation of objectives within Detachment Fallbrook's INRMP. See Chapter 4 for complete list of management actions, some of which may not require EPR funding (e.g., avoidance and minimization, education/outreach, regional partnering). Table N-1 summarizes in-house practices that do not require additional funding and Table N-2 lists projects that require funding to support the INRMP.

Table N-1. Summary of In-House Practices that Require No Funding Above Mission Level Funding to Implement

Management Activity	INRMP Objective(s)/ Section	ERL Number	Metrics Focus Area	Primary Legal Driver	Scheduled Implementation
Laws and Regulations: • Ensure Detachment Fallbrook maintains compliance with all applicable natural resource laws and regulations	5.5	4	Ecosystem Integrity, Listed Species and Critical Habitat	ESA, CWA, Sikes Act, DoDI 4715.03, OPNAV M-5090.1	Ongoing
INRMP Implementation, Reviews: • Oversee and ensure adaptive implementation of INRMP (budget programming, contract executions and oversight, regional partnering, etc.) • Implement and oversee the INRMP annual review and metrics analysis • Update and modify management measures, as necessary, after reviews • Perform Environmental Management System (EMS) self-audits and support external EMS audits	All	4	INRMP Implementation	Sikes Act, DoDI 4715.03, OPNAV M-5090.1	Ongoing
Wildland Fire Management: • Support implementation of the WFMP and the associated WFMP BO (e.g., pre-disking firebreak surveys for Stephens' kangaroo rat burrows, biomonitoring, USFWS reporting) • Support the annual fire management meeting	4.3	4	Ecosystem Integrity, Listed Species and Critical Habitat	ESA, Sikes Act, DoDI 4715.03, OPNAV M-5090.1	Ongoing
Grazing Management: • Support implementation of the Grazing Management Plan (GMP) • Oversee the annual range monitoring to determine number of cattle that can be on the range. • Monitor effects of cattle grazing on natural resources	4.4	4	Ecosystem Integrity, Listed Species and Critical Habitat	ESA, Sikes Act, DoDI 4715.03, OPNAV M-5090.1	Ongoing

Management Activity	INRMP Objective(s)/ Section	ERL Number	Metrics Focus Area	Primary Legal Driver	Scheduled Implementation
Natural Resource Contract Management: • Oversee and support contracts issued to support the program. • Identify/prioritize/define requirements for the contracts • Complete budget planning/funding requests • Develop contract scopes • Develop/oversee focused species survey protocols specific to Detachment Fallbrook • Oversee implementation of the contracts through access control, kick-off meetings, logistics support, and trouble shooting. • Close out projects once deliverables are reviewed and accepted.	All	4	Ecosystem Integrity, Listed Species and Critical Habitat	ESA, Sikes Act, DoDI 4715.03, OPNAV M-5090.1	Ongoing
Pest Management: • Review/oversee as is applicable to natural resource management • Oversee the Integrated Pest Management Plan update (every five years) • Oversee annual NOPRS data • Respond to animal calls and perform removal or make arrangements for a third party to remove • Educate personnel on prevention as needed	4.14	4	Ecosystem Integrity	ESA, Sikes Act, DoDI 4715.03, OPNAV M-5090.1	Ongoing
Documents/Record Management: • Maintain/monitor records of injured wildlife/animal calls to monitor extent of problem • Tracks access/visitor safety briefs/badges for natural resource contractors • Maintain the incidental species observation logs • Maintain weather log • Monitor herbarium • Maintain original copies of all documents /records for the Detachment	4.21	4	Ecosystem Integrity, Listed Species and Critical Habitat	ESA, Sikes Act, DoDI 4715.03, OPNAV M-5090.1	Ongoing

Management Activity	INRMP Objective(s)/ Section	ERL Number	Metrics Focus Area	Primary Legal Driver	Scheduled Implementation
GIS Data Management: • Provide data to contractors as needed • Review and QA/QC all GIS deliverables from contractors • Perform data queries and analysis to support natural resource management • Generate figures/maps as needed • Responsibly archive and manage the GIS database	4.21	4	Ecosystem Integrity, Listed Species and Critical Habitat	ESA, Sikes Act, DoDI 4715.03, OPNAV M-5090.1	Ongoing
Mission Support and Natural Resources Reviews: • Ensure the established environmental review process is implemented to evaluate the effects of actions on natural areas prior to implementing new activities. • Conduct NEPA project reviews, submit NEPA CX request for Natural Resource project, if applicable. • Review IRP/MRP projects • Conduct regulatory consultations/permitting • Support the Command as necessary by conducting briefs, providing tours, etc. as requested.	5.5	4	Ecosystem Integrity, Listed Species and Critical Habitat, INRMP Implementation	ESA, Sikes Act, DoDI 4715.03, OPNAV M-5090.1	As needed
Public Outreach and Regional Partnering: • Explore opportunities to participate in public outreach programs and enhance community involvement, and develop partnerships with local organizations, as applicable. • Attend applicable regional meetings (e.g. San Diego Weed Management, Riparian Birds Working Group) • Coordinate with MCB Camp Pendleton • Coordinate weed management with neighboring property owners • Participate in National Military Fish and Wildlife Association (NMFWA), DoD Partners in Flight program, DOD Partners in Amphibian and Reptile Conservation's (PARC), and other DOD associations and programs • Track trends of widespread regional environmental stressors	5.9	3	Sikes Act Cooperation (Partnership Effectiveness)	Sikes Act, DoDI 4715.03, OPNAV M-5090.1	Ongoing

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Table N-2. Projects that Require Funding Above Mission Level Funding to Implement

