FINAL
JOINT INTEGRATED NATURAL RESOURCES MANAGEMENT PLAN FOR MARINE CORPS BASE AND MARINE CORPS AIR STATION CAMP PENDLETON, CALIFORNIA

Revision










March 2018

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FOR
MARINE CORPS BASE AND MARINE CORPS AIR STATION
CAMP PENDLETON, CALIFORNIA

Revision

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March 2018

INTEGRATED NATURAL RESOURCES MANAGEMENT PLAN
Marine Corps Base and Marine Corps Air Station
Camp Pendleton, California

APPROVAL

"Consistent with the use of military installations to ensure the preparedness of the Armed Forces, the Secretaries of the military departments shall carry out the program required by this subsection to provide for-

- The conservation and rehabilitation of natural resources on military installations;
- The sustainable multipurpose use of the resources, which shall include hunting, fishing, trapping, and nonconsumptive uses; and
- Subject to safety requirements and military security, public access to military installations to facilitate the use"

Sikes Act (1 6 USC 670a)

This Integrated Natural Resources Management Plan meets the requirements of the Sikes Act (16 USC §670a et seq.) as amended. By their signatures below, or an enclosed letter of endorsement, all parties grant their concurrence with and acceptance of this document.

K. J. KILLEA — Date: 5/21/18
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Commanding General
Marine Corps Installations West-Marine Corps, Base Camp Pendleton

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LIST OF ACRONYMS AND ABBREVIATIONS

ºC	degrees Centigrade
ºF	degrees Fahrenheit
1st MLG	First Marine Logistics Group
AC/S	Assistant Chief of Staff
A-DCS	Approach-Departure Clearance Surface
AFA	Artillery Firing Area
AGL	above ground level
AT&SF	Atchison, Topeka, and Santa Fe
AT-FP	Antiterrorism and Force Protection
BA	Biological Assessment
BAHWG	Bird and Animal Hazard Working Group
BASH	Bird/Wildlife Aircraft Strike Hazard
BEAP	Base Exterior Architectural Plan
BGEPA	Bald and Golden Eagle Protection Act
BNSF	Burlington-Northern Santa Fe
BO	Biological Opinion
BRAC	Base Realignment and Closure
C.F.R.	Code of Federal Regulations
CAL	Confined Area Landing
Cal-IPC	California Invasive Plant Council
CamPen	Camp Pendleton
CAO	Cleanup and Abatement Order
CAP	Corrective Action Plan
CAS	Close Air Support
CBT	Combat Town
CCA	Candidate Conservation Agreement
CCAR	Climate Change Adaptation Roadmap
CDFW	California Department of Fish and Wildlife
CESA	California Endangered Species Act
CESU	Cooperative Ecosystem Studies Unit
CETEP	Comprehensive Environmental Training and Education Program
cfs	cubic feet per second
CMAGR	Chocolate Mountain Aerial Gunnery Range
CMC	Commandant of the Marine Corps
CMP	Conservation Metrics Portal
CNO	Chief of Naval Operations

CNPS	California Native Plant Society
COLS	Common Output Levels of Service
CPAAA	Camp Pendleton Amphibious Assault Area
CPAVTA	Camp Pendleton Amphibious Vehicle Training Area
CPFD	Camp Pendleton Fire Department
CPX	command post exercise
CRAM	California Rapid Assessment Methodology
CRPR	California Rare Plant Ranks
CRS	Cultural Resources Section
CWA	Clean Water Act
DoD	Department of Defense
DoDI	Department of Defense Instruction
DoDM	Department of Defense Manual
DoI	Department of Interior
DoN	Department of the Navy
DPS	distinct population segment
ECE	Environmental Compliance Evaluation
EDRR	early detection and rapid response
EFH	Essential Fish Habitat
EHV	ecosystem health value
EIRS	Environmental Incident Reporting System
EO	Executive Order
EOD	Explosive Ordnance Disposal
EOM	Environmental Operations Map
EPA	U.S. Environmental Protection Agency
ES	Environmental Security
ESA	Endangered Species Act
ESRI	Environmental Systems Research Institute
FAA	Federal Aviation Administration
FLETC	Federal Law Enforcement Training Centers
FMF	Fleet Marine Force
FONSI	Finding of No Significant Impact
FSSG	First Force Service Support Group
FY	fiscal year
GCE	ground combat element
GCM	global climate model
GIS	geographic information system
GPS	global positioning system

GSOB	goldspotted oak borer
GTF	Grow the Force
GWS	Resource Enforcement/Compliance Section (referred to as GWS)
HA	hydrologic area
HCP	Habitat Conservation Plan
HHIA	High Hazard Impact Area
HMMWV	High Mobility Multipurpose Wheeled Vehicle
HMP	Habitat Monitoring Program
HOLF	Helicopter Outlying Landing Field
HQMC	Headquarters, U.S. Marine Corps
HU	hydrologic unit
HW	hazardous waste
I-5	Interstate 5
ICRMP	Integrated Cultural Resources Management Plan
IED	Improvised Explosive Device
IGI&S	Installation Geospatial Information and Services
IIT	Infantry Immersion Trainer
IMEF	First Marine Expeditionary Force
INRMP	Integrated Natural Resources Management Plan
IR	Installation Restoration
IWG	INRMP Working Group
JIEDDO	Joint Improvised Explosive Device Defeat Organization
KSHB	Kuroshio shot hole borer
LAAD	Low Altitude Anti-aircraft Defense
LCAC	Landing Craft Air Cushion
LMPT	Land Management Police Training
LTETM	Long Term Ecological Trend Monitoring
LFAM	Live Fire and Maneuver
LMS	Land Management Section
LZ	landing zone
MAG-39	Marine Aircraft Group 39
MAGTF	Marine Air and Ground Task Force
MarDiv	Marine Division
MAW	Marine Aircraft Wing
MBTA	Migratory Bird Treaty Act
MCAF	Marine Corps Air Facility

MCALF	Marine Corps Auxiliary Landing Field
MCAS	Marine Corps Air Station
MCB	Marine Corps Base
MCCS	Marine Corps Community Services
MCO	Marine Corps Order
MCTSSA	Marine Corps Tactical Systems Support Activity
MEB	Marine Expeditionary Brigade
MEU	Marine Expeditionary Unit
MFA	Mortar Firing Area
MGRS	Military Grid Reference System
MHCP	Multiple Habitat Conservation Plan
mm	millimeter
MMPA	Marine Mammal Protection Act
MOA	Memorandum of Agreement
MOU	Memorandum of Understanding
MOUT	Military Operations in Urban Terrain
MP	Mortar Position
MPMG	Multipurpose Machine Gun
MSCP	Multiple Species Conservation Plan
MSL	mean sea level
NAVFAC	Naval Facilities Engineering Command
NBC	nuclear, biological, and chemical
NCCP	Natural Community Conservation Planning
NCTD	North County Transit District
NEPA	National Environmental Policy Act
NFDR	National Fire Danger Rating
NIS	Nonnative, Invasive Species
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
NOTAM	Notice to Airmen
NPS	National Park Service
NVCS	National Vegetation Classification System
NWCF	Naval Working Capital Fund
O&M, MC	Operations and Maintenance, Marine Corps
PLN	Environmental Planning Branch
PSHB	polyphagous shot hole borer
RAWS	Remote Automatic Weather Stations
RCMP	Range Complex Management Plan

REPI	Readiness and Environmental Protection Integration
RMB	Resources Management Branch
ROD	Record of Decision
RSOP	Reconnaissance, Selection, Occupation of Position
RSU	Reserve Support Unit
RUF	Regimental Urban Facilities
SCCF	South Coast Conservation Forum
SDG&E Plan	SDG&E Subregional NCCP
SDG&E	San Diego Gas and Electric Company
SECNAV	U.S. Secretary of the Navy
SECNAVINST	Secretary of the Navy Instructions
SME	Subject Matter Expert
SOCTIIP	Southern Orange County Transportation Infrastructure Improvement Program
SONGS	San Onofre Nuclear Generating Station
SOTG	Special Operations Training Group
SPAWAR	Space and Naval Warfare Systems Control
SSPP	Strategic Sustainability Performance Plan
State Parks	California Department of Parks and Recreation, Orange County District
STEP	Status Tool for the Environmental Program
SWAP	State Wildlife Action Plan
TCA	Transportation Corridor Agencies
TERF	Terrain Flight
TNT	trinitrotoluene
UAV	unmanned aerial vehicles
U.S.C.	United States Code
USACE	U.S. Army Corps of Engineers
USDA	U.S. Department of Agriculture
USFS	U.S. Forest Service
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
USMC	U.S. Marine Corps
UXO	unexploded ordnance
VERTREP	vertical replenishment
V/STOL	Vertical/Short Takeoff and Landing
WACO	Western Area Counsel Office
WMS	Wildlife Management Section

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EXECUTIVE SUMMARY

The Department of Defense (DoD) utilizes and manages approximately 30 million acres (12 million hectares) of land. Each military base that has suitable habitat for conserving and managing natural ecosystems is required to prepare, maintain, and implement an Integrated Natural Resources Management Plan (INRMP). This INRMP was prepared for Marine Corps Installations West-Marine Corps Base Camp Pendleton (MCB CamPen or "the Base") and Marine Corps Air Station Camp Pendleton (MCAS CamPen or "the Air Station") in accordance with 16 United States Code (U.S.C.) §670a et seq. – Sikes Act, DoD Instruction 4715.03 – Environmental Conservation Program; Marine Corps Order P5090.2A CH 3 and 32 Code of Federal Regulations Part 190 – DoD Natural Resources Management Program.

The purpose of this INRMP is to assist the installation Commanders in their efforts to conserve and rehabilitate natural resources while ensuring the preparedness of the Armed Forces. This INRMP is a long-term planning document that guides implementation of the natural resources program to ensure consistency with Camp Pendleton's military mission and to support "no net loss" in military mission capability for the Base and Air Station lands, while providing for the conservation and rehabilitation and the sustainable multipurpose use of natural resources on Camp Pendleton. Camp Pendleton currently supports approximately 51,000 annual training events, up from 40,000 to 45,000 in 2001, which represents a 13 to 27 percent increase in training activity over the past 15 years. During this same period, the installations have simultaneously provided for the conservation of 18 species listed as threatened or endangered under the Federal Endangered Species Act; the protection of waters of the U.S., including wetlands; migratory bird management; game management; and a host of other natural resources issues.

This INRMP revision is necessary to address the recent change in status and occurrence of two species listed under the Endangered Species Act. The western distinct population segment of the yellow-billed cuckoo (*Coccyzus americanus*), which is known to occur on the Base, was listed as threatened in October 2014 (79 Federal Register 59992). In addition, Encinitas baccharis (*Baccharis vanessae*), a federally listed threatened plant species, was documented on the Base in September 2013 (San Diego Natural History Museum vouchers SD235484 and RSA820587). The integration of the 488-acre (198-hectare) Air Station also represents a significant change to the Base's INRMP, which requires a revision. Natural resources management on the Air Station was previously guided by a separate INRMP (MCAS CamPen 2013). The purpose of combining the Air Station's INRMP with the Base's INRMP is to provide continuous and integrated management of the natural resources and environment aboard the Station and Base. A combined approach allows for integrated resource management and collaboration between the Air Station

and the Base. The combined INRMP is in no way a means to combine the Air Station's and Base's natural resource programs but rather serves as a means to promote collaboration and cooperation toward resource management.

In accordance with the Sikes Act, this revision was developed through the cooperation of a number of on-Base and off-Base individuals and organizations. A Core Working Group was established to coordinate revision of this INRMP. The Core Working Group was composed of key representatives from the following:

- MCB CamPen Environmental Security Department
- MCAS CamPen Environmental Department
- U.S. Fish and Wildlife Service
- National Oceanic and Atmospheric Administration Fisheries
- California Department of Fish and Wildlife
- California Department of Parks and Recreation, Orange County District

Resource-specific programs have been developed and described to address relevant natural resources issues at Camp Pendleton. The primary drivers for each program are summarized in this INRMP, as well as other background information applicable to the program (e.g., responsible entities, relevant ecosystems, and program background). Each program presented in this INRMP includes one or more elements that address specific management components of the program. Each program and element has a goal, and each element includes one or more objectives intended to meet program and element goals. Goals are visionary, ideal, and general in character, and provide long-term guidance in defining direction and purpose of the program. Objectives provide a more concise statement of what must be achieved to meet program and element goals. Finally, specific actions were developed to support each objective identified in the INRMP. Actions represent specific efforts that are implemented by both the Base and Air Station to support each natural resources management program. Refer to Appendix P of this INRMP for a complete list of actions planned for the current INRMP term (i.e., 2018–2023).

Management programs described in this INRMP include:

- Threatened, Endangered, and Rare Species
- Sustainable Ecosystem Management
- Migratory Bird and Raptor Management
- Marine and Fish Management
- Game Management

- Outdoor Recreation
- Human-Wildlife Conflict Management
- Incident Management
- Natural Resources Awareness and Education

The management actions and projects identified for Camp Pendleton are intended to support the military mission, while managing natural resources effectively, ensuring Base lands remain available and in good condition, and ensuring compliance with relevant environmental regulations. These actions incorporate the principles of ecosystem management and are consistent with Marine Corps policy regarding sustainable, multiple use of natural resources on Marine Corps property. These actions also support Marine Corps policy that land use practices and decisions be interdisciplinary, rely on scientifically sound conservation procedures and techniques, and employ scientific methods.

The majority of the actions identified in this revised INRMP (233 of 261) are considered administrative or would have no environmental impact, or are continuations of actions that were addressed in the 2001 INRMP Environmental Assessment, or were, or currently are being, analyzed under other National Environmental Policy Act (NEPA) documents. Of the remaining actions, 18 pertain to implementing actions identified in various management plans for listed species, amending two conservation plans, and one habitat suitability assessment and will be analyzed under NEPA at a future time. The other 10 actions are activities authorized in the past via short-term, project-specific Categorical Exclusions and can continue to be authorized via project-specific processing under NEPA. Therefore, the effects of implementing all actions identified in the 2018 Camp Pendleton INRMP will not be assessed together under NEPA. Rather, the 28 actions subject to NEPA will be evaluated in the future through separate and project-specific NEPA analyses to obtain appropriate authorization. The Marine Corps will implement recommendations in the INRMP within the framework of regulatory compliance, Marine Corps mission obligations, and funding constraints. All actions contemplated in the 2018 Camp Pendleton INRMP are subject to the availability of funds properly authorized and appropriated under federal law. Nothing in the 2018 Camp Pendleton INRMP is intended to be, nor must be, construed as a violation of the Anti-Deficiency Act (31 U.S.C. §1341 et seq.).

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CHAPTER 1.0
INTRODUCTION

1.1 PURPOSE AND AUTHORITY

The Sikes Act (16 United States Code [U.S.C.] §670a et seq.), 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 U.S. Fish and Wildlife Service (USFWS) and appropriate state fish and wildlife agencies. Specifically, the Sikes Act requires that, consistent with the use of military installations to ensure the preparedness of the Armed Forces, the Secretaries of the military departments carry out the program to provide for (1) the conservation and rehabilitation of natural resources on such military installations; (2) the sustainable multipurpose use of the resources, which shall include hunting, fishing, trapping, and nonconsumptive uses; and (3) public access to military installations to facilitate the use, subject to safety requirements and military security.

The 1997 amendments to the Sikes Act require the Department of Defense (DoD) to develop and implement an Integrated Natural Resources Management Plan (INRMP) for each military installation with significant natural resources. In accordance with the Sikes Act, INRMPs must reflect a mutual agreement between military installations, USFWS, and state fish and wildlife agencies concerning conservation, protection, and management of natural resources on military lands. Pursuant with Department of Defense Instruction (DoDI) 4715.03 – Natural Resources Conservation Program, Department of Defense Manual (DoDM) 4715.03 – Integrated Natural Resources Management Plan Implementation Manual, and Marine Corps Order (MCO) P5090.2A CH 3 – Environmental Compliance and Protection Manual, INRMPs must provide continued military access to land, air, and water resources for realistic training and testing while sustaining the long-term ecological integrity of natural resources and the ecosystem services they provide.

The purpose of this INRMP is to assist Commanders at Marine Corps Installations West-Marine Corps Base Camp Pendleton (MCB CamPen or “the Base”) and Marine Corps Air Station Camp Pendleton (MCAS CamPen or “the Air Station”) in their efforts to conserve and rehabilitate natural resources while ensuring the preparedness of the Armed Forces. This INRMP is intended principally to guide the effective management of natural resources within MCB CamPen and MCAS CamPen, so as to ensure that lands therein remain available and in good condition to support the military mission of both installations, and with “no net loss” in that capability. To ensure frequent and continued use of land for military training, now and in the future,

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 existing military installation plans and mission requirements.

To meet these requirements, this INRMP endeavors to:

- Identify and facilitate coordination between the responsible parties and stakeholders concerned with natural resources management at MCB CamPen and MCAS CamPen;
- Describe the current and future installation mission for MCB CamPen and MCAS CamPen and its requirements and constraints on natural resources;
- State the policies, management philosophy, and objectives of natural resources management at MCB CamPen and MCAS CamPen;
- Provide information regarding the existing biological and physical conditions and the desired future conditions of natural resources for both installations;
- Identify key natural resource management issues and concerns at both installations and in the surrounding area;
- Identify and describe projects and management actions required to meet the objectives of natural resources management while ensuring no net loss in the capability of installation lands to support the military mission; and
- Identify scheduling priorities and funding opportunities for the implementation of natural resources projects and management actions.

This INRMP provides technical guidance to persons planning and/or preparing installation approvals, management actions, orders, instructions, guidelines, Standard Operating Procedures, and other plans, for integrating natural resources management efforts into the Base's and Air Station's planning and decision-making processes. It is not intended, however, for use by military personnel operating in the field. Field operations and activities are directed to adhere to guidelines, plans, orders, or other approvals that have been developed using this INRMP and have already had environmental compliance review, and, where applicable, regulatory approvals and/or permitting (e.g., MCIWEST-MCB CAMPENO 3500.1 CH 1, Range and Training Area Standard Operating Procedures). This INRMP does not dictate land use decisions, but rather provides important information to support sound land use and natural resources management decisions. National Historic Preservation Act requirements are not addressed in this INRMP. Cultural resources management issues (archaeological and historical) are addressed separately within Camp Pendleton's Integrated Cultural Resources Management Plan (ICRMP) (ASM 2017).

1.2 SCOPE AND DURATION

Section 101(a)(1)(B) of the Sikes Act requires that each Military Department prepare and implement an INRMP, unless the Secretary of Defense determines that the absence of significant natural resources on a particular installation makes preparation of such a plan inappropriate. The scope of this INRMP is to address natural resources management on those lands and nearshore areas that are:

- Owned by the United States and administered by the Marine Corps;
- Used by the Marine Corps via license, permit, or lease for which the Marine Corps has been assigned management responsibility;
- Withdrawn from the public domain for use by the Marine Corps for which the Marine Corps has been assigned management responsibility; and
- Leased on the installation and occupied by non-DoD entities.

The Base occupies approximately 125,000 acres (50,586 hectares), in northwestern San Diego County of southern California, with approximately 17 miles (27 kilometers) of coastline bordering the Pacific Ocean. The Air Station is located on 488 acres (198 hectares) in the south-central portion of the Base. Although the Air Station is a separate installation owning its own land and is not a tenant of the Base, in accordance with the 2015 MCIWEST-MCB CAMPENO 5090.1, MCB CamPen Environmental Security Department will coordinate with MCAS CamPen on the actions identified in this INRMP. This INRMP addresses natural resources management on the lands and nearshore environments of the Base and Air Station (collectively referred to as "Camp Pendleton") for a period of 5 years from the date of approval.

Real estate agreements (e.g., leases, easements, assignments) cover approximately 5,000 acres (2,023 hectares), excluding leased acreage within cantonment areas. As needed, the Base's Environmental Security Department may require lessees to prepare a management plan, consistent with the philosophies and supportive of the objectives of this INRMP, if the lessee's operations would interface with resource management on Camp Pendleton. However, lessees are not specifically bound to the management actions described in this document. The DoD Component permitting authorities may include provisions in leases, permits, or licenses requiring the grantee to perform natural resources conservation duties as a condition of occupancy or use of the parcel. Installation commanders still address natural resources management on any of these lands.

1.3 INRMP REVIEW, REVISION, AND COORDINATION

1.3.1 INRMP Review and Revision

INRMPs are long-term planning documents that require periodic reviews of management goals and practices to provide the opportunity to incorporate new science and information as well as assess the performance of management actions. In accordance with the Sikes Act, INRMPs must be reviewed and, if necessary, revised, at intervals of not more than 5 years. An INRMP may be simply updated to accommodate revisions to the information contained in INRMPs that do not require substantial changes in the way natural resources on the Base and Air Station are to be managed. INRMP revisions are required when the existing INRMP is determined to be inadequate, because the installation mission or physical features have changed significantly, following Base Realignment and Closure (BRAC) actions, if new species are listed or listed species are identified on the installation, or if the mission intensity or training is dramatically changed or increased.

This INRMP revision is necessary to address the recent change in status and occurrence of two species listed under the Federal Endangered Species Act (ESA). The western distinct population segment (DPS) of the yellow-billed cuckoo (*Coccyzus americanus*), which is known to occur on the Base, was listed as threatened in October 2014 (79 Federal Register 59992). In addition, Encinitas baccharis (*Baccharis vanessae*), a federally listed threatened plant species, was documented on the Base in September 2013 (San Diego Natural History Museum vouchers SD235484 and RSA820587). The integration of the 488-acre (198-hectare) Air Station also represents a significant change to the INRMP, which requires a revision. Natural resources management on the Air Station was previously guided by a separate INRMP (MCAS CamPen 2013).

1.3.2 INRMP Coordination

The Sikes Act states that the INRMP must reflect the "mutual agreement" of USFWS, the state fish and wildlife agency, and the DoD "concerning conservation, protection, and management of fish and wildlife resources." To fulfill this requirement, any new INRMPs and significant changes to existing INRMPs are required to be developed in cooperation with USFWS, the National Oceanic and Atmospheric Administration National Marine Fisheries Services (NOAA Fisheries), as appropriate, and state fish and wildlife agencies.

This INRMP revision was developed through the cooperation of a number of on-Base and off-Base individuals and organizations. A Core Working Group was established to coordinate revision of this INRMP. The Core Working Group was composed of key representatives from the following:

- MCB CamPen Environmental Security Department
- MCAS CamPen Environmental Department
- USFWS
- NOAA Fisheries
- California Department of Fish and Wildlife (CDFW)
- California Department of Parks and Recreation, Orange County District (State Parks)

Coordination began early in the revision process in April 2015, when agency representatives and other interested parties were invited to participate in the development of the goals and objectives for natural resources management, and will continue through the finalization of the document anticipated in early 2018.

1.3.3 Public Review and NEPA Consideration

There was one public review process for the revised INRMP. As discussed below, the actions identified in this INRMP that are subject to the National Environmental Policy Act (NEPA) will be evaluated in the future through separate and project-specific analyses, including public review as applicable, to obtain appropriate authorization.

1.3.3.1 INRMP Public Review

The revised INRMP was posted on the MCB CamPen website (http://www.pendleton.marines.mil/Staff-Agencies/Environmental-Security/Document-Library/) for public review, with an opportunity to provide comments. Over 90 agencies and individuals (e.g., state and federal resource agencies; regional and state environmental conservancies or research centers and museums; Indian tribes; regional utilities; local municipalities; and nongovernment organizations) were also notified that the INRMP was available for comment. The 30-day public review period for the revised INRMP began on 24 July 2017 and ended 23 August 2017. The Marine Corps considered all comments received prior to finalizing the INRMP (comment letters are included in Appendix A).

1.3.3.2 INRMP NEPA Consideration

The majority of the actions identified in this revised INRMP (233 of 261) are considered administrative or would have no environmental impact, or are continuations of actions addressed in the 2001 INRMP Environmental Assessment, or were, or currently are being, analyzed under other NEPA documents. Of the remaining actions, 18 pertain to implementing actions identified in various management plans for listed species, amending two conservation plans, and one habitat suitability assessment and will be analyzed under NEPA at a future time. The other 10

actions are activities authorized in the past via short-term, project-specific Categorical Exclusions and can continue to be authorized via project-specific processing under NEPA. Therefore, the effects of implementing all actions identified in the 2018 Camp Pendleton INRMP will not be assessed together under NEPA. Rather, the 28 actions subject to NEPA will be evaluated in the future through separate and project-specific NEPA analyses to obtain appropriate authorization.

1.4 STATUTORY REQUIREMENTS PERTINENT TO NATURAL RESOURCES MANAGEMENT

The Sikes Act is the primary federal statute requiring natural resources management on military installations. The Sikes Act requires, to the extent appropriate and applicable, that the INRMP 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 resources management objectives and time frames for proposed actions;
- Sustained use by the public of natural resources to the extent such use is consistent with the needs of fish and wildlife management and subject to installation safety and security requirements;
- Enforcement of natural resources laws and regulations;
- No net loss in the capability of military lands to support the military mission of the installation; and
- Such other activities as the Secretary of the military department determines appropriate.

The development and implementation of this INRMP revision fulfills the statutory requirements as defined under the Sikes Act.

Other key statutory drivers applicable to natural resources management on MCB CamPen and MCAS CamPen include the following:

- NEPA
- ESA
- Migratory Bird Treaty Act (MBTA)
- Bald and Golden Eagle Protection Act (BGEPA)
- Clean Water Act (CWA)
- Coastal Zone Management Act
- Clean Air Act
- Marine Mammal Protection Act (MMPA)
- Magnuson-Stevens Fisheries Conservation and Management Act
- Federal Noxious Weed Act

Environmental mandates also include several presidential executive orders (EOs), Memoranda of Understanding (MOUs), and Executive Memoranda such as:

- EO 13186 – Responsibilities of Federal Agencies to Protect Migratory Birds
- EO 13693 – Planning for Federal Sustainability in the Next Decade
- EO 13751 – Safeguarding the Nation from the Impacts of Invasive Species
- EO 12962 – Recreational Fisheries
- EO 11990 – Protection of Wetlands
- EO 11988 – Floodplain Management
- MOU between DoD and USFWS and the Association of Fish and Wildlife Agencies for a Cooperative Integrated Natural Resources Management Program on Military Installations
- MOU between DoD and the Pollinator Partnership
- MOU between DoD and USFWS to Promote the Conservation of Migratory Birds
- Guidance to Implement the Memorandum of Understanding to Promote the Conservation of Migratory Birds
- MOU between DoD and Bat Conservation International
- Executive Memorandum on Incorporating Ecosystem Services into Federal Decision Making

A description of these statutory drivers and copies of the above-referenced MOUs and guidance that are relevant to natural resources management are provided in Appendix B.

1.5 NATURAL RESOURCES STEWARDSHIP ON MILITARY LANDS

DoD is a major user of land, sea, and air space. It utilizes and manages approximately 30 million acres (12 million hectares) of land, air, and water resources on more than 425 major military installations. DoD requires continued access to those lands and the air space above them to maintain mission readiness. Land is needed for deployment of weapon systems and combat training exercises. Marine and estuarine environments are needed to conduct training exercises, test vessels and submarine tracking equipment, evaluate missile weapon systems, and conduct trials on new ships. Airspace is needed to train pilots, and test aircraft and air-based weapon systems. The DoD Natural Resources Program supports the military's testing and training mission by ensuring continued access to realistic habitat conditions, while simultaneously working to ensure the long-term sustainability of our nation's priceless natural heritage.

1.5.1 Policies and Guidelines

DoDI 4715.03, the Natural Resources Conservation Program, establishes the following principles and guidelines for natural resources management:

- DoD shall manage its natural resources to facilitate testing and training, mission readiness, and range sustainability in a long-term, comprehensive, coordinated, and cost-effective manner.
- DoD shall demonstrate stewardship of natural resources in its trust by protecting and enhancing those resources for mission support, biodiversity conservation, and maintenance of ecosystem services.
- DoD shall manage DoD lands, waters, airspaces, and coastal resources or natural resources for multiple uses when appropriate, including sustainable yield of all renewable resources, scientific research, education, and recreation.
- All DoD natural resources conservation programs must be integrated with mission activities, installation planning and programming, and other activities as appropriate.

MCO P5090.2A CH 3 reiterates that natural resources under Marine Corps stewardship and control shall be managed to support military readiness and be conserved, preserved, protected, rehabilitated, and enhanced; and that land use practices and decisions be interdisciplinary and maintain military readiness, rely on scientifically sound conservation procedures and techniques, and employ scientific methods.

1.5.2 Ecosystem Management

DoDI 4715.03 and MCO P5090.2A CH 3 further require that INRMPs incorporate the principles of ecosystem management for natural resources under the stewardship and control of DoD. The goals of this strategy are to maintain and improve 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.

The basic principles and guidelines of ecosystem management are to:

- Maintain and improve the sustainability and native biological diversity of ecosystems,
- Consider ecological units and timeframes in management decisions,
- Support sustainable human activities,
- Develop a vision of ecosystem health that includes social and economic conditions,
- Develop priorities and reconcile conflicts,
- Develop coordinated approaches to work toward ecosystem health that involve the military operational community and regional stakeholders,
- Rely on best science and available data,
- Use goals and objectives to monitor and evaluate outcomes, and
- Use adaptive management.

It is DoD policy to conduct installation programs and activities to identify, maintain, and restore the composition, structure, and function of natural communities that make up ecosystems to ensure their long-term sustainability and biodiversity at landscape and other relevant ecological scales to the maximum extent that mission needs allow (DoDM 4715.03).

1.5.3 Ecosystem Services

Healthy, functioning ecosystems provide a variety of services such as improving the quality and moderating the quantity of water; providing wildlife habitat and spawning and nursery habitats for fisheries; mitigating storms and floods; coastal protection; buffering pollutants; carbon sequestration; and supporting a wide array of cultural benefits, recreational opportunities, and aesthetic values. Camp Pendleton endeavors to maintain and enhance healthy, functioning ecosystems through implementation of its Sustainable Ecosystem Management Program and other natural resources management programs. Potential impacts to ecosystem services such as

these are currently assessed through the NEPA process. In accordance with Executive Memorandum M-16-01 on Incorporating Ecosystem Services into Federal Decision Making, once an implementation guidance is developed for this memorandum, Camp Pendleton will formalize procedures to integrate consideration of ecosystem services into the decision process.

1.5.4 Adaptive Management

To be responsive to new information, changing conditions, changes in mission requirements, or successes/failures in project implementation, an adaptive management approach is implemented for natural resources management. Adaptive management is an iterative cycle of planning, monitoring, evaluation, and adjusting management practices.