Project or Activity/Objective [a]	EPR # (Abbreviated Title) [a]	ERL # [b]	INRMP Section	Prime Legal Drivers	Metrics Focus Area	Scheduled Implementation [c]	Funding Source/Cost Estimate [d]
Ecosystem Management							
OBJ: Monitor, maintain, and restore ecological structure, function, and disturbance processes to protect ecosystem services, resiliency, and native biodiversity.							
Implement the Long Term Ecological Trend Monitoring (LTETM).	00396NR005 (LTETM)	4	4.2	Sikes Act, ESA, EO 11987, EO 13112, DoDI 4715.03, OPNAV M-5090.1	Ecosystem Integrity	Approx every 3 to 6 years	
Maintain and update the INRMP.	0039600003 (INRMP)	4	4.2	ESA, Sikes Act, DoDI 4715.03, OPNAV M-5090.1	Ecosystem Integrity	Non-annual recurring, review annually, update ≤ 5 years	
Pursue a programmatic mission and maintenance BO with the USFWS.	00396NR017 (Biological Assessment)	4	4.2	ESA	Listed Species and Critical Habitat	Approx FY20	
Promote natural resources education through public events, native plant garden, etc.	00396NR006 (Education Events)	3	4.2	Sikes Act, DoDI 4715.03, OPNAV M-5090.1	Ecosystem Integrity	Annually	
Data management support for regulatory compliance and ecosystem management. Maintain, update, analyze, and responsibly archive data in support of management of federally listed species, species at risk, and other natural resources.	00396NR012 (Effects Assmt, Data Mgmt)	4	4.2	ESA, MBTA, CWA, Sikes Act, DoDI 4715.03, OPNAV M-5090.1	Ecosystem Integrity	Annually	
Virtually all other EPRs support this objective including but not limited to: 0039600005 (Invasive Plant Control), 0039612036 (Invasive Animal Control) , 0039612035 (Soil Conservation, Erosion Ctrl), 00396NR009 (Grazing Mgmt), 00396NR014 (Wetland Conservation), 0039612003 (Vegetation/Habitat Mapping), 003961235A (Aerial Photography)							

Project or Activity/Objective [a]	EPR # (Abbreviated Title) [a]	ERL # [b]	INRMP Section	Prime Legal Drivers	Metrics Focus Area	Scheduled Implementation [c]	Funding Source/Cost Estimate [d]
Wildland Fire Management							
OBJ: Implement a comprehensive fire management program to reduce fuel load; support fire management network; ensure effective suppression capabilities; and protect, maintain, and enhance ecosystem functions and diversity.							
Map perimeter and severity of fires.	0039612003 (Veg/Habitat Mapping)	4	4.3	ESA, Sikes Act, DoDI 4715.03, OPNAV M-5090.1, WFMP	Ecosystem Integrity	As needed	
Review and update the Fire Atlas and Fire Management Plan and associated Biological Opinion.	003961236A (Fire Atlas, Mgmt Plan)	4	4.3	OPNAVINST 5090, DoDI 4715.03, WFMP	Ecosystem Integrity	Non-annual recurring	
Conduct prescribed burns as a method for reducing fuel load and, to the extent feasible, habitat enhancement.	00396NR007 (Prescription Burns)	4	4.3	ESA, Sikes Act, DoDI 4715.03, OPNAV M-5090.1, WFMP	Ecosystem Integrity	As needed, not expected before 2020	
Conduct avoidance/minimization measures and monitoring during fuelbreak maintenance. To the extent feasible, enhance fuelbreaks for SKR habitat benefit.	00396NR018 (Firebreak Support)	4	4.3	ESA, Sikes Act, DoDI 4715.03, OPNAV M-5090.1, WFMP	Ecosystem Integrity	Annually	
Other EPRs that may directly or indirectly support this objective include but are not limited to: 0039600005 (Invasive Plant Control), 0039612035 (Soil Conservation, Erosion Ctrl), 00396NR009 (Grazing Mgmt), 00396NR014 (Wetland Conservation), 003961235A (Aerial Photography), and EPRs that support federally listed species and the implementation of the WFMP BO.							

Project or Activity/Objective [a]	EPR # (Abbreviated Title) [a]	ERL # [b]	INRMP Section	Prime Legal Drivers	Metrics Focus Area	Scheduled Implementation [c]	Funding Source/Cost Estimate [d]
Livestock Grazing							
OBJ: Maintain a sustainable and effective livestock grazing program to reduce fuel load and maximize the beneficial use of grazing as a natural resources management tool.							
Conduct general vegetation cover and health assessment. Specific areas of focus could include an examination of the functionality of different cattle grazing regimens (including exclusion and flash grazing) on vegetation health and structure. Monitor potential effect of grazing on soil and water resources, and listed species.	00396NR008 (Grazing Monitoring)	4	4.4	ESA, CWA, Soil Conservation Act, Sikes Act, EO 11990, EO 11987, EO 13112, DoDI 4715.03, OPNAV M-5090.1, WFMP	Ecosystem Integrity	Annually	
Conduct studies for miscellaneous issues that support grazing such as supplementary wells, maintenance of watering facilities, etc. Provide annual management summaries, amendments/edits to Grazing Management Plan.	00396NR009 (Grazing Mgmt)	4	4.4	ESA, CWA, Soil Conservation Act, Sikes Act, EO 11990, EO 11987, EO 13112, DoDI 4715.03, OPNAV M-5090.1, WFMP	Ecosystem Integrity	Annually	
Other EPRs that may directly or indirectly support this objective include but are not limited to: 0039600005 (Invasive Plant Control), 0039612035 (Soil Conservation, Erosion Ctrl), 00396NR014 (Wetland Conservation), 00396NR005 (LTETM), 003961235A (Aerial Photography), 00396NR012 (Effects Assmt, Data Mgmt), and EPRs that support federally listed species and the implementation of the WFMP BO							
Soil Resources							
OBJ: Conserve soil productivity, nutrient functioning, water quality, air quality, and wildlife habitat through effective implementation of BMPs to prevent and control soil erosion and contamination.							
Implement multi-year erosion monitoring, inventorying, assessment, and control.	0039612035 (Soil Conserv., Erosion Ctrl), Other EPRs also support	4	4.5	SWCA, CWA, Sikes Act , ESA, DoDI 4715.03, OPNAV M-5090.1, WFMP	Ecosystem Integrity	Non-annual recurring	