Annual and periodic monitoring of habitat conditions, population trends, nesting success, and other ecosystem components is a major activity of the natural resources management programs at MCB CamPen and MCAS CamPen. Development and maintenance of such inventories are aided by the use of a geographic information system (GIS), global positioning system (GPS), and remote sensing technology, combined with periodic monitoring and surveys. The routine collection of data and the application of state-of-the-art technology maximize the quality and quantity of information available to land managers, enabling adaptive management through the evaluation of potential impacts, biological trends, efficacy of management initiatives, and identification of data gaps. Updated information and "lessons learned" are then incorporated into management protocols and programmatic instructions for users of the Base and Air Station. This ability to evaluate land use compatibility and to adaptively manage resource utilization maximizes land area available for training.

1.6 CAMP PENDLETON NATURAL RESOURCES MANAGEMENT OVERVIEW AND STRUCTURE

Camp Pendleton's history of practicing responsible stewardship while accommodating multiple land uses dates back as far as the mid-1950s, beginning with a cooperative agreement with state fish and game biologists to establish a hunting and fishing program. Since then, the nation's growing awareness of issues concerning pollution, habitat loss, and land degradation has resulted in an increase in environmental protection legislation. Camp Pendleton, likewise, has increased its investment in regulatory compliance and natural resources management.

The Base's and Air Station's current approach to managing natural resources reflects the principles of ecosystem management, consistent with DoD and Marine Corps policy. The natural resources management approach for both installations seeks to balance the dual goals of maximizing land use for military readiness and maintaining native habitats. The overriding focus

of natural resources management is to implement a comprehensive, ecosystem-based management program for resource conservation that will facilitate maximum support of the installations' military training missions and infrastructure, while simultaneously promoting both the sustainability of native species and habitat diversity, and compliance with applicable laws and regulations.

With 18 federally listed threatened or endangered species known to occur on Camp Pendleton, and numerous additional sensitive plant and animal species, the Base and Air Station recognize the need for an ecosystem approach to natural resources management, as this approach balances the needs of all ecosystem components (including mission, biological, economic, and human elements), provides comprehensive compliance with the ESA, and integrates both DoD and Department of Interior (DoI) guidelines. The primary strategies for natural resources conservation and management aboard the installations include habitat enhancement (e.g., exotic species control, erosion control, seeding, and restoration) and the avoidance and minimization of adverse impacts through implementation of programmatic instructions (published rules and guidelines for land users on the installations).

Camp Pendleton's natural resources management consists of a suite of conservation and management programs led by natural resources staff. Each program has specific elements, goals, objectives, and planned actions, which have been developed and prioritized to sustain military operational and support requirements, to achieve Camp Pendleton's overarching natural resources management goals, and incorporate the principles of ecosystem management in all programs. Natural resources conservation and management programs are driven by the need to maintain sufficient natural areas and varied vegetation that will allow sound and realistic tactical training, as well as support sound ecological management. Chapter 4 of this INRMP details Camp Pendleton's programs related to natural resources management.

The Base's Environmental Security Department and the Air Station's Environmental Department are the primary users of this INRMP. Although they are separate installations, the Base and Air Station have integrated their management of natural resources given their proximity to one another and common natural resources management needs. This integration includes coordinating execution of endangered species monitoring efforts, and sharing of monitoring results. Although resource management integration is conducted, each installation is ultimately and directly responsible for the management of the natural resources within its boundaries.

In addition to the Base's Environmental Security Department and Air Station's Environmental Department, multiple other organizations have a role in supporting Camp Pendleton's natural resources. Although not directly responsible for implementation of this INRMP, these other organizations provide support to help ensure compliance with natural resources laws,

regulations, and management initiatives. A complete presentation of the Base's and the Air Station's natural resources management structure is included as Appendix C. The organizational structures of the Base's Environmental Security Department and the Air Station's Environmental Department are summarized in the following subsections.

1.6.1 Marine Corps Base Camp Pendleton Environmental Security Department

The Base's Environmental Security Department provides the lead and overall coordination of environmental compliance and natural resources management on-Base. This department is divided into divisions, including the Regional Operations Division, Environmental Compliance Division, and Environmental Conservation Division. These divisions are further subdivided into branches and sections.

The Environmental Conservation Division is responsible for managing the Base's natural and cultural resources, and is the primary user of the INRMP. Branches of the Environmental Conservation Division include the Resources Management Branch (RMB) and Environmental Planning Branch (PLN). The organization and roles of these branches are discussed further in the following subsections. While the Regional Operations Division and Environmental Compliance Division support natural resources management, these divisions are not discussed below as they are not the primary users of this INRMP. Refer to Appendix C for the management structure of these two divisions.

1.6.1.1 Resources Management Branch

The RMB manages and monitors natural resources on Camp Pendleton to ensure compliance with federal laws and regulations, long-term sustainment, and conservation and rehabilitation of natural resources, and to allow ongoing and continued training and operations that ensure combat readiness. The RMB is organized into four sections:

1) Land Management Section (LMS)
2) Cultural Resources Section (CRS)
3) Wildlife Management Section (WMS), and
4) Resource Enforcement/Compliance Section (referred to as GWS)

Chapter 4 of this INRMP describes natural resources management programs of the LMS, WMS, and GWS. The CRS and its programs are not addressed in the INRMP but are covered in detail in the Base's ICRMP (ASM 2017).

1.6.1.2 Environmental Planning Branch

PLN provides procedural and technical advice, environmental review, operation and maintenance planning, and project implementation on both military and nonmilitary NEPA documentation for facility planning, construction plans, maintenance activities, military training operations, leases, and other proposed actions that may affect natural and/or cultural resources. PLN is organized into four sections:

1) Consultation Section
2) NEPA Section
3) Project Management Section, and
4) Strategic Planning Section

PLN serves as the lead for coordination and integration of on-Base land use and natural resources planning with local and regional off-Base planning concepts, initiatives, and programs. PLN is responsible for finding and coordinating purchase of appropriate off-Base mitigation lands, and conducts informal and formal consultation for impacts to sensitive species and habitat with regulatory agencies. PLN and RMB coordinate closely to facilitate NEPA and the permitting process. PLN uses annual monitoring results and GIS data from RMB contracting efforts to support NEPA planning and consultation efforts.

1.6.2 Marine Corps Air Station Camp Pendleton Environmental Department

The Air Station's Environmental Department administers natural resources management mechanisms for the Commander of the Air Station. The Air Station's Environmental Department is headed by an Environmental Officer, who provides the lead and overall coordination of environmental compliance and natural resources management. For its underlying doctrine, the Air Station's Environmental Department draws upon NEPA, MCO P5090.2A CH 3 and the principles of ecosystem management in accordance with DoD guidance. Refer to Appendix C for the management structure of the Air Station's Environmental Department.

1.7 INTEGRATION OF THE INRMP TO EXISTING PLANS AND ORDERS

Integration of the INRMP not only requires coordination of efforts among the natural resources management programs and planned actions for the Base's Environmental Security Department and the Air Station's Environmental Department, but also integration with other installation planning documents. The INRMP is not intended to replace existing orders, policy, range and training operations guidance, or other military management plans, but to document and assist in the development, integration, and coordination of natural resources management with other plans

and programs. Where natural resources programs are currently not documented through formal planning efforts, the INRMP may serve as the means to formally establish such programs. Moreover, the INRMP is intended to facilitate the integration of natural resources management actions (plans and programs) with the primary military training and support mission of Camp Pendleton.

Programmatic instructions and plans represent the published "general rules" that regulate and guide activities on Camp Pendleton (e.g., military training, maintenance, construction, and outdoor recreation). Many programmatic instructions are broadly applicable and help avoid or minimize impacts to the environment in general (e.g., fire danger ratings); however, other programmatic instructions may be specific to actual locations of listed species (e.g., least tern nesting sites) or to general areas of Camp Pendleton (e.g., riparian habitat and range and training areas). Programmatic instructions are disseminated by various methods including plans, requirements, orders, and bulletins; and as special conditions in documents approving recurring activities (e.g., Biological Opinions [BOs] issued by USFWS). The following subsections describe programmatic instructions relevant to natural resources for both the Base and Air Station.

1.7.1 Master Plans

Long-range development of the Base is guided by the 2030 Base Master Plan (U.S. Navy 2011). The master plan describes existing land uses, developed areas, and natural and human-made conditions that constrain development. The goals of the plan are to accurately reflect current and projected mission requirements, provide land use policy guidelines to promote optimum future land uses, and provide guidance and recommendations for siting new facilities. The plan makes recommendations for improvements and modifications to the infrastructure, physical plant, and natural resources of the Base, and contains development guidelines for optimum utilization of land and airspace to support the Base mission.

The 2030 Base Master Plan emphasizes the need to maximize and preserve open space areas on the Base to accommodate weapons firing and impact areas and amphibious, ground, and aviation ranges and training areas. The 2030 Master Plan shows broad categories of uses, dividing the Base into impact areas, developed areas, and training and maneuvering areas. Impact areas are mostly in the central part of the Base. Most of the rest of the Base is devoted to training and maneuvering areas. To avoid incompatible uses in these military operations and training areas, the Base Master Plan designates distinct and clearly defined areas containing personnel housing and cantonments where development is concentrated.

MCAS CamPen is fully developed. The Air Station's Master Plan identifies strategies to support the DoD-wide installation planning philosophy to develop a sustainable platform to support

effective execution of assigned military missions as efficiently as possible (MCAS CamPen 2015). Due to the compact size of the Air Station, the land use must be highly mission-focused. To the extent feasible, land preservation is considered in the installation planning.

1.7.2 Base Exterior Architectural Plan

The Base's Base Exterior Architectural Plan (BEAP) and the Air Station's BEAP provide guidance for the design, development, and review of all physical development at Camp Pendleton. Issues addressed that are most relevant to natural resources management are landscaping specifications and efforts to reduce the risk of wildland fire in areas adjacent to natural open space. These Plans outline objectives and guidelines in cantonment areas for native plant use and invasive plant control that are consistent with the goals and objectives of this INRMP. Included in the Base's and the Air Station's BEAPs is the requirement that native California species make up a minimum of 80 percent of plant material used within cantonment areas and a maximum of 20 percent of approved, drought-tolerant Mediterranean climate nonnative species. For projects adjacent to open space or in sensitive environments, California native species must constitute 100 percent of the plant material, and for projects adjacent to open space and/or meant as native habitat, plants native to San Diego County are preferred. A list of approved native and other landscaping plants and a list of forbidden species, which have been approved by the Base's Environmental Security Department and the Air Station's Public Works Department, are provided in the BEAPs and must be complied with for all landscaping, unless an exception is granted. Plants identified in the approved list have been selected, in part, because of their fire-retardant characteristics and will help deter wildfire in landscaped areas. The Base's and the Air Station's BEAPs further require brush management plans to be developed for all new projects in areas adjacent to natural open space to help reduce the risk of wildland fire.

1.7.3 Marine Corps Base Camp Pendleton Requirements

The Camp Pendleton Requirements (MCB CamPen 2016) contain design and specifications that must be addressed during the preparation of construction documents or requests for proposals for work aboard the Base. As with the BEAP, the most relevant issues to natural resources management are landscaping specifications and efforts to reduce the risk of wildland fire in areas adjacent to natural open space. Specifications for plantings, ground cover and mulch, hydroseeding, and other landscaping issues are provided. Landscaping guidelines require that spaces in or adjacent to natural areas be revegetated with a seed mix approved by the Base's Environmental Security Department. Other design specifications for issues such as stormwater, low impact development, water quality, and flood control are also addressed in the Camp Pendleton Requirements.

1.7.4 Marine Corps Base Camp Pendleton Environmental Compliance Guide

The Marine Corps Base Camp Pendleton Environmental Compliance Guide is a quick-reference introduction to environmental issues, laws, and regulations confronting Marines, Sailors, Soldiers, and civilian employees on Camp Pendleton. This guidance provides points of contact for users of the Base to obtain further information.

1.7.5 P-971 Airport Planning Criteria and P-80.3 Airfield Safety Clearances

P-971, the DoD Airport and Heliport Planning Criteria (Departments of the Air Force, the Army and the Navy 1981) and P-80.3, the DoN Facility Planning Factor Criteria for Navy and Marine Corps Shore Installations (DoN 1982, specifically, Appendix E therein for Airfield Safety Clearances) specify airfield safety clearance criteria including height restrictions, lateral clearances, and clear zones/takeoff safety zones. On 6 June 2014, DoN, Naval Air Systems Command, issued the Air Station a temporary waiver allowing vegetation that penetrates into the southwestern Approach-Departure Clearance Surface (A-DCS) to remain intact. The waiver acknowledges that, with the existing penetration of the MASS-3 hillside into the A-DCS, the mature vegetation southwest of the airfield poses little risk to operations. The waiver brings the Air Station into compliance with the DoD and DoN planning criteria noted above.

1.7.6 MCIWEST-MCB CAMPENO 3500.1 CH 1

MCIWEST-MCB CAMPENO 3500.1 CH 1 (Range and Training Area Standing Operating Procedures) prescribes the regulations and general precautions to be taken while conducting training activities on Camp Pendleton, including both the Base and Air Station. Included in this order are specific programmatic instructions that address how units training on and over Camp Pendleton are to operate under given conditions. Conditions addressed in Chapter 2 of this order include base-wide environmental procedures, areas off-limits to training, natural resources considerations and restrictions, and the various Fire Danger Ratings.

1.7.7 MCIWEST-MCB CAMPENO 5000.2 CH 1

MCIWEST-MCB CAMPENO 5000.2 CH 1 (Marine Corps Base Camp Pendleton Base Regulations) establishes the responsibilities and procedures that govern the conduct of all persons and activities on-Base. Chapter 8 of this order outlines Base policies governing natural and cultural resources. In accordance with this order, it is the continuing policy of the Base to:

a) Restore, improve, and preserve land, water, and other natural resources, and to prevent or control pollution of these resources in the public and in keeping with the military interest.

b) Identify, evaluate, and protect cultural resources eligible for inclusion in the National Register of Historic Places.

c) Grant public access, within manageable quotas, to lands and waters for hunting, fishing, and other recreational pursuits, to the extent that such access will not conflict with the mission of the Base.

d) Establish and carry out policy regarding the evaluation, management, and protection of endangered species, wildlife, vegetation, rare plants, wetland resources, and habitat aboard the Base, in accordance with Marine Corps Orders, the Base's INRMP, and federal and state laws.

e) Establish and carry out policy regarding the evaluation, management, and protection of cultural resources aboard the Base.

f) Provide command oversight of implementation of natural and cultural resources laws.

g) Provide one central point of contact for conducting regulatory consultation with the state and federal agencies managing natural resources.

Chapter 8 Section 2 of MCIWEST-MCB CAMPENO 5000.2 CH 1 outlines other environmental compliance policies related to water quality, air quality, and waste management.

1.8 INTEGRATION WITH REGIONAL CONSERVATION PLANNING EFFORTS

Camp Pendleton has managed to maintain more than 90 percent of its land as natural areas, which consist of some of the last significant open space and wildlife habitat in the coastal areas of southern California. By virtue of its land mass, location, and natural areas, Camp Pendleton contributes significantly to the continued survival of the threatened and endangered plant and wildlife species in San Diego County. As such, Camp Pendleton is an integral component to a variety of regional conservation efforts.

The Base's and Air Station's natural resources management efforts are intended to complement and support local and regional conservation efforts. Regional conservation planning efforts relevant to the natural resources present on Camp Pendleton are summarized in the following subsections.

1.8.1 California State Wildlife Action Plan

In 2000, Congress enacted the State Wildlife Grants Program to support state programs that benefit wildlife and habitats. To receive funding for this program, California wildlife agencies were required to submit a Wildlife Action Plan to USFWS in 2005. CDFW (previously California Department of Fish and Game), in collaboration with the Wildlife Health Center, University of California at Davis, consequently developed the first California State Wildlife Action Plan (SWAP) (Bunn et al. 2007). The SWAP will be updated at least every 10 years to allow integration of new information. A draft SWAP update was published for public comment in May 2015.

The SWAP provides guidance and recommendations for statewide and regional conservation actions. Statewide conservation actions are those actions that are important across most or all of the regions while regional conservation actions are specific to stressors that are significant in only certain regions of the state.

Camp Pendleton is located within the South Coast Region (or South Coast Province per the draft 2015 SWAP update). The primary stressors affecting wildlife and habitats in this region referenced by the 2005 SWAP include growth and development, water management conflicts and degradation of aquatic ecosystems, invasive species, altered fire regimes, and recreational pressures. The draft 2015 SWAP update expands the list of stressors/pressures applicable to the South Coast Province, including identification of climate change as a distinct pressure. Camp Pendleton seeks to address the SWAP's recommended statewide and regional conservation actions, when applicable. Examples of how this INRMP addresses the SWAP's recommended statewide conservation actions include efforts to control and prevent introductions of invasive species, wildland fire management to benefit ecosystem integrity, and management of wetland resources.

1.8.2 Cleveland National Forest

Camp Pendleton and the adjacent Cleveland National Forest occupy some of the last significant open space and wildlife habitats in the coastal areas of southern California. The Cleveland National Forest is the southernmost National Forest in California, encompassing approximately 460,000 acres (186,155 hectares) of chaparral and riparian habitat. The Cleveland National Forest aims to protect and improve the habitats of plants and animals, including 22 endangered plant and animal species, within the area while simultaneously allowing for other forest uses.

Camp Pendleton's eastern boundary (approximately 25 percent) is contiguous with the Cleveland National Forest or holdings of the Bureau of Land Management that are virtually uninhabited.

Camp Pendleton benefits the Cleveland National Forest by providing an important habitat linkage and wildlife corridor of open space and continuity from the forest to other surrounding wildlife preserves and conservation areas. Camp Pendleton protects the forest's habitats and biological diversity by limiting access to the forest and thus isolating it from human activity and disturbance.

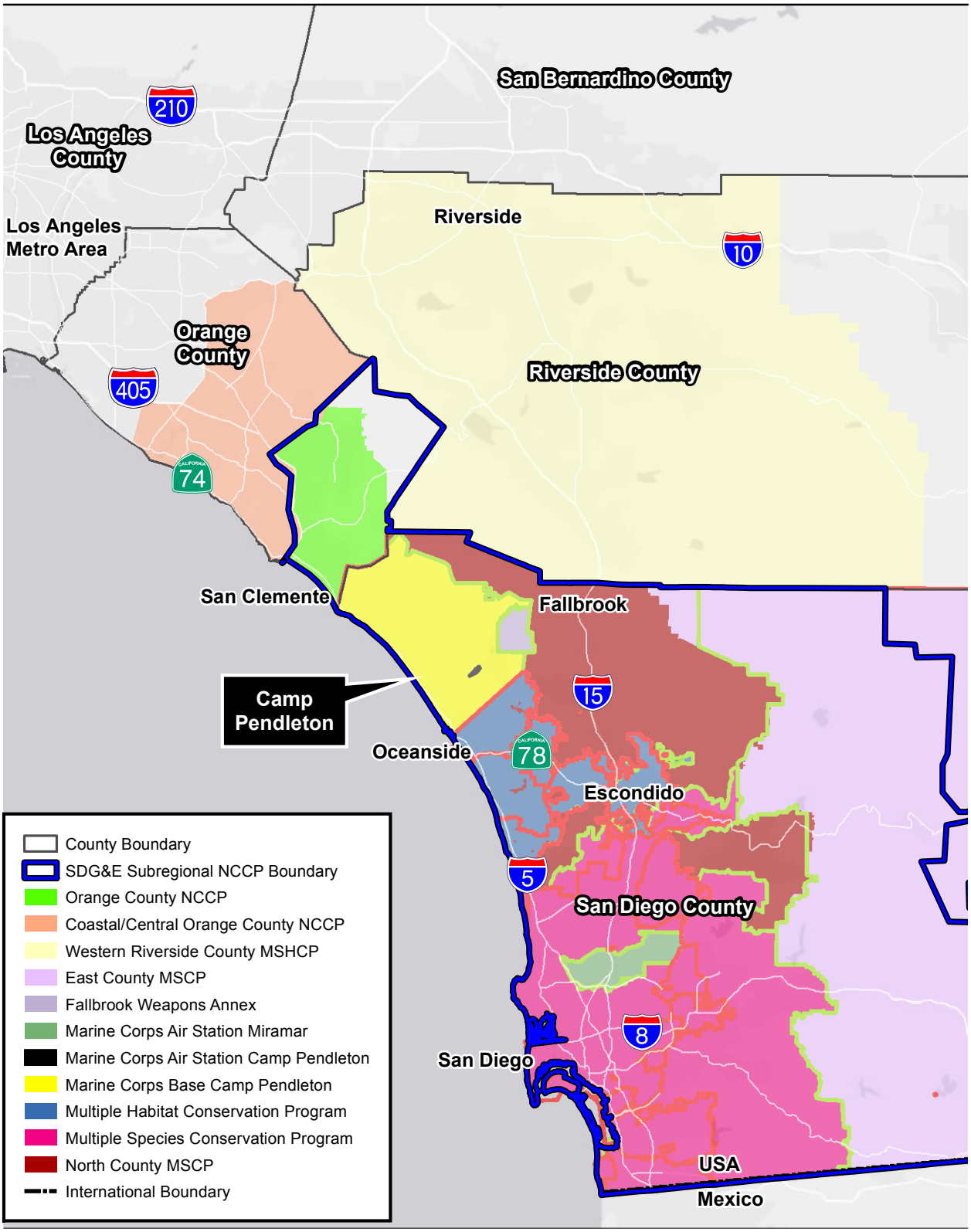
1.8.3 Natural Communities Conservation Planning Program

The Natural Community Conservation Planning (NCCP) Act, passed by the State of California in 1991, established regional conservation planning efforts that focus on ensuring the continued survival of sensitive plant and wildlife species and their associated habitats. The NCCP process was developed to encourage the conservation of natural communities before species within those communities are threatened with extinction. The program is designed to be a voluntary, collaborative effort and it represents an ecosystem approach to conservation. There are now nine NCCPs being implemented and 14 being planned statewide, covering a total of over 11 million acres (4.4 million hectares). Camp Pendleton acknowledges that cooperative relationships are becoming increasingly important as surrounding jurisdictions establish NCCPs and regional Habitat Conservation Plans (HCPs). Regional NCCPs and HCPs operating or planned in the vicinity of Camp Pendleton are depicted in 1-1 and the plan areas adjacent to Camp Pendleton are summarized further in the following subsections.

1.8.3.1 North County Multiple Species Conservation Program Subarea Plan

The County of San Diego is in the process of developing the North County Multiple Species Conservation Program Subarea Plan (North County Plan), which will expand the County's Multiple Species Conservation Program (MSCP) to the northern part of the unincorporated area. The current draft of the North County Plan includes 29 covered species within the Plan area that is approximately 345,000 acres (139,616 hectares) in size, which consists of the northern part of the San Diego County's unincorporated lands, including the areas around Ramona and Rancho Santa Fe, and the unincorporated areas around the cities of Oceanside, Encinitas, San Marcos, Vista, and Escondido, east to the Cleveland National Forest, and north to the county line.

The North County Subarea Plan extends to the eastern edge of Camp Pendleton. Military Lands (which include the Base, the Air Station, and Naval Weapons Station Seal Beach Detachment Fallbrook) and Indian Reservations are excluded from the plan area; however, Camp Pendleton will serve as an integral open space linkage between the North County Subarea Plan areas along its northern and eastern sides. The Base and Air Station strive to ensure that land use and regional planning efforts are complementary with surrounding biodiversity conservation efforts, such as the North County Subarea Plan.



Source: ESRI, DOD, USFWS.

15 7.5 0 15 Miles

Scale: 1:950,400; 1 inch = 15 Miles

Figure 1-1
Camp Pendleton and Surrounding Conservation Plan Areas

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1.8.3.2 San Diego Multiple Habitat Conservation Plan

The San Diego Multiple Habitat Conservation Plan (MHCP) is a comprehensive conservation planning process that addresses the needs of multiple plant and animal species and the preservation of native vegetation residing within northwestern San Diego County. The MHCP encompasses 111,908 acres (45,288 hectares) (29,962 acres [12,125 hectares] of natural habitat) and provides for species conservation in a proposed 19,000-acre [7,689-hectare] reserve system. The MHCP includes the seven incorporated cities of northwestern San Diego County (Carlsbad, Encinitas, Escondido, Oceanside, San Marcos, Solana Beach, and Vista).

Military lands, including Camp Pendleton, were removed from the planning area in 1994. However, Camp Pendleton has continued to coordinate planning efforts with the MHCP to ensure linkages are maintained across planning boundaries.

1.8.3.3 San Diego Gas and Electric Company Subregional Natural Community Conservation Plan

The San Diego Gas and Electric Company (SDG&E) Subregional NCCP (SDG&E Plan), approved in 1995, covers an area from southern Orange County to the Mexican border. The purpose of the plan is to establish and implement a long-term agreement between SDG&E, USFWS, and CDFW to provide incidental take coverage for 110 plant and animal species while allowing SDG&E to develop, install, maintain, operate, and repair its facilities, which are or will become necessary to provide electric, natural gas, and other services to the customers served by SDG&E within the plan area. The basic formula for addressing the impacts of SDG&E activities in sensitive resource areas is first to attempt to avoid impacts to covered species and their habitats, second to minimize necessary impacts to covered species to the extent feasible, and third to mitigate for those unavoidable impacts. SDG&E's NCCP includes 69 Operational Protocols as well as behavioral and construction techniques to avoid and minimize impacts to sensitive resources.

The SDG&E Plan established a mitigation bank to compensate for unavoidable impacts and an enhancement program to monitor, enhance and re-establish impacted areas. A total of 354 acres (143 hectares) of mitigation credits have been set aside in several land parcels purchased by SDG&E as a mitigation bank.

In 2017, SDG&E and the USFWS signed a Low-Effect Habitat Conservation Plan (Permit Number: TE26660C-0) that provides an additional 60 acres (24 hectares) of impact credit and incidental take coverage for 37 species over a 5-year term. In cooperation with the USFWS and

CDFW, SDG&E is also proactively pursuing an amendment to SDG&E's existing Subregional Plan to prepare for future needs.

SDG&E, through its parent company Sempra Energy, holds more than 1,300 acres (526 hectares) of leases/right-of-way agreements with Camp Pendleton for transmission lines and various associated support facilities. Camp Pendleton supports the mission of the SDG&E Plan by limiting military activity within these areas, and provides a natural habitat linkage to the plan's covered species.

1.8.3.4 Orange County Southern Subregional Habitat Conservation Plan

The Orange County Southern Subregional Habitat Conservation Plan, approved in 2007, is the most recent plan to be completed in southern California and creates a preservation area totaling 32,818 acres (13,281 hectares), which consists of a variety of habitats within southern Orange County. This HCP covers 32 animal species and 10 vegetation communities, including seven federally listed species. Habitat and species covered under the plan include coastal sage scrub, grasslands, oak woodlands, coastal California gnatcatcher (*Polioptila californica californica*), arroyo toad (*Anaxyrus californicus*), and San Diego fairy shrimp (*Branchinecta sandiegonensis*). The plan extends as far north as Dana Point, along the coast north of Camp Pendleton, and inland to the Santa Ana Mountains in the Cleveland National Forest.

Camp Pendleton lands contribute to the functionality of the plan by providing a core block and linkage of open space between portions of the Cleveland National Forest and other conservation lands and the HCP's undeveloped lands in Rancho Mission Viejo that are adjacent to Camp Pendleton's northern boundary.

1.8.4 Santa Ana – Palomar Mountains Linkage

The Santa Ana – Palomar Mountains Linkage is one of the only two remaining natural areas in southern coastal California that provides connections between protected coastal and inland habitats. The South Coast Missing Linkages Project, created by a coalition of agencies, universities, and organizations dedicated to identifying and conserving the highest priority linkages in the South Coast Ecoregion, is a comprehensive plan for a regional network that would maintain and restore critical habitat linkages between existing reserves. The Santa Ana – Palomar Mountains Linkage contains the last remaining natural habitats that connect the Santa Ana Mountains and the coastal lowland areas of Camp Pendleton to an inland chain of largely protected mountain ranges (Palomar, San Diego, San Jacinto, and San Bernardino mountains). Camp Pendleton is located at the western end of the Santa Ana – Palomar Mountains Linkage (Luke et al. 2004).

The final Santa Ana – Palomar Mountains Linkage design is a band of habitat roughly 4 miles (6.4 kilometers) wide and 16 miles (25.7 kilometers) long that extends from the Cleveland National Forest-Trabuco Ranger District, Camp Pendleton, and the Naval Weapons Station Seal Beach Detachment Fallbrook to the western and northern boundaries of the Cleveland National Forest-Palomar Ranger District. The plan identifies two core linkage areas within the design, the Palomar Core Area and the Santa Ana Core Area. The plan defines the Santa Ana Core Area as a large block of protected habitat that contains the lowland coastal areas of Camp Pendleton and the Detachment Fallbrook, as well as the mountainous Trabuco Ranger District of the Cleveland National Forest. While Camp Pendleton's primary mission is to train Marines, the Base and Air Station take a proactive role in the management of special-status species, and Base lands support an array of native plant and animal communities. By managing these special-status species and array of habitats, Camp Pendleton supports the preservation and conservation of the Santa Ana – Palomar Mountains Linkage.

1.8.5 San Onofre State Beach

San Onofre State Beach is administered by State Parks, the largest single leaseholder on Camp Pendleton accounting for approximately 2,000 acres (809 hectares) leased. San Onofre State Beach includes a mix of trails, beaches, and campgrounds. The State Parks-leased areas are used for public recreation; however, with advanced coordination, military training is permissible within the park.

Lease agreements require that State Parks comply with any and all applicable federal and state regulatory laws. State Parks has established general management guidelines for their leased lands that exist as policy statements within the general plans for each facility operated by the State Parks system. The guidelines provide necessary guidance for all staff and visitors for the operation, maintenance, and use of San Onofre State Beach campgrounds, trails, and beaches to ensure protection of natural resources within State Parks leased lands. Maintenance operations in the parks include maintaining the existing camping and recreational facilities, landscape maintenance, and erosion control. In addition, a lease amendment requires that State Parks conducts its natural resources management consistent with the philosophies and supportive of the objectives of this INRMP. The lease amendment further states that State Parks shall generate and submit a natural resources management plan for their leased lands for approval by the Base, and provide annual updates and status of actions and activities identified in that plan. Ongoing coordination and cooperative projects between the Base, Air Station, and San Onofre State Beach are conducted in line with Camp Pendleton's ecosystem approach.