Project or Activity/Objective [a]	EPR # (Abbreviated Title) [a]	ERL # [b]	INRMP Section	Prime Legal Drivers	Metrics Focus Area	Scheduled Implementation [c]	Funding Source/Cost Estimate [d]
Large scale stream restoration	00396NR014 (Wetland Conservation)	4	4.5	CWA, EO 11990, ESA, FNWA, Sikes Act, DoDI 4715.03, OPNAV M-5090.1	Ecosystem Integrity	Non-annual recurring, peak cost in FY22	
Other EPRs that support this objective include but are not limited to: 00396NR005 (LTETM), 00396NR012 (Effects Assmt, Data Mgmt), 00396NR008 (Grazing Monitoring), 00396NR009 (Grazing Mgmt).							
Vegetation Communities, Habitats, and Land Cover Types							
OBJ: Maintain, monitor, and restore plant communities to support optimal species richness, biodiversity, ecosystem services, and habitat resiliency.							
Conduct vegetation mapping.	0039612003 (Veg/Habitat Mapping)	4	4.6	ESA, Sikes Act, EO 13112, EO 11987, DoDI 4715.03, OPNAV M-5090.1, WFMP	Ecosystem Integrity	Every 5 to 10 years	
Aerial photography	003961235A (Aerial Photography)	4	4.6	ESA, Sikes Act, DoDI 4715.03, OPNAV M-5090.1, WFMP	Ecosystem Integrity	Every 5 years	
Maintain wetland restoration sites. Conduct wetland delineations to support avoidance/minimization and management.	00396NR014 (Wetland Conservation)	4	4.6	CWA, EO 11990, ESA, FNWA, Sikes Act, DoDI 4715.03, OPNAV M-5090.1	Ecosystem Integrity	Non-annual recurring, peak every 10-15 years.	
Control invasive and noxious plant species by removal of noxious weeds, surveys for new infestations, and monitoring areas with prior infestations for management.	0039600005 (Invasive Plant Control)	4	4.6	ESA, Sikes Act, EO 11987, EO 13112, FNWA, DoDI 4715.03, OPNAV M-5090.1, WFMP	Ecosystem Integrity	Annually	
Other EPRs that may directly or indirectly support this objective include but are not limited to:0039612035 (Soil Conservation, Erosion Ctrl), 00396NR009 (Grazing Mgmt), 00396NR005 (LTETM), 003961225B (Rare Plant Surveys), 00396NR012 (Effects Assmt, Data Mgmt),							

Project or Activity/Objective [a]	EPR # (Abbreviated Title) [a]	ERL # [b]	INRMP Section	Prime Legal Drivers	Metrics Focus Area	Scheduled Implementation [c]	Funding Source/Cost Estimate [d]
Rare and Sensitive Plants							
OBJ: Conserve habitats that would support rich native plant diversity, including rare and sensitive species, to the extent feasible considering the legacy of land use impacts and balancing contemporary land use requirements.							
Survey for rare and sensitive plants. Map rare and sensitive plant species and their recruitment.	003961225B (Rare Plant Surveys)	4	4.7	ESA, Sikes Act, DoDI 4715.03, OPNAV M-5090.1, WFMP	Ecosystem Integrity	Every 5 years	
Control invasive and noxious plant species by removal of noxious weeds, surveys for new infestations, and monitoring areas with prior infestations for management.	0039600005 (Invasive Plant Control)	4	4.7	ESA, Sikes Act, EO 11987, EO 13112, FNWA, DoDI 4715.03, OPNAV M-5090.1, WFMP	Ecosystem Integrity	Annually	
Other EPRs that may directly or indirectly support this objective include but are not limited to: 00396NR005 (LTETM), 00396NR012 (Effects Assmt, Data Mgmt), 0039612003 (Vegetation & Habitat Mapping), 00396NR009 (Grazing Mgmt), and 003961236A (Fire Atlas & Mgmt Plan).							
Fish and Wildlife Management: Invertebrates							
OBJ: Conserve viable habitat to support optimal native invertebrate diversity on the Detachment and support investigative research that improves our understanding of invertebrate ecology, their potential as bioindicators, and their susceptibility to environmental stressors.							
Survey for invertebrates and SAR.	003961225E (Invertebrate Surveys)	4	4.8	ESA, Sikes Act, EO 11987, EO 13112, DoDI 4715.03, OPNAV M-5090.1	Fish and Wildlife Management, Public Use	Non-annual recurring	
Control exotic, invasive animals through removal of individuals, early detection/rapid response (EDRR), and research and monitoring.	0039612036 (Invasive Animal Control)	4	4.8	ESA, Sikes Act, EO 11987, EO 13112, FNWA, DoDI 4715.03, OPNAV M-5090.1	Fish and Wildlife Management, Public Use	Annually	
Other EPRs that may directly or indirectly support this objective include but are not limited to: 00396NR012 (Effects Assmt, Data Mgmt), 0039612003 (Vegetation & Habitat Mapping), 00396NR014 (Wetlands), 00396NR009 (Grazing Mgmt), and 003961236A (Fire Atlas & Mgmt Plan).							