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CHAPTER 2.0
INSTALLATION OVERVIEW

2.1 LOCATION AND AREA

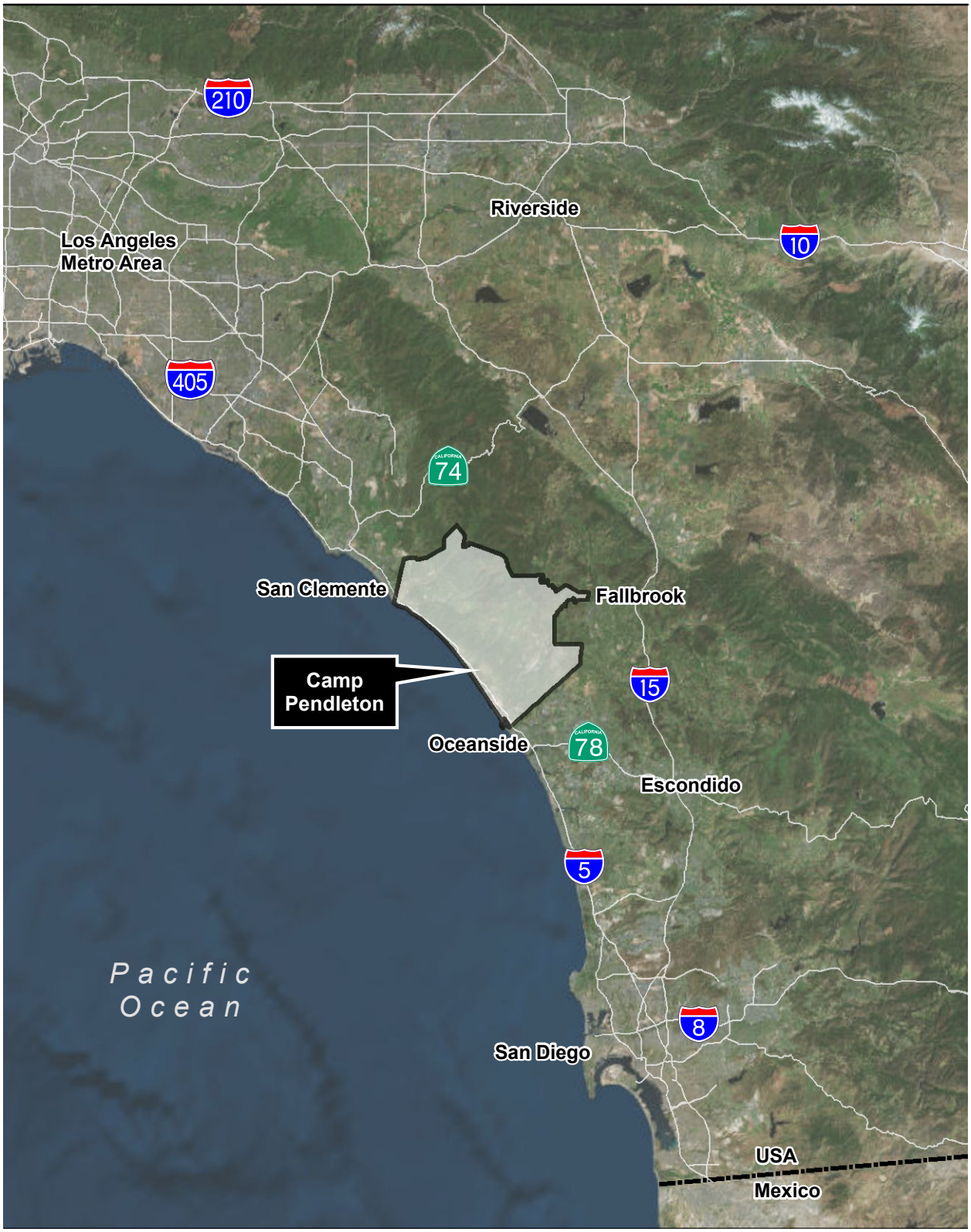
The Base occupies approximately 125,000 acres (50,586 hectares) in northwestern San Diego County of southern California, and the Air Station is located on 488 acres (198 hectares) in the south-central portion of the Base. The Base is characterized predominantly by undeveloped natural areas, with approximately 17 miles (27 kilometers) of coastline bordering the Pacific Ocean (Figures 2-1 and 2-2). The Air Station is largely developed land. Camp Pendleton is situated between two major metropolitan areas: Los Angeles, 82 miles (132 kilometers) to the north, and San Diego, 38 miles (61 kilometers) to the south. Nearby communities include Oceanside to the south, Fallbrook to the east, and San Clemente to the northwest. Camp Pendleton shares portions (approximately 8 miles [13 kilometers]) of its northern border with the San Mateo Wilderness Area of the Cleveland National Forest and its eastern border with Naval Weapons Station Seal Beach Detachment Fallbrook. Aside from the Wilderness Area and the Naval Weapons Station Seal Beach Detachment Fallbrook (which are both largely natural areas), surrounding land use includes urban development, rural residential development, and active farms and ranches.

2.2 PRE-MILITARY AND HISTORIC MARINE CORPS LAND USE

2.2.1 MCB CamPen

Historic uses of the area that Camp Pendleton currently occupies, and regional growth over the past 200 years, have significantly influenced not only the physical appearance of Camp Pendleton and its environs, but also the ecological setting in which the Base finds itself today. Much of southern California's biodiversity and its high degree of species endemism have been significantly impacted through historic land use and increasing human population and development.

The land currently occupied by the Base has a long history of human presence (>10,000 years), including the prehistoric Shoshonean-speaking people who used the coastal lands for shellfish and vegetable gathering, and the higher oak woodlands for acorn gathering and deer hunting, through Spanish colonials (1769–1821) and Mexican (1821–1848) and American ranchers (1848–1942) (Zedler et al. 1997). Cattle grazing and, later, crop cultivation were the primary land uses in the



Source: ESRI, DOD.

15 7.5 0 15 Miles

Scale: 1:950,400; 1 inch = 15 Miles

Figure 2-1
Camp Pendleton Location

Path: \\ussdg1fp001.na.aecomnet.com\DATA\projects\6033\60337020_CPen_INRMP\900-CAD-GIS\920 GIS\922_Maps\Draft\LocationMap.mxd, 9/3/2015, paul_moreno

Source: ESRI, DOD.

35 17.5 0 35 Miles

Scale: 1:2,217,600; 1 inch = 35 Miles

Figure 2-2
Regional Map

Path: P:\6033\60337020_CPen_INRMP\900-CAD-GIS\920 GIS\922_Maps\Draft\RegionalMap.mxd, 9/27/2017, paul.moreno

region until the U.S. government purchased a majority of the land in 1942 and the military took over the property during World War II.

During the Rancho period, agriculture and livestock was the economic base of the region. Rancho Santa Margarita once stretched 200,000 acres (80,937 hectares) from Oceanside to Saddleback Mountain, and at its peak 10,000 head of cattle and 250 horses roamed the area (Ritchie 2007). It is believed that sheep were introduced in the late 1800s. Subsequent owners of the property also used the land for grazing, and grazing leases continued after the military took over the property. Camp Pendleton was reputed to have the finest grazing land in southern California during the early 20th century. At one time, approximately 24,000 acres (9,713 hectares) of land at Camp Pendleton was leased-out for sheep grazing; however, all sheep grazing leases were cancelled in 2003. Grazing and farming activities were supported by El Camino Real, the old thoroughfare used by the missionaries that became Highway 101 and used to follow what is now the Basilone Road alignment before it was moved closer to the coast. Infrastructure development included a railroad, which ran from San Diego to Oceanside, inland along the Santa Margarita River to Temecula, and connected to the transcontinental railroad at San Bernardino. In the Santa Margarita River, the tracks were generally 10 to 30 feet (3 to 9 meters) above the riverbed in the canyon; however, 30 miles (48.3 kilometers) of track was washed out in 1884 and again in 1891. This route was then replaced by a more-secure route along the coast.

Extensive farming was first established in the Las Flores/Las Pulgas basin in 1897, with a bean farm that grew to eventually cover approximately 1,980 acres (801 hectares) by 1943. Other areas farmed on Camp Pendleton over the years include the San Mateo, and San Onofre valleys; Ysidora Basin; the Chappo area (now the Supply Depot and airfield); the coastal bench from Oceanside to San Onofre east and west of Interstate 5 (I-5); and Stuart Mesa. At one time, farmed areas of the Base totaled around 10,000 acres (4,047 hectares) (Zedler et al. 1997). Coastal farms were unirrigated, as were parts of the San Onofre and Las Flores areas. Irrigated farms included Ysidora Basin, Stuart Mesa, San Mateo, and parts of San Onofre. Truck farming started in the San Onofre valley in 1925. A 3,000-acre (121 hectares) guayule (*Parthenium argentatum*) crop deemed the "Emergency Rubber Project" was in place that included most of the coastal bench lands north of Horno

Canyon. Other historical crops included lemons, nursery stock, dry-land farmed lima beans, tomatoes, strawberries, sweet corn, barley, bulbs, vegetable seed, flowers, and potatoes for the California Potato Experiment Station. In 1944 and 1945, the Base tried to cancel its agricultural leases but gave up after a general protest. It was decided that the agricultural economy of the entire United States would have been affected, particularly because of vegetable seed and poinsettia production.

In 1931, the U.S. government wanted to establish an emergency airfield on the Rancho Santa Margarita y Las Flores property due to increased air travel on the southern flight path from New York to Los Angeles. The manager of the ranch, Charles S. Hardy, agreed to lease the land to the government for such a purpose because the owner refused to sell the land. The lease started on 1 July 1931. In 1941, DoN bought 9,000 acres (3,642 hectares) of the Rancho Santa Margarita y Las Flores property for $2,500,000 and designated the area as an ammunition depot. Then in 1942, DoN purchased an additional 123,620 acres (50,027 hectares) of the property for $4,239,062 for use as a military training center (Herbert 1961). Later that year, President Franklin D. Roosevelt named the Base as Camp Joseph H. Pendleton, in honor of Major General (MajGen.) Joseph H. Pendleton, a pioneer of Marine Corps activities in San Diego and an advocate for a major Marine Corps installation on the west coast.

Construction on-Base commenced immediately, with initial construction taking place in the Mainside area, which is located in the southeastern corner of the Base. This region was subdivided into smaller areas that were numbered in order of their construction beginning with Area 11 and ending with Area 17, a numbering system that exists today. Tent camps 1 (Las Pulgas), 2 (San Onofre), and 3 (Cristianitos) were created in the outlying canyon areas west of the Mainside area. These tent camps were purposely dispersed to reduce bombing and fire hazards. In addition, an airstrip and a 600-bed hospital were constructed.

Between 1942 and 1945, over $25 million was spent on Base construction and improvements. Initially, thousands of tents were erected but they were quickly replaced with Quonset huts in the three tent camps.

Originally, Camp Pendleton was meant to serve as an auxiliary training camp for the MCB at San Diego, but it quickly became the center of West Coast Marine Corps activity as the Corps took

on an increasingly crucial role in amphibious warfare necessary to take control of Pacific Islands from the Japanese in the Pacific Theater. Throughout the war, Camp Pendleton was responsible for training Marines for full-scale combat in the Pacific. Its land area was large enough so that it could support training for three full divisions. In 1942, Camp Pendleton received its first combat units, the Ninth Marines, a reinforced regiment that had been training at Camp Elliott (former portion of MCAS Miramar) and later became part of the Third Marine Division (3rd MarDiv). The Ninth Marines were followed by the 4th and 5th MarDivs.

In 1944, Camp Pendleton was declared a permanent installation. Camp Elliott merged with Camp Pendleton, and Pendleton became the biggest Marine camp in the nation with a population peaking at 86,749 Marines, Sailors, and civilians. The Fleet Marine Force, San Diego Area headquarters, which had been located at Camp Elliott, moved to Camp Pendleton and Camp Elliott became a distribution center for the Navy. To make room for these incoming men, thousands of additional tents and Quonset huts were erected**.**

At the close of the war, Camp Pendleton became a demobilization center for all troops returning from the Pacific Theater. As divisions were reduced or disbanded, the population of the Marine Corps went from a high of 485,000 to a low of 80,000 in 1947.

In 1946, General Vandegrift ordered that Camp Pendleton remain the center of all Marine Corps activities on the West Coast and designated it as the permanent home of the 1st MarDiv and the Signal Communication School. The following year, Camp Pendleton's unofficial title was changed from "Marine Training and Replacement Command, San Diego Area" to "Marine Barracks, Camp Pendleton."

MajGen. Graves B. Erskine was put in command of the Base in 1947. He was the first Base commander who operated the Base separately and not as part of the "San Diego Area" command. It was his wish to develop the installation into a first-class Marine installation. Upon his arrival, he moved into the old Santa Margarita Ranch House, instituted the Camp Pendleton Rodeo, and set about to rebuild and upgrade the facility. Changes he ordered included planting of trees, installation of lawns, and, most importantly, the replacement of temporary buildings with permanent ones. A shortage of funds and building materials required the Marines to renovate old

buildings rather than construct new ones. Tents were torn down and replaced with Quonset huts and barracks were renovated. A $130,000 beach club was built at San Onofre, a commissary was opened at Chappo Flats, and a library began to operate across from the Headquarters Building in the Mainside area. Between World War II and the Korean War, new construction activity at Camp Pendleton consisted of a few warehouses and a permanent brick and reinforced concrete barracks and mess hall complex in Area 22.

On 25 June 1950, when the North Korean People's Army invaded South Korea, only 9,000 Marines of the 1st MarDiv, along with a small maintenance force, were stationed at Camp Pendleton. Immediate attention was placed on rebuilding the existing units to fighting strength.

After June 1950, attention was shifted to rebuilding the 1st MarDiv, which was used in the amphibious assault landing at Inchon on 15 September 1950 and ground operations, including at Chosin Reservoir, where seven divisions of the Chinese Communist Army engaged Camp Pendleton-based Marines in a failed attempt to prevent them from leaving. At Camp Pendleton, a massive buildup took place as active duty and mobilized reserve Marines trained and staged through Camp Pendleton. Nearly 200,000 Marines (including 22 reserve units, mostly battalions) passed through the Base on their way to Korea.

In this same period, the Training and Replacement Command and the First Advanced Infantry Training Regiment were established at Camp Pendleton. The Training and Replacement Command was located at Camp San Onofre and the First Advanced Infantry Training Regiment was located at Tent Camp 1. In an effort to expose the Marines to as realistic combat conditions as possible, Marine instructors built a "combat town" to simulate a North Korean village.

Construction at Camp Pendleton during the Korean War years occurred at a frenzied pace and even outdid what had occurred during World War II. Twenty million dollars was expended for renewing and upgrading existing facilities. Permanent facilities, constructed mostly of concrete block, were developed at Las Pulgas, San Mateo, Horno, and Margarita. With no rapid demobilization after the Korean War, as there had been after World War II, MajGen. John Sheldon, commander of Camp Pendleton, embarked on a long-range planning program to make Pendleton a more permanent facility. In 1953, the official name of Camp Pendleton was changed from Marine Barracks, Camp Pendleton to Marine Corps Base, Camp Pendleton.

After the war, Camp Pendleton served as a training facility and provided administrative and logistical support for Fleet Marine Force units and replacement units. Camp Pendleton was not only home to the 1st MarDiv (which returned home after a 5-year tour in Korea), but also became home to the 5th MarDiv, located in the Margarita area. Camp San Mateo became home to the Second Battalion (later called the Ready Battalion Landing Team), and the northern edge of

Camp Talega became home to the First Pioneer Battalion. At Pendleton, this battalion built rifle and pistol ranges and maintained roads and bridges.

During the following decade, the Marine Corps took steps to change troop organization and fighting techniques to increase strategic and tactical mobility without sacrificing combat effectiveness. Based on the threat of nuclear warfare and the development and success of vertical envelopment (amphibious helicopter assault) in particular, changes in divisional organization were made to adapt the helicopter to amphibious warfare without minimizing the Marines' "force in readiness" role. Testing of these new theories in amphibious operations was conducted through large-scale exercises on the beaches of Camp Pendleton throughout the 1950s and 1960s.

Although Camp Pendleton remained a busy installation in the years following the Korean War, little was appropriated for construction. This was mostly due to lack of funds caused by a continuing legal battle between Camp Pendleton and Fallbrook residents over Santa Margarita River water rights and Congressional reticence to approve construction funding because an unfavorable finding in the legal case could affect Camp Pendleton's future.

The election of John F. Kennedy to the presidency in 1960 and his belief that the nation was unprepared for a conventional war resulted in an increase in Marine Corps end strength and a major Marine Corps expansion in the San Diego area. Camp Pendleton's Del Mar area received a number of permanent messing, billeting, administrative and training facilities and major construction took place at Edson Range, an annex of the Marine Corps Recruit Depot, San Diego.

Mostly because of its strategic location, Camp Pendleton became the Marine Corps' chief training installation during the Vietnam War. Marines from units throughout the country descended upon the Base and upon arrival were immediately assigned to the Staging Battalion. During the Vietnam War, the Staging Battalion was what the Training and Replacement Command had been in World War II and Korea, the final jumping-off point for battle. Once assigned to a Staging Battalion, a Marine became part of a unit and took part in an intensive 15-day training program oriented toward guerilla warfare. The majority of the guerilla warfare training took place at Camp Las Pulgas and in the wooded terrain behind the Naval Hospital in Area 26. To further assist Marines in improving jungle-fighting skills, as well as to accommodate the influx

of troops into the station, new combat villages were built. Marines learned to fight amongst bamboo structures complete with underground tunnels, concrete bunkers, and barbed wire. These villages were not only designed to teach fighting techniques, but also to acquaint Marines with the traditions and cultures of Vietnam.

Reactivation of the 5th MarDiv and training of tens of thousands of Marines for Vietnam brought about a billeting shortage followed by a construction boom at Camp Pendleton. The demand was so great that nearly two-thirds of new arrivals were forced to live temporarily in tents while permanent barracks were being constructed. This not only affected Camp Pendleton, but also caused a housing crisis in Oceanside. In April 1967, the 5th MarDiv moved four of its battalions into modern $3.8 million barracks at Las Flores. From 1958 to the mid-1970s, development across the Base continued as Vietnam became a priority for Camp Pendleton. Between 1969 and 1970 alone, nearly 80,000 Marines were trained at Pendleton and sent to Vietnam.

Although Base construction slowed down a bit during the 1970s, a few facilities were constructed. In 1972, a special research and development complex was created for the Marine Corps Tactical Systems Support Activity. In addition, dispensaries and dental clinics were upgraded and a modern correctional center and a shopping center were added at the north end of the Base. In 1974, a 600-bed naval Regional Medical Center was opened, replacing numerous single-story World War II-era structures that had functioned as the hospital for the Base. This new hospital was designed to serve the Marines at Camp Pendleton, the Marine Air Station at El Toro, the MCB at Twenty-nine Palms, the Marine Corps Supply Center at Barstow, and the Naval Weapons Station Seal Beach Detachment Fallbrook at Fallbrook, as well as dependents and retired military personnel**.**

From April 1975 to October 1975, Camp Pendleton served as a refugee camp for Vietnamese and Cambodian refugees who had fled Southeast Asia. Over 50,000 refugees were supported in Camps Talega, Cristianitos, and San Onofre. After years of supporting post-Vietnam Cold War training and deployments of Marines, in August 1990, Camp Pendleton was again used to prepare and deploy Marines. Marines from Camp Pendleton were among the first sent overseas to assist in the defense of Saudi Arabia. Through March 1991, when the Camp Pendleton-based 1st MarDiv, supported by the Third Marine Aircraft Wing (3rd MAW) and First Force Service Support Group (1st FSSG), liberated Kuwait from the occupying Iraqi Army, the Base provided logistic support and received, trained, and further deployed mobilized Marine reservists and reserve units.

In March 2003, Marines and Sailors from Camp Pendleton as part of First Marine Expeditionary Force (IMEF) used skills learned at the Base in their historic drive from Kuwait to Baghdad during Operation Iraqi Freedom. Beginning in 2008, ongoing operations in Afghanistan have

required the development of new training programs and facilities at Camp Pendleton to implement lessons learned in sustaining stability and security operations.

In early 2007, President George W. Bush approved the request for the Marine Corps to grow from its then-current end strength of 175,000 Marines to 202,000. The Marine Corps 202,000 Plus Up initiative (also known as “Grow the Force” [GTF]) would be accomplished through incremental annual increases in the existing war-fighting organization of the Marine Corps, and by the reallocation of existing facilities and the construction of new support facilities at several Marine Corps installations. As part of the GTF initiative, and to accommodate an anticipated increase of nearly 3,000 Marines at Camp Pendleton by 2011, approximately 41 permanent facilities, including associated site improvements and significant base-wide infrastructure expansion, were proposed. Construction of many of these permanent facilities, including bed-down, support, parking, training, and infrastructure facilities, has been completed.

2.2.2 MCAS CamPen

MCAS CamPen began as a small, dirt airfield in 1942 when Marine aviation comprised fewer than 200 aircraft. It was originally activated on 25 September 1942 at Marine Barracks, Camp Joseph H. Pendleton, California, as Marine Corps Auxiliary Landing Field (MCALF) Camp Pendleton, under the Administrative Control of Marine Corps Air Station, El Toro, Santa Ana, California. During the 1940s, the Air Station remained as a limited component of the Marine Corps defense picture. As a Sub-Unit of MCAS El Toro, it played a role as a back-up for the MCAS El Toro operations and added an additional training element in conjunction with Camp Pendleton training activities. In 1950, the north end of the landing field was an empty field used for annual combat review of troops from the 1st Marine Division and Marine Barracks, but it would not stay that way much longer. During the 1950s, the technology of the national defense system would undergo major alterations and a new type of aircraft—helicopters—would become very critical to military operations. With the development of the practical helicopter and the changes in operational doctrine that these craft made possible, the Air Station’s mission focused primarily on helicopter operations. The Air Station was gradually modernized in step with the growing importance of helicopters to the Marine Corps.

A major change came to the air field in the late 1960s with the activation of Provisional Marine Aircraft Group (MAG) 39. MAG-39 was activated during April 1968 at Quang Tri, Vietnam. Its mission at that time was to "...help stop, disrupt and destroy invading North Vietnamese Army units" in numerous combat operations, including Scotland II, Lancaster I and II, Kentucky, Mameluke Thrust, and Jeb Stuart II. During June and July 1968, the Group helped conduct the evacuation of the Khe Sanh Combat Base, transporting all supplies and equipment to LZ (Landing Zone) "Stud," which became the new home for Provisional MAG-39 aircraft. The

aviation unit then participated in Operation Meade River during the largest Marine heliborne assault of the Vietnam War and, during January 1969, the Group's assets were directed in support of Operation Dewey Canyon. In September, the Group provided support for the Third Marine Division as it relocated from Vietnam.

By 1977, MCALF Camp Pendleton housed 67 operational aircraft and plans were underway to increase that number to 93 by 1980 with a total of 1,937 officers and enlisted personnel on board the airfield. Personnel lived on other areas of the Base as the buildings on the MCALF were all connected with flight operations and fulfillment of the MCALF mission. As a result of its growth, MCALF Camp Pendleton was redesignated a Marine Corps Air Facility (MCAF) on 1 September 1978. Since that time, MAG-39 has supported the 3d Marine Air Wing, 1st Marine Division, and MCB CamPen. It soon became evident that a full-fledged air station under its own commanding officer was needed and, by 1985, the facility had been redesignated once again. This time, it was designated as MCAS CamPen. Corresponding plans to increase the facilities on the Air Station also were underway, and the station began a process of expansion. The change reflects the fact that the MCAS was conducting more air operations than either MCAS El Toro or MCAS Tustin by 1985. The change was attributable to the increase in operational flight hours from 25,000 in 1981 to 29,500 in 1984.

The Air Station suffered a disastrous flood in 1993, which also affected the neighboring historic Santa Margarita Ranch House. Considerable damage was done but with no loss of life. In 2000, a levee was built to reduce the risk of subsequent flooding.

Following various BRACs in the 1990s, the Air Station has become considerably more active. The number of aircraft operated by its tenants has increased by 35 percent, its personnel have increased by nearly 20 percent, and flight operations and hangar space have increased by more than 40 percent.

The Air Station has been an independent installation within greater Camp Pendleton for over 30 years. Its flexibility and careful growth over that period suggests that it will long continue to play an important role in Marine Corps aviation.

2.3 MISSION

2.3.1 MCB CamPen

The mission of Camp Pendleton is "to operate a training base that promotes the combat readiness of the Operating Forces and the mission of other tenant commands by providing training opportunities, facilities, services and support responsive to the needs of Marines, Sailors and

their families" (MCB CamPen 2015). Camp Pendleton maintains and uses its natural areas to ensure the readiness of the nation's military forces. The ability of the military to fight and win our nation's wars is tied directly to readiness resulting from realistic training. There is no substitute. Camp Pendleton is the Marine Corps' premier amphibious training Base; its only west coast amphibious assault training center; and the only west coast installation capable of supporting combined and comprehensive air, sea, and ground combat training. The Base has been conducting air, sea, and ground assault training since World War II, providing a unique combination of natural and military resources for the training of Marines and other DoD personnel. For over 70 years, Camp Pendleton has served as one of the nation's most important training Bases and has contributed substantially to the success of our national security forces in conflicts and missions worldwide.

Camp Pendleton is one of the busiest DoD installations in the United States. Approximately, 45,000 training events are scheduled for the nearly 60,000 service members that train at Camp Pendleton each year. These events range from small unit training to Regimental and Marine Expeditionary Brigade (MEB) exercises. The Base provides training facilities for many active duty and reserve Marine, Navy, Army, Air Force, and National Guard units, as well as other federal, state, and local agencies. The Base's proximity to the Navy's homeport at San Diego is strategically significant in supporting mobilizations and deployments to, and contingencies for, the western Pacific and Southwest Asia. The Base is the home for the Commander, Marine Corps Installations West and a cornerstone of the Marine Corps' training range complex in the southwestern United States, which includes the Marine Corps Air Ground Combat Center in Twenty-nine Palms, California; the Barry M. Goldwater Range near MCAS Yuma in Arizona; and the Chocolate Mountain Aerial Gunnery Range (CMAGR) in the southeastern corner of California. Each installation plays an integral role in the training of Marines and Marine Air and Ground Task Forces (MAGTFs) for combat operations. Marine units from Camp Pendleton utilize these ranges to accomplish specific training requirements. Current and emerging doctrine points to the ever-increasing importance of Camp Pendleton as a point of entry and operational platform that connects to Naval and Joint Bases and training lands within the western United States and replicates operational reach consistent with the exercise of Expeditionary Maneuver Warfare, and Operational Maneuver from the Sea.

Camp Pendleton is the Marine Corps' only training installation on the west coast for conducting amphibious operations (operations that involve the projection of U.S. forces from the sea), which is a principal mission of the Marine Corps. Camp Pendleton is home to the IMEF and the Marine Corps Installations West. Major subordinate commands of the IMEF, the 1st MarDiv, the First Marine Logistics Group (1st MLG), and elements of the MAG-39 (an element of the 3rd MAW) are also based at and train on Camp Pendleton. Many other units, including the Marine Corps Tactical Systems Support Activity (MCTSSA), Assault Craft Unit 5 (a U.S. Navy command),

Naval Hospital Camp Pendleton, Naval Dental Clinic Camp Pendleton, the Field Hospital Operations and Training Command (a U.S. Navy command), an Army Reserve Center, and the Weapons and Field Training Battalion (an element of Marine Corps Recruit Depot, San Diego), are also based on Camp Pendleton. Forces of the IMEF are continuously deployed in support of operations and contingencies worldwide to meet national security objectives as directed by the National Command Authority.

To accomplish the national security mission and support the nation's Overseas Contingency Operation, Marines and other DoD personnel must be trained in all requirements for responding to national security threats. Training activities include, but are not limited to, amphibious landings, use of tracked vehicles, infantry and vehicle maneuvers, artillery and small arms firing, aerial weapons delivery, engineer support operations, logistics support, field combat service support, communications, airlift support for troops and weapons, equipment maintenance, and field medical treatment. Camp Pendleton units train with some of the most modern and sophisticated weapon systems and equipment available. Such technology is constantly evolving to stay ahead of weapon system advancements by threat forces. Continual training to maintain personnel/unit proficiency is a critical component of combat power and is the primary mission of the Base.

Training on-Base is supported by a wide range of Marine Corps and DoD service support activities, including an airfield and aviation landing areas, ammunition storage areas, radar and communication facilities, supply warehouses, motor vehicle storage and maintenance facilities, recreational activities, bachelor and family housing facilities, medical and dental services, military security, child and family care services, and firefighting.

2.3.2 MCAS CamPen

The mission of MCAS CamPen is to maintain and operate the Marine Corps' premier Air Station in support of flight operations to prepare Marines for combat while protecting and enhancing the environment and providing the highest quality facilities and services.

The Air Station has been in existence for over 70 years. Although fully enclosed within Camp Pendleton, the Air Station is a separate installation owning its own land; it is not a tenant of Camp Pendleton. The Air Station is managed under the purview of the Commanding General, Marine Corps Installations Command by its Commanding Officer. The Environmental Officer of the Air Station is responsible to the Commanding Officer for all matters related to natural and cultural resources both for the Air Station itself and—importantly—for its tenant squadrons.

2.4 OPERATIONS AND ACTIVITIES

A variety of land uses occur at Camp Pendleton; however, the priority of Camp Pendleton is, and will continue to be, to provide training and support facilities for active duty and reserve Marine, Navy, Army, Air Force, and National Guard units, as well as other federal, state, and local agencies. Camp Pendleton is host to over 80,000 military, civilian, and contracted personnel daily. Annually, nearly 60,000 personnel train at Camp Pendleton, with up to 47,000 service members and their dependents actually assigned-to/living at Camp Pendleton. Additionally, more than 77,000 retired military personnel reside within a 50-mile radius of Camp Pendleton with access to Base recreation facilities, commissary, exchange, and medical services.

While some locations and land uses on-Base support only one type of activity (e.g., family housing and impact areas), most areas on-Base support multiple activities (2-3). The following sections discuss the predominate types of land uses on-Base: military training, Base infrastructure and mission support (including cantonment and recreational facilities), and real estate agreements and leases.

2.4.1 MCB CamPen

2.4.1.1 Military Training

The uniqueness and variety of Camp Pendleton's topography, combined with its contiguous offshore amphibious training areas, its live-fire ranges, and its protective restricted airspace, offer maximum flexibility for establishing realistic combat training scenarios. Camp Pendleton's use of its more than 125,000 acres (50,586 hectares) of land for training (Figures 2-4 through 2-7) includes 31 training areas, 14 impact areas, 87 live-fire ranges, 51 artillery firing areas, 13 live-fire and maneuver areas, five amphibious assault landing beaches, and approximately 230 square miles (595.7 square kilometers) of Special Use Airspace. As of 2016, the Base supports approximately 51,000 annual training events, up from 40,000 to 45,000 in 2001, representing a 13 to 27 percent increase in training activity over 15 years. While the combat training environment, weapons, tactics, and tempo have changed over the years, Camp Pendleton's training emphasis has continued to be *designed to mold young men and women into the Country's finest fighting force*. As a training base, Camp Pendleton must maintain its ability to provide ready, capable Marines in the right place, at the right time, and with the right training for them to survive and accomplish their mission in the uncertain challenges of future battlefields.