Project or Activity/Objective [a]	EPR # (Abbreviated Title) [a]	ERL # [b]	INRMP Section	Prime Legal Drivers	Metrics Focus Area	Scheduled Implementation [c]	Funding Source/Cost Estimate [d]
Fish and Wildlife Management: Fish							
OBJ: Conserve habitat that would support native fish diversity within the Santa Margarita River.							
Conserve fish and aquatic species through monitoring, surveys, and habitat assessments.	00396NR016 (Fish, Aquatic Conservation)	4	4.9	Sikes Act, EO 11987, EO 13112, DoDI 4715.03, OPNAV M-5090.1	Fish and Wildlife Management, Public Use	Non-annual recurring	
Control invasive animals through removal of individuals (e.g., aquatic exotics control in Santa Margarita River). Provides vigilance opportunities for native fish, including steelhead.	0039612036 (Invasive Animal Control)	4	4.9	ESA, Sikes Act, EO 11987, EO 13112, FNWA, DoDI 4715.03, OPNAV M-5090.1	Fish and Wildlife Management, Public Use	Annually	
Maintain wetland restoration sites.	00396NR014 (Wetland Conservation)	4	4.6	CWA, EO 11990, ESA, FNWA, Sikes Act, DoDI 4715.03, OPNAV M-5090.1	Fish and Wildlife Management, Public Use	As needed	
Other EPRs that may directly or indirectly support this objective include but are not limited to: 00396NR012 (Effects Assmt, Data Mgmt), 0039612035 (Soil Conservation & Erosion Control), 0039612003 (Vegetation & Habitat Mapping), 00396NR008 (Grazing Monitoring), 00396NR009 (Grazing Mgmt), 003961236A (Fire Atlas & Mgmt Plan), and 39600005 (Invasive Plant Control).							
Fish and Wildlife Management: Amphibians and Reptiles							
OBJ: Conserve viable habitat to support optimal native amphibian and reptile diversity.							
Survey for reptiles and amphibians and SAR.	003961225D (Herp Surveys)	4	4.10	Sikes Act, DoDI 4715.03, OPNAV M-5090.1	Fish and Wildlife Management, Public Use	Non-annual recurring approx. every 4 yrs	
Control exotic, invasive animals through removal of individuals, early detection/rapid response (EDRR), and research and monitoring.	0039612036 (Invasive Animal Control)	4	4.10	ESA, Sikes Act, EO 11987, EO 13112, FNWA, DoDI 4715.03, OPNAV M-5090.1	Fish and Wildlife Management, Public Use	Annually	
Maintain wetland restoration sites.	00396NR014 (Wetland Conservation)	4	4.6	CWA, EO 11990, ESA, FNWA, Sikes Act, DoDI 4715.03, OPNAV M-5090.1	Fish and Wildlife Management, Public Use	As needed	

Project or Activity/Objective [a]	EPR # (Abbreviated Title) [a]	ERL # [b]	INRMP Section	Prime Legal Drivers	Metrics Focus Area	Scheduled Implementation [c]	Funding Source/Cost Estimate [d]
Other EPRs that may directly or indirectly support this objective include but are not limited to: 00396NR012 (Effects Assmt, Data Mgmt), 0039612035 (Soil Conservation & Erosion Control), 0039612003 (Vegetation & Habitat Mapping), 00396NR016 (Fish & Aquatic Conservation), 0039600121 (ARTO Surveys), 00396NR008 (Grazing Monitoring), 00396NR009 (Grazing Mgmt), 0039600005 (Invasive Plant Control), and 003961236A (Fire Atlas & Mgmt Plan).							
Fish and Wildlife Management: Birds							
OBJ: Conserve viable habitat to support optimal native avian diversity within coastal sage scrub, riparian, grassland, chaparral, and oak woodland communities.							
Migratory bird surveys and conservation, e.g. for DOD PIF species, management focus species, and raptors. Support bird-related animal calls. Test for led and pesticide poisoning. Avoidance surveys for nesting birds.	003961225A (MBTA Management)	4	4.11	MBTA, BEPA, ESA, Sikes Act, EO 13186, DoDI 4715.03, OPNAV M-5090.1	Fish and Wildlife Management, Public Use	Annually, peak survey every 5-10 years	
Maintain wetland restoration sites.	00396NR014 (Wetland Conservation)	4	4.6	CWA, EO 11990, ESA, FNWA, Sikes Act, DoDI 4715.03, OPNAV M-5090.1	Fish and Wildlife Management, Public Use	As needed	
Other EPRs that may directly or indirectly support this objective include but are not limited to: 00396NR012 (Effects Assmt, Data Mgmt), 0039612003 (Vegetation & Habitat Mapping), 0039612002 (CAGN Surveys), 00396-7002 (CAGN Conservation), 0039600002 (LBVI, SWFL Surveys), 00396NR019 (LBVI, SWFL Conservation), 0039612036 (Invasive Animal Control), 0039600005 (Invasive Plant Control), 00396NR008 (Grazing Monitoring), 00396NR009 (Grazing Mgmt), and 003961236A (Fire Atlas & Mgmt Plan).							
Fish and Wildlife Management: Mammals							
OBJ: Conserve viable habitat to support optimal native mammalian diversity, including bats and carnivores.							
Survey for mammal species and SAR including bats, small mammals, medium sized mammals such as jackrabbits, large mammals such as mountain lions. Survey wildlife corridors.	003961225C (Mammal Surveys)	4	4.12	Sikes Act, DoDI 4715.03, OPNAV M-5090.1	Fish and Wildlife Management, Public Use	Non-annual recurring	