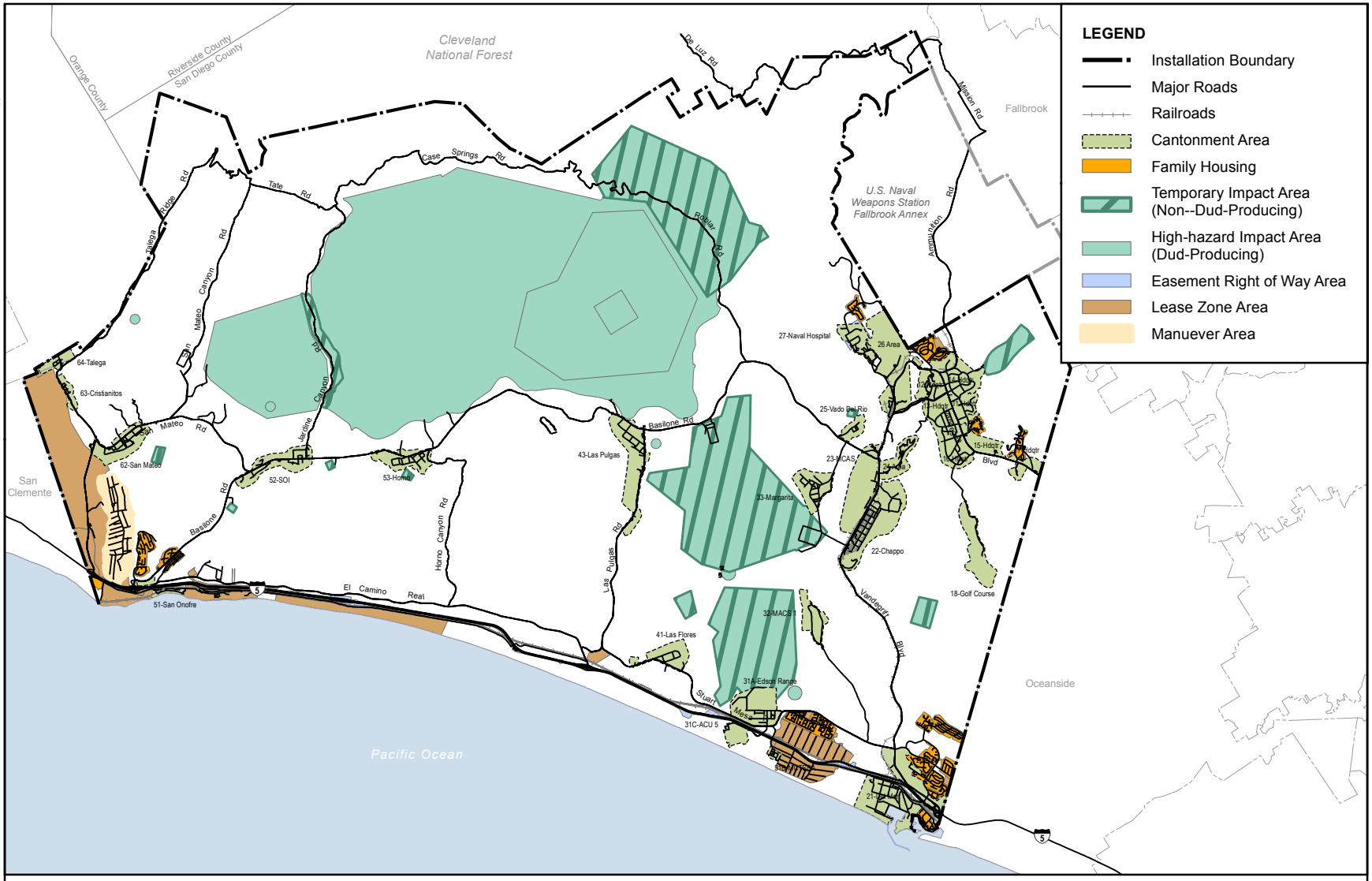


Figure 2-3
Existing Land Use

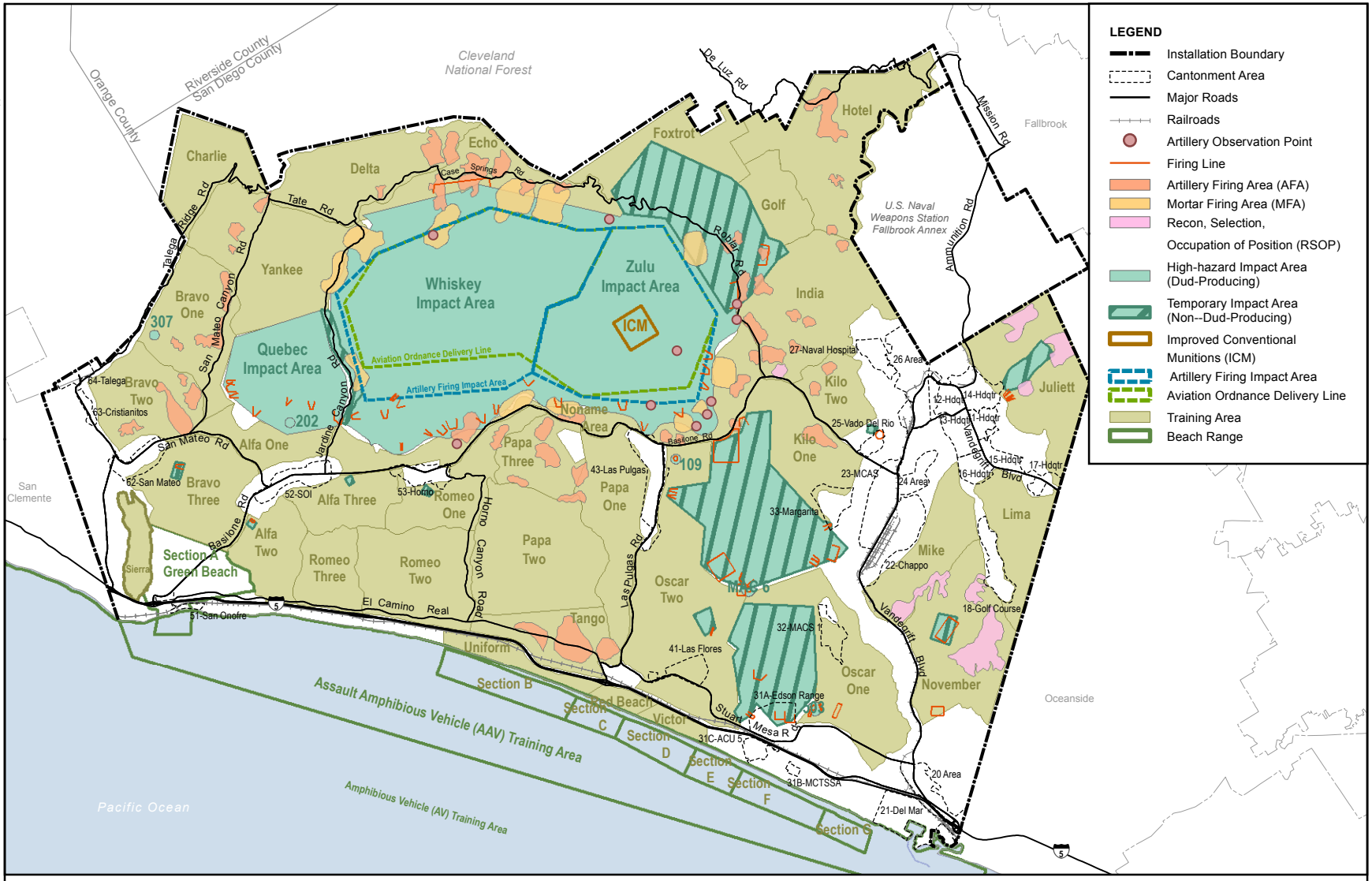
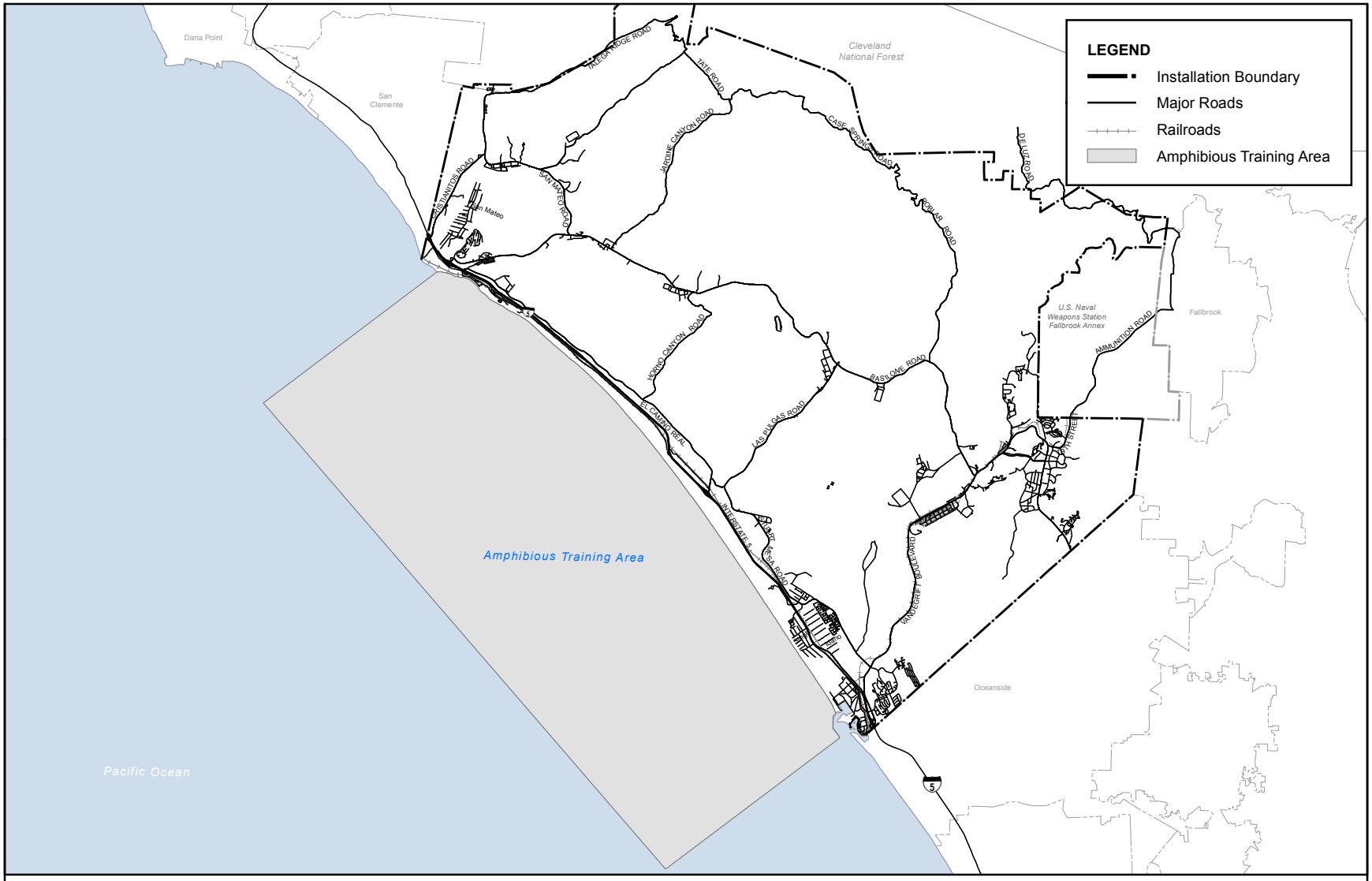