Project or Activity/Objective [a]	EPR # (Abbreviated Title) [a]	ERL # [b]	INRMP Section	Prime Legal Drivers	Metrics Focus Area	Scheduled Implementation [c]	Funding Source/Cost Estimate [d]
Survey for bats within structures required for the mission and conduct exclusion activities and create alternative roosts for the species. Support conservation that precludes listing.	00396NR015 (Bat Conservation)	4	4.12	Sikes Act, DoDI 4715.03, OPNAV M-5090.1	Fish and Wildlife Management, Public Use	Non-annual recurring	
Other EPRs that may directly or indirectly support this objective include but are not limited to: 00396NR012 (Effects Assmt, Data Mgmt), 39612025 (SKR Surveys), 00396-7003 (SKR Conservation), 0039612003 (Vegetation & Habitat Mapping), 00396NR009 (Grazing Mgmt), 003961236A (Fire Atlas & Mgmt Plan), 00396NR007 (Prescription Burns), 0039612036 (Invasive Animal Control), 39600005 (Invasive Plant Control), 00396NR014 (Wetland Conservation)							
Federally Listed Species							
OBJ 1: Southern Steelhead Trout - Implement management strategies that maintain a healthy and diverse riverine and riparian community to benefit the steelhead and other SAR and native sympatric species.							
Conserve fish and aquatic species through monitoring, surveys, and habitat assessments.	00396NR016 (Fish, Aquatic Conservation)	4	4.13.1	Sikes Act, EO 11987, EO 13112, DoDI 4715.03, OPNAV M-5090.1	Fish and Wildlife Management, Public Use	Non-annual recurring	
Control invasive animals through removal of individuals (e.g., aquatic exotics control in Santa Margarita River). Provides vigilance opportunities for steelhead presence.	0039612036 (Invasive Animal Control)	4	4.13.1	ESA, Sikes Act, EO 11987, EO 13112, FNWA, DoDI 4715.03, OPNAV M-5090.1	Fish and Wildlife Management, Public Use	Annually	
Maintain wetland restoration sites.	00396NR014 (Wetland Conservation)	4	4.6	CWA, EO 11990, ESA, FNWA, Sikes Act, DoDI 4715.03, OPNAV M-5090.1	Listed Species, and Critical Habitat	As needed	
Other EPRs that may directly or indirectly support this objective include but are not limited to: 00396NR012 (Effects Assmt, Data Mgmt), 0039612035 (Soil Conservation & Erosion Control), 0039612003 (Vegetation & Habitat Mapping), 00396NR008 (Grazing Monitoring), 00396NR009 (Grazing Mgmt), 003961236A (Fire Atlas & Mgmt Plan), and 39600005 (Invasive Plant Control).							
OBJ 2: Arroyo Toad - Implement management strategies that maintain a healthy and biodiverse riverine and riparian community to benefit the arroyo toad and other SAR and native sympatric species.							
Conduct surveys for the arroyo toad, breeding and upland.	0039600121 (ARTO Surveys)	4	4.13.2	ESA, Sikes Act, DoDI 4715.03, OPNAV M-5090.1, WFMP	Listed Species and Critical Habitat	Every 5 years	

Project or Activity/Objective [a]	EPR # (Abbreviated Title) [a]	ERL # [b]	INRMP Section	Prime Legal Drivers	Metrics Focus Area	Scheduled Implementation [c]	Funding Source/Cost Estimate [d]
Survey for reptiles and amphibians and SAR.	003961225D (Herp Surveys)	4	4.10	Sikes Act, DoDI 4715.03, OPNAV M-5090.1	Fish and Wildlife Management, Public Use	Non-annual recurring approx. every 4 yrs	
Control invasive animals through removal of individuals (e.g., aquatic exotics control in Santa Margarita River).	0039612036 (Invasive Animal Control)	4	4.15	ESA, Sikes Act, EO 11987, EO 13112, FNWA, DoDI 4715.03, OPNAV M-5090.1	Fish and Wildlife Management, Public Use	Annually	
Maintain wetland restoration sites.	00396NR014 (Wetland Conservation)	4	4.6	CWA, EO 11990, ESA, FNWA, Sikes Act, DoDI 4715.03, OPNAV M-5090.1	Listed Species and Critical Habitat	As needed	
Other EPRs that may directly or indirectly support this objective include but are not limited to: 00396NR012 (Effects Assmt, Data Mgmt), 0039612035 (Soil Conservation & Erosion Control), 0039612003 (Vegetation & Habitat Mapping), 00396NR016 (Fish & Aquatic Conservation), 00396NR008 (Grazing Monitoring), 00396NR009 (Grazing Mgmt), 003961236A (Fire Atlas & Mgmt Plan), and 39600005 (Invasive Plant Control).							
OBJ 3: California Least Tern - Implement management strategies that maintain a healthy and diverse riparian community to benefit federally listed, sensitive, and other sympatric species.							
Maintain wetland restoration sites.	00396NR014 (Wetland Conservation)	4	4.6	CWA, EO 11990, ESA, FNWA, Sikes Act, DoDI 4715.03, OPNAV M-5090.1	Listed Species and Critical Habitat	As needed	
Watch list species during other bird surveys.	Multiple	---	4.13.3	----	Listed Species and Critical Habitat	varies	
Other EPRs that may directly or indirectly support this objective include but are not limited to: 00396NR012 (Effects Assmt, Data Mgmt), 0039600002 (LBVI, SWFL Surveys), 003961225A (MBTA Management), 00396NR016 (Fish & Aquatic Conservation), 00396NR008 (Grazing Monitoring), 00396NR009 (Grazing Mgmt), and 39600005 (Invasive Plant Control).							
OBJ 4: Southwestern Willow Flycatcher - Implement management strategies that maintain a healthy and diverse riparian community to benefit federally listed, sensitive, and other sympatric species.							
Conduct surveys for the southwestern willow flycatcher during least Bell's vireo surveys.	0039600002 (LBVI, SWFL Surveys)	4	4.13.4	ESA, Sikes Act, DoDI 4715.03, OPNAV M-5090.1, WFMP	Listed Species and Critical Habitat	Annual sampling, Basewide every 5 years	

Project or Activity/Objective [a]	EPR # (Abbreviated Title) [a]	ERL # [b]	INRMP Section	Prime Legal Drivers	Metrics Focus Area	Scheduled Implementation [c]	Funding Source/Cost Estimate [d]
Research, conserve, and protect southwestern willow flycatcher and enhance their habitat.	00396NR019 (LBVI, SWFL Conservation)	4	4.13.4	ESA, Sikes Act, MBTA, EO 13186, DoDI 4715.03, OPNAV M-5090.1, WFMP	Listed Species and Critical Habitat	Non-annual recurring, Multi-year programs	
Maintain wetland restoration sites.	00396NR014 (Wetland Conservation)	4	4.6	CWA, EO 11990, ESA, FNWA, Sikes Act, DoDI 4715.03, OPNAV M-5090.1	Listed Species and Critical Habitat	As needed	
Other EPRs that may directly or indirectly support this objective include but are not limited to: 00396NR005 (LTETM), 00396NR012 (Effects Assmt, Data Mgmt), 003961225A (MBTA Management), 0039612003 (Vegetation & Habitat Mapping), 003961236A (Fire Atlas & Mgmt Plan), 00396NR008 (Grazing Monitoring), 00396NR009 (Grazing Mgmt), 39600005 (Invasive Plant Control), and 0039612036 (Invasive Animal Control).							
OBJ 5: Least Bell's Vireo - Implement management strategies that maintain a healthy, diverse, and intact riparian community that is able to support the least Bell's vireo, where appropriate, and other SAR and native sympatric species.							
Conduct surveys, and habitat mapping every 5 years, for the least Bell's vireo.	0039600002 (LBVI, SWFL Surveys)	4	4.13.5	ESA, Sikes Act, DoDI 4715.03, OPNAV M-5090.1, WFMP	Listed Species and Critical Habitat	Annual sampling, Basewide every 5 years	
Research, conserve, and protect least Bell's vireo and enhance their habitat.	00396NR019 (LBVI, SWFL Conservation)	4	4.13.5	ESA, Sikes Act, MBTA, EO 13186, DoDI 4715.03, OPNAV M-5090.1, WFMP	Listed Species and Critical Habitat	Non-annual recurring, Multi-year programs	
Maintain wetland restoration sites.	00396NR014 (Wetland Conservation)	4	4.6	CWA, EO 11990, ESA, FNWA, Sikes Act, DoDI 4715.03, OPNAV M-5090.1	Listed Species and Critical Habitat	As needed	
Other EPRs that may directly or indirectly support this objective include but are not limited to: 00396NR005 (LTETM), 00396NR012 (Effects Assmt, Data Mgmt), 003961225A (MBTA Management), 0039612003 (Vegetation & Habitat Mapping), 003961236A (Fire Atlas & Mgmt Plan), 00396NR008 (Grazing Monitoring), 00396NR009 (Grazing Mgmt), 39600005 (Invasive Plant Control), and 0039612036 (Invasive Animal Control).							
OBJ 6: Coastal California Gnatcatcher - Implement management strategies that maintain a healthy, diverse, and intact coastal sage scrub community that is able to support the California gnatcatcher and other SAR and native sympatric species.							
Conduct surveys, and habitat mapping every 5 years, for the coastal California gnatcatcher.	0039612002 (CAGN Surveys)	4	4.13.6	ESA, Sikes Act, MBTA, EO 13186, DoDI 4715.03, OPNAV M-5090.1, WFMP	Listed Species and Critical Habitat	Annual sampling, Basewide every 5 years	

Project or Activity/Objective [a]	EPR # (Abbreviated Title) [a]	ERL # [b]	INRMP Section	Prime Legal Drivers	Metrics Focus Area	Scheduled Implementation [c]	Funding Source/Cost Estimate [d]
Research, conserve, and protect coastal California gnatcatchers and enhance their habitat.	00396-7002 (CAGN Conservation)	4	4.13.6	ESA, Sikes Act, OPNAVINST 5090, DoDI 4715.03, WFMP	Listed Species and Critical Habitat	Non-annual recurring	
Other EPRs that may directly or indirectly support this objective include but are not limited to: 00396NR005 (LTETM), 00396NR012 (Effects Assmt, Data Mgmt), 003961225A (MBTA Management), 0039612003 (Vegetation & Habitat Mapping), 003961236A (Fire Atlas & Mgmt Plan), 00396NR008 (Grazing Monitoring), 00396NR009 (Grazing Mgmt), 39600005 (Invasive Plant Control), and 0039612036 (Invasive Animal Control).							
OBJ 7: Stephens' Kangaroo Rat - Implement management strategies that maintain a healthy and diverse grassland community to benefit the Stephens' kangaroo rat and other sympatric species.							
Survey and monitor Stephens' kangaroo rat population, habitat suitability, and presence/absence distribution.	39612025 (SKR Surveys)	4	4.13.7	ESA, Sikes Act, DoDI 4715.03, OPNAV M-5090.1, WFMP	Listed Species and Critical Habitat	Annual sampling, Basewide every 5 years	
Research, conserve, and protect Stephens' kangaroo rat and enhance their habitat.	00396-7003 (SKR Conservation)	4	4.13.7	ESA, Sikes Act, DoDI 4715.03, OPNAV M-5090.1, WFMP	Listed Species and Critical Habitat	Annually	
Conduct avoidance/minimization measures and monitoring during fuelbreak maintenance. To the extent feasible, enhance fuelbreaks for SKR habitat benefit.	00396NR018 (Firebreak Support)	4	4.13.7	ESA, Sikes Act, DoDI 4715.03, OPNAV M-5090.1, WFMP	Listed Species and Critical Habitat	Annually	
Other EPRs that may directly or indirectly support this objective include but are not limited to: 00396NR005 (LTETM), 00396NR012 (Effects Assmt, Data Mgmt), 0039612003 (Vegetation & Habitat Mapping), 0039612035 (Soil Conservation, Erosion Ctrl), 00396NR009 (Grazing Mgmt), and 003961236A (Fire Atlas & Mgmt Plan), and 00396NR007 (Prescription Burns).							
Pest Management and Animal Control							
OBJ: Support an integrated pest management approach at Detachment Fallbrook that protects facilities, personnel, and native species from risk or loss due to pest species or their management.							
Control exotic, invasive animals through removal of individuals, early detection/rapid response (EDRR), and research and monitoring.	0039612036 (Invasive Animal Control)	4	4.14	ESA, Sikes Act, EO 11987, EO 13112, FNWA, DoDI 4715.03, OPNAV M-5090.1	Ecosystem Integrity	Annually	

Project or Activity/Objective [a]	EPR # (Abbreviated Title) [a]	ERL # [b]	INRMP Section	Prime Legal Drivers	Metrics Focus Area	Scheduled Implementation [c]	Funding Source/Cost Estimate [d]
Control exotic, invasive plants through removal of individuals, EDRR, and research and monitoring.	39600005 (Invasive Plant Control)	4	4.14	ESA, Sikes Act, EO 13112, EO 11987, DoDI 4715.03, OPNAV M-5090.1, WFMP	Ecosystem Integrity	Every 5 to 10 years	
Watch list species during other biological surveys facilitates EDRR.	Multiple	---	4.14	----	Listed Species and Critical Habitat	varies	
Other EPRs that may directly or indirectly support this objective include but are not limited to: 00396NR005 (LTETM), 00396NR012 (Effects Assmt, Data Mgmt), 0039612003 (Vegetation & Habitat Mapping), 00396NR008 (Grazing Monitoring), 00396NR009 (Grazing Mgmt), 0039612002 (CAGN Surveys), 00396-7002 (CAGN Conservation), 0039612025 (SKR Surveys), 00396-7003 (SKR Conservation), 0039600002 (LBVI, SWFL Surveys), 00396NR019 (LBVI, SWFL Conservation), 003961225A (Migratory Bird Surveys & Mgmt), 0039600121 (ARTO Surveys), 003961225B (Listed and Rare Plants Surveys), 003961225C (Mammal Surveys), 003961225D (Amphibians & Reptiles Surveys), 003961225E (Invertebrate Surveys), 00396NR006 (Education Events), 00396NR014 (Wetlands), and 00396NR016 (Fish & Aquatic Conservation).							
Invasive and Exotic Species							
OBJ: Control the spread and introduction of invasive and noxious species with priority on those with the greatest potential to degrade sensitive species populations and/or habitat.							
Control exotic, invasive animals through removal of individuals, early detection/rapid response (EDRR), and research and monitoring.	0039612036 (Invasive Animal Control)	4	4.15	ESA, Sikes Act, EO 11987, EO 13112, FNWA, DoDI 4715.03, OPNAV M-5090.1	Ecosystem Integrity	Annually	
Control invasive and noxious plant species by removal of noxious weeds, surveys for new infestations, and monitoring areas with prior infestations for management.	39600005 (Invasive Plant Control)	4	4.15	ESA, Sikes Act, EO 11987, EO 13112, FNWA, DoDI 4715.03, OPNAV M-5090.1, WFMP	Ecosystem Integrity	Annually	
Watch list species during other biological surveys facilitates EDRR.	Multiple	---	4.15	----	Listed Species and Critical Habitat	varies	

Project or Activity/Objective [a]	EPR # (Abbreviated Title) [a]	ERL # [b]	INRMP Section	Prime Legal Drivers	Metrics Focus Area	Scheduled Implementation [c]	Funding Source/Cost Estimate [d]
Other EPRs that may directly or indirectly support this objective include but are not limited to: 00396NR005 (LTETM), 00396NR012 (Effects Assmt, Data Mgmt), 0039612003 (Vegetation & Habitat Mapping), 00396NR008 (Grazing Monitoring), 00396NR009 (Grazing Mgmt), 0039612002 (CAGN Surveys), 00396-7002 (CAGN Conservation), 0039612025 (SKR Surveys), 00396-7003 (SKR Conservation), 0039600002 (LBVI, SWFL Surveys), 00396NR019 (LBVI, SWFL Conservation), 003961225A (Migratory Bird Surveys & Mgmt), 0039600121 (ARTO Surveys), 003961225B (Listed and Rare Plants Surveys), 03961225C (Mammal Surveys), 003961225D (Amphibians & Reptiles Surveys), 003961225E (Invertebrate Surveys), 00396NR006 (Education Events), 00396NR014 (Wetlands), and 00396NR016 (Fish & Aquatic Conservation).							
Documents, Records, and Data Management							
OBJ: Provide for the optimal collection, storage, and management of data to facilitate compliance, project reviews and support, resource assessment monitoring, adaptive management, and informed decision making.							
Data management support for regulatory compliance. Maintain, update, analyze, and responsibly archive data in support of management of federally listed species, species at risk, and other natural resources.	00396NR012 (Effects Assmt, Data Mgmt)	4	4.21	ESA, CWA, Sikes Act, DoDI 4715.03, OPNAV M-5090.1	Ecosystem Integrity	Annually	
Maintain and update the INRMP.	0039600003 (INRMP)	4	4.21	ESA, Sikes Act, DoDI 4715.03, OPNAV M-5090.1	Ecosystem Integrity	Non-annual recurring, review annually, update ≤ 5 years	
Virtually all other EPRs support this objective with the initial collection of data and documentation of records.							

Acronyms:
BEPA= Bald Eagle Protection Act
CWA= Clean Water Act
DoDI=Department of Defense Instruction
EDRR= Early Detection, Rapid Response
EO= Executive Order
EPR= Environmental Program Requirement
ERL= Environmental Readiness Level
ESA= Endangered Species Act
FNWA= Federal Noxious Weed Act
MBTA= Migratory Bird Treaty Act
OBJ= Objective
OPNAVINST=Naval Operations Instruction
Sikes Act= Sikes Act (as amended)
SWCA= Soil Water Conservation Act
WFMP= Wildland Fire Management Plan and Related Biological Opinion

[a] Often, a single project or activity is associated with a single EPR, and vice versa. Occasionally, one project (contract) may be suitable for funding by more than one EPR, and vice versa. For example, habitat enhancement may simultaneously involve SKR Conservation [00396-7003], erosion control [0039612035], and/or invasive plant control [0039600005]. Below is the list of EPRs as of POM18 with their full titles for Natural Resources Management at Detachment Fallbrook:

(1)	00396-7002	(2 BO SW FBK CA Gnatcatcher Conservation)
(2)	00396-7003	(2 BO SW FBK Stephens' Kangaroo Rat Conservation)
(3)	0039600002	(2 BO SW FBK Least Bell's Vireo & SWFL Surveys)
(4)	0039600003	(CHE SW FBK INRMP)
(5)	0039600005	(2 BO SW FBK Invasive Plant Control)
(6)	0039600121	(2 BO SW FBK Arroyo Toad Surveys)
(7)	0039612002	(2 BO SW FBK CA Gnatcatcher Surveys)
(8)	0039612003	(2 BO SW FBK Vegetation & Habitat Mapping)
(9)	0039612025	(2 BO SW FBK Stephens' Kangaroo Rat Surveys)
(10)	0039612035	(CHE SW FBK- LBVI, ARTO, & SKR Soil Conservation & Erosion Control)
(11)	0039612036	(1 RP SW FBK Invasive Animal Control)
(12)	003961225A	(MBTA SW FBK Migratory Bird Surveys & Mgmt)
(13)	003961225B	(1 CR SW FBK Listed and Rare Plants Surveys)
(14)	003961225C	(SIKES SW FBK Mammal Surveys)
(15)	003961225D	(4 SAR SW FBK Amphibians & Reptiles Surveys)
(16)	003961225E	(1 CR SW FBK Invertebrate Surveys)
(17)	003961235A	(1 CP SW FBK Aerial Photography)
(18)	003961236A	(2 BO SW FBK Fire Atlas & Mgmt Plan)
(19)	00396NR005	(SIKES SW FBK Long Term Ecological Trend Monitoring)
(20)	00396NR006	(EO 13112 SW FBK Earth Day & Native Plant Garden)
(21)	00396NR007	(2 BO SW FBK Prescription Burns)
(22)	00396NR008	(2 BO SW FBK Grazing Monitoring)
(23)	00396NR009	(2 BO SW FBK Grazing Program Mgmt)
(24)	00396NR012	(CHE SW FBK - CAGN, SKR & LBVI Effects Analysis Data Management)
(25)	00396NR014	(CWA SW FBK Wetland Delineation and Restoration)
(26)	00396NR015	(4 SAR SW FBK Bat Conservation)
(27)	00396NR016	(4 SAR SW FBK Fish & Aquatic Conservation)
(28)	00396NR017	(2 BA SW FBK Mission & Maintenance Biological Assessment)
(29)	00396NR018	(2 BO SW FBK Firebreak Maintenance Support)
(30)	00396NR019	(2 BO SW FBK Least Bell's Vireo & SWFL Conservation)

[b] For additional description of Environmental Readiness Levels (ERLs), see Chapter 5. ERL definitions are abbreviated below:

ERL 4= Requirements derived from existing laws, regulations, and EOs.
ERL 3= Proactive involvement in legislative and regulatory process to mitigate future restrictions/requirements.
ERL 2= Proactive initiatives; supports Navy and DoD policy requirements.
ERL 1= Proactive actions for potential compliance; investments in environmental leadership and general proactive stewardship.

[c] For the purpose of this table, "non-annual recurring" refers to projects for which contracts are expected to be funded on a recurring basis, but not annually (e.g., alternating years or once every 3 years). Projects that are non-annually recurring may be classified as annually recurring in EPR Web because the EPR is funded in "off" years to cover the nominal amount necessary to fund ongoing in-house support of open contracts (typically, in-house contract support funds do not cross fiscal years).

[d] Cost estimates include contracting support except in "off" years where there may not be a new contract award, but there is still in-house contracted support. In some cases, the total for project/activity may only represent a part of the EPR (e.g., 0039612003 provides stationwide vegetation mapping every five to ten years, but can support smaller efforts such as fire perimeter and burn severity mapping in interim years). "Alt yrs" refers to funding amounts that are on alternate years from a "peak" funding year; the frequency of alternation may vary (e.g., every other year, every third year).