Figure 2-4
Ground Training



Source: Marine Corps Base Camp Pendleton

4 0 4 Miles

Scale: 1:253,440; 1 inch = 4 Miles

Figure 2-5
Amphibious Training Area

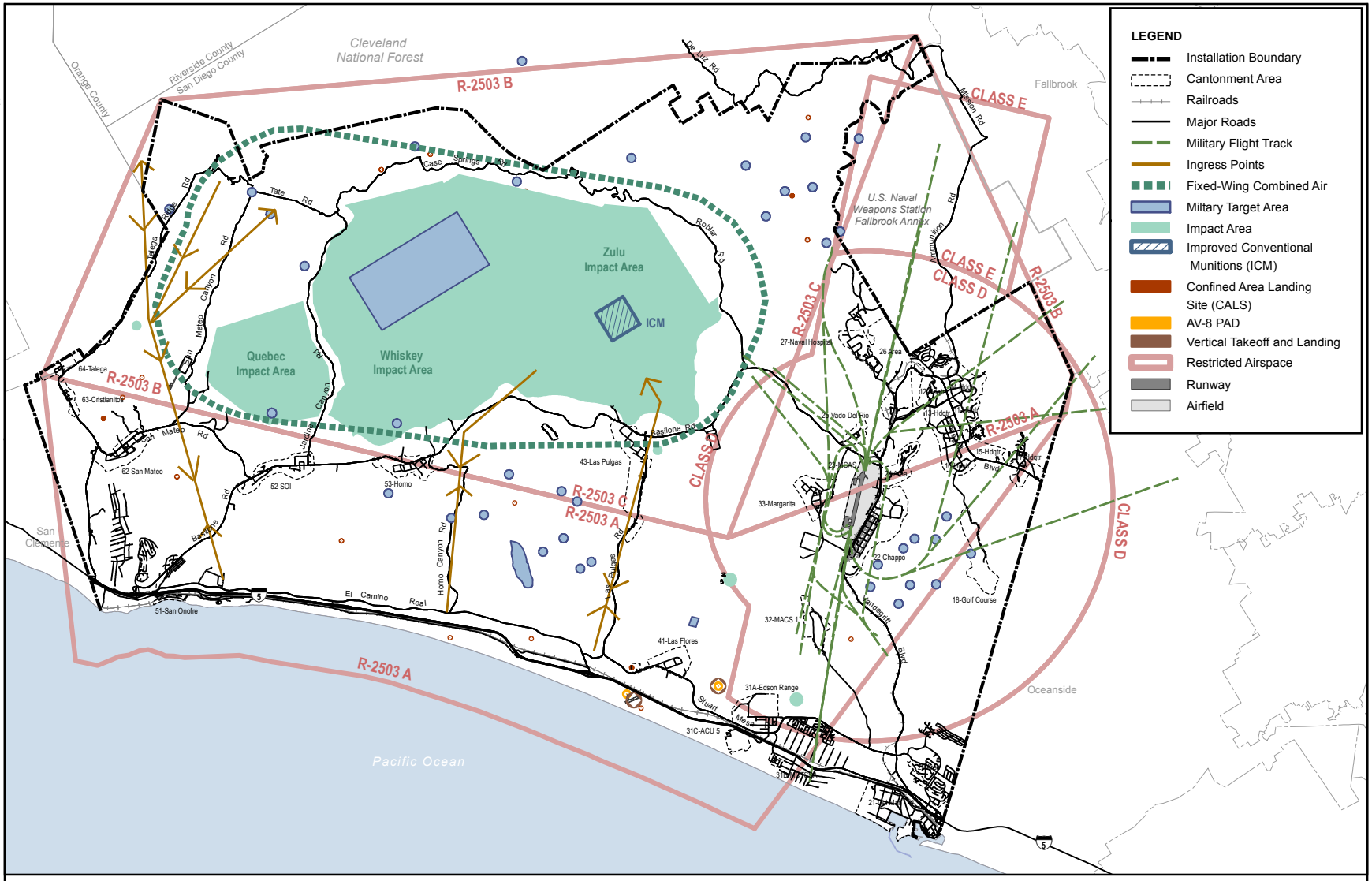


Figure 2-6
Fixed Wing Aircraft Training

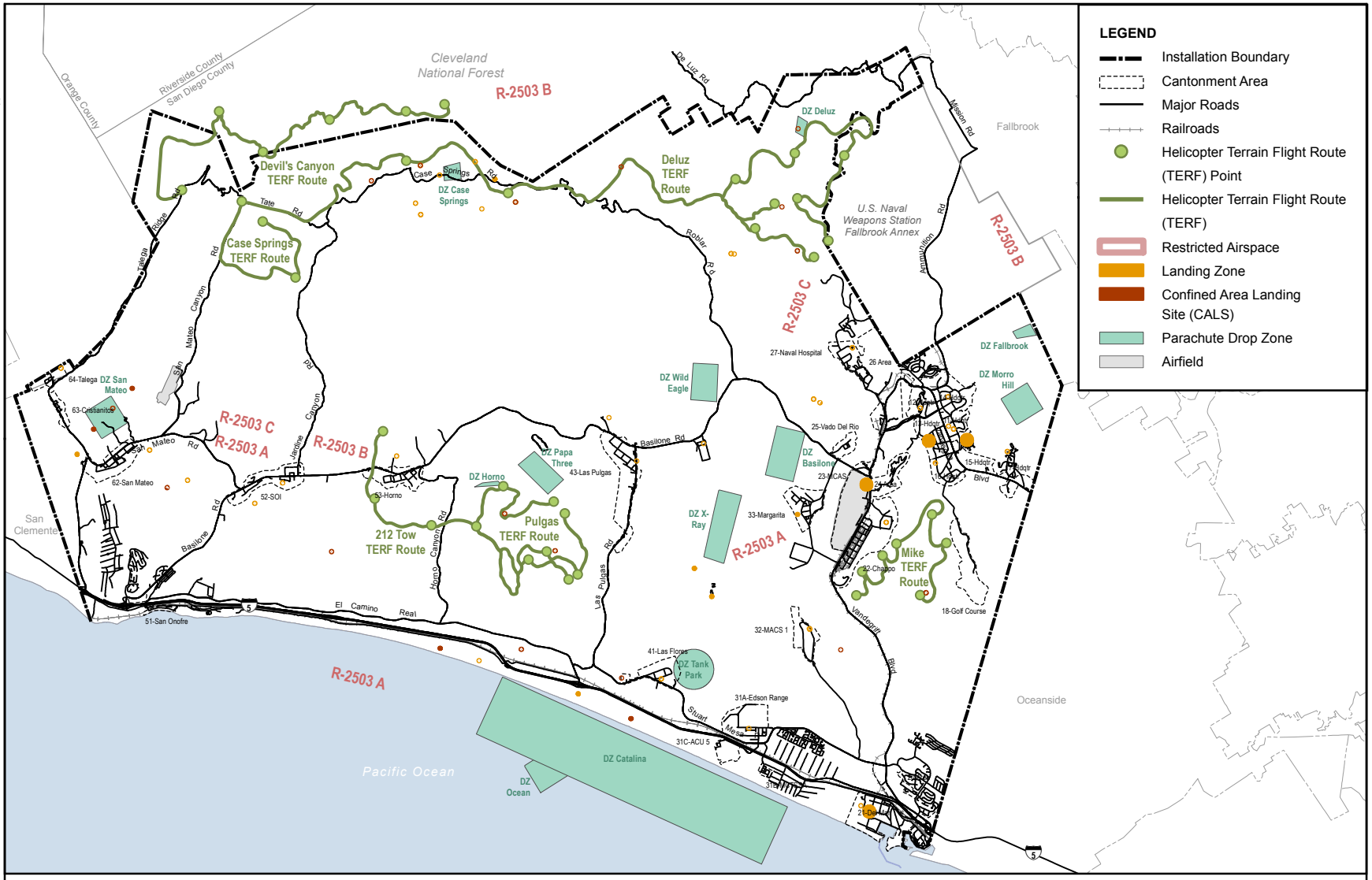


Figure 2-7
Helicopter Training

Camp Pendleton's role in the modern Marine Corps is summarized by the Commandant of the Marine Corps (CMC): "[Bases and stations] provide the means by which we develop, train and maintain a modern force that is prepared to win our Nation's battles. Installations are the platform from which we project expeditionary power by deploying and sustaining Marine Air-Ground Task Forces. They will continue to grow in importance as we fully implement our future doctrine and the '*reach back'* requirements it demands." Camp Pendleton must ensure that Marines, individually and as a unit, are ready to answer the Nation's call, anytime, anywhere.

Marines are required to be trained in all U.S. Marine Corps (USMC) Title 10 mandated requirements and to be combat-ready for global deployment in pursuit of national security objectives. Training activities must include, but are not limited to, amphibious landings, use of tracked vehicles, personnel maneuvers in natural areas and urban/built-up areas, artillery and small arms firing, aerial weapons delivery, engineer support operations, logistics support, field combat service support, communications, airlift support (re-supply) of troops and weapons, equipment maintenance, and field medical treatment.

Camp Pendleton is most heavily used by and structured to support the IMEF. The IMEF is the command element for the 1st MarDiv, 1st MLG, and 3rd MAW. The latter is headquartered at MCAS Miramar. One of the 3rd MAW's four Aircraft Groups, MAG-39, a helicopter Group, is based at MCAS CamPen. Portions of the IMEF are continuously deployed worldwide to project and protect the Nation's security as directed by the National Command Authority. The Base also supports several specialized schools: Headquarters and Support Battalion, Security Battalion, Amphibious Vehicle Test Branch, and a Reserve Support Unit. Camp Pendleton's training ranges are heavily used, not only by active Marine and Navy units, but also by reserve Marines, Army National Guard, and local community law enforcement agencies.

2.4.1.2 Amphibious Operations

Camp Pendleton's amphibious training operations take place within a variety of offshore ocean training areas that extend the Base's operational capabilities (2-5). The waters immediately west of the Base, known as the Camp Pendleton Amphibious Assault Area (CPAAA), contain 294 square miles (761.5 square kilometers) of amphibious assault training and maneuvering areas, including the seaward portion of restricted airspace area R-2503A and R-2503D. The CPAAA includes an area dedicated to Landing Craft Air Cushion (LCAC) training and operations, as well as the Camp Pendleton Amphibious Vehicle Training Area (CPAVTA). No live ordnance is used within the CPAAA during amphibious training operations; only occasional aviation operations take place within the seaward portion of R-2503A. Extensive Naval surface, subsurface, and aviation operations take place during amphibious training evolutions within the CPAAA. The CPAAA is not an exclusive military-use area and is used daily by commercial and private

vessels. Located adjacent to the shoreline is the CPAVTA. The CPAVTA is used for amphibious operations, simulated dive, glide, and low-level bombing. It also includes an LCAC Transit Lane. No live or inert ordnance is expended in this area.

The majority of amphibious assault training activity occurs at Red Beach. Other amphibious assault training can take place at Gold, Green, White, and Blue Beaches. These four beaches, though, have environmental and physical limitations that reduce their effectiveness for training and ingress opportunities. Of the five amphibious landing beaches, Red Beach has the least amount of environmental and physical constraints on training activities.

2.4.1.3 Maneuver Corridors

Proficiency with the variety of military weapons and hardware used by Marines stationed at Camp Pendleton is crucial to the readiness of the Marine Corps and the military training mission of the Base. A key to developing weapons proficiency is ready access to the various firing ranges spread across the Base's interior, particularly those firing positions located around the perimeter of the Zulu, Whiskey, and Quebec impact areas located generally in the center of the Base. One of the primary components of accessing interior ranges is the availability of inland transit routes, called maneuver corridors. These maneuver corridors represent key locations where movement of military personnel, equipment, and vehicles is facilitated, or at least relatively unrestricted by either terrain, vegetation, man-made constraints (e.g., buildings and developed areas), and/or environmental regulations (e.g., designated critical habitat, sensitive species, archaeological locations, wetlands, etc.).

2.4.1.4 Training Areas

Camp Pendleton's training areas and open space lands facilitate the intensive training mandated by Marines to acquire a full range of basic and advanced combat readiness skills, weapons proficiency, and tactical leadership skills. The Base's natural areas are unique and irreplaceable to the Marine Corps because they combine over 17 miles (27 kilometers) of coastline and extensive, diverse inland training areas. Camp Pendleton is the only west coast Marine Corps facility where amphibious training operations can be combined with elements of Marine aviation and other supporting combat arms to develop, evaluate, and exercise Marine Corps combat doctrine to the fullest extent feasible. The ability to maintain certification of ready Marine Expeditionary Units (MEUs) on the west coast is made entirely possible by the existence of the sea, land, and air training capabilities provided by Camp Pendleton.

Inland training areas consist of nearly 114,000 acres (46,134 hectares) of live-fire ranges, impact areas, and training areas. Camp Pendleton's 31 training areas and ranges are designed to

facilitate all phases of combat readiness training—from individual basic warrior (small arms) training to larger company/battalion-sized training operations. Even larger live-fire combined arms training evolutions that include the use of artillery and Close Air Support (CAS) are conducted aboard the Base.

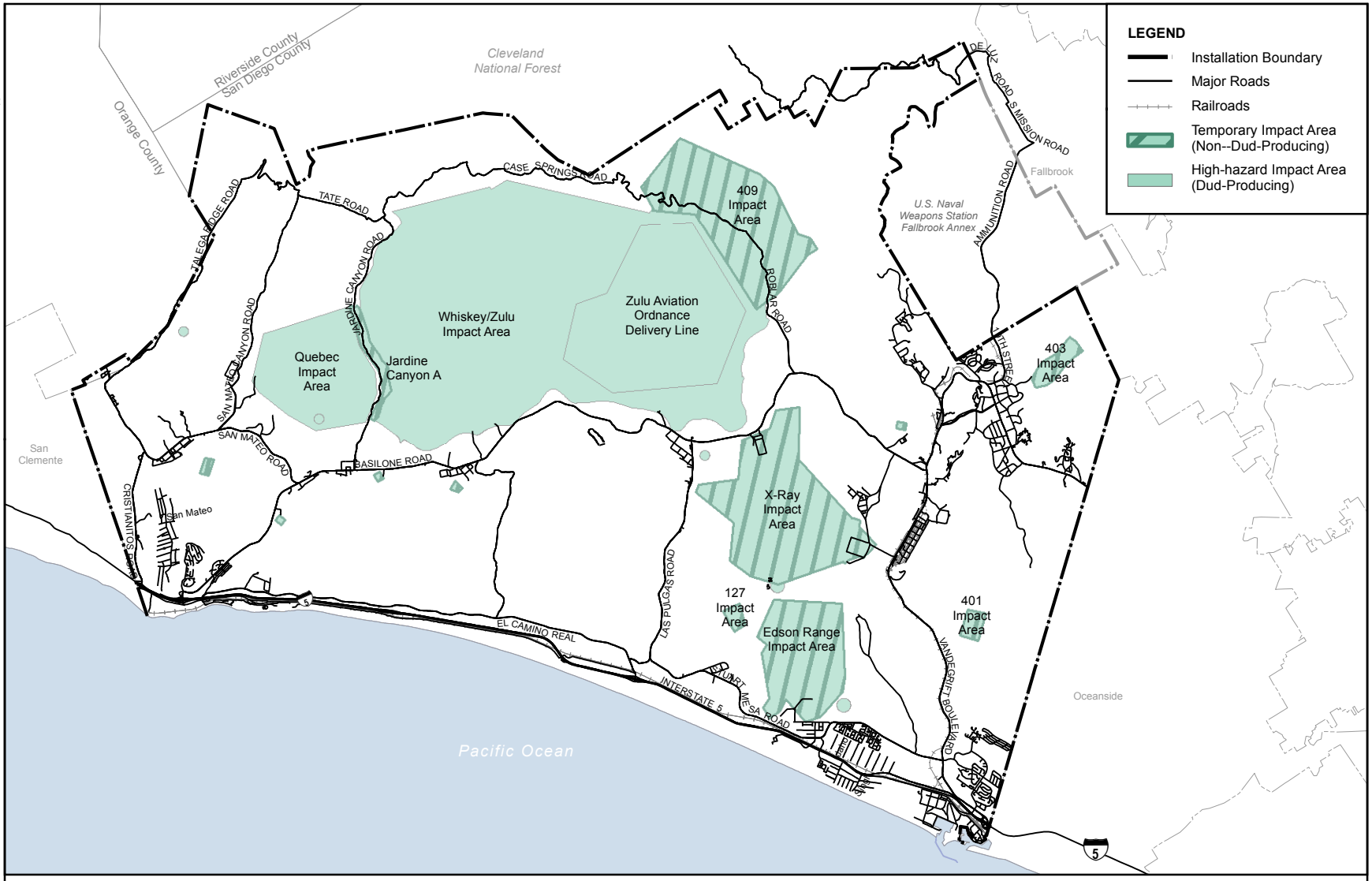
2.4.1.5 Impact Areas

Several locations on Camp Pendleton have been specifically designated for the receipt of live-fire ordnance (projectiles and explosives) and serve as targeting areas for associated live-fire exercises for the various weapons used in training. These locations, designated as impact areas, cover approximately 33,200 acres (13,436 hectares) of Camp Pendleton and can be seen in 2-8. Of this, nearly 4,200 acres (1,700 hectares), including the Range 409 impact area, R-206 and inactive firing Ranges 312A, 313A, and 403, overlap with the training area acreage provided above. Impact areas on Camp Pendleton are classified as either Temporary, Dedicated, or High Hazard Impact Areas (HHIA):

- *Temporary Impact Area* – An impact area within the training complex used for a limited period of time to contain fired, placed, dropped, thrown, or launched military munitions and the resulting fragments, debris, and components. Temporary impact areas are normally used for non-dud-producing military munitions, and should be able to be cleared and returned to other training support following termination of firing. These include the X-Ray, R-409A, Yankee, Jardine Canyon, San Mateo Canyon, Horno Canyon, Piedre de Lumbre Canyon, R800 Maneuver Box, R-109, R127 (Inactive), R-202, R-206, R-207 (Inactive), R-207A (Inactive), R-211, R-211A, R-219, R-300, R-301, R-303, R-401, and R- 403 (Inactive).

- *Dedicated Impact Area* – An impact area that is permanently designated within the training complex and used indefinitely to contain fired, placed, dropped, thrown, or launched military munitions and the resulting fragments, debris, and components. Dedicated impact areas are normally used for nonsensitive military munitions. These include all the Live Fire and Maneuver (LFAMs) areas located in the Training Areas.

- *High-Hazard Impact Area* – An impact area that is permanently designated within the training complex and used to contain sensitive high explosive military munitions and the resulting fragments, debris, and components. High hazard impact areas are normally established as part of dedicated impact areas where access is limited and strictly controlled due to the extreme hazard of dud ordnance (for example, ICM, HEAT, 40-millimeter [mm], and other highly sensitive military munitions). These include the Quebec, Whiskey, and Zulu impact areas.



Source: Marine Corps Base Camp Pendleton

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Scale: 1:190,080; 1 inch = 3 Miles

Figure 2-8
Impact Areas

HHIAs support the delivery of ground-to-ground and air-to-ground ordnance and may contain unexploded (dud) ordnance. Dud-producing impact areas are designated as the Quebec, Whiskey, and Zulu impact areas. These three impact areas contain most of the live-fire ranges on-Base, and are bordered on all sides by safety zones and the remaining maneuver and training ranges.

No maneuver activities are conducted within the Quebec, Whiskey, and Zulu impact areas, with the exception of transit of Jardine Canyon. Access to dud-producing impact areas is tightly controlled for safety reasons. Wildfire in these areas is not normally suppressed due to safety concerns. Firebreaks are used to contain wildfires in dud-producing impact areas.

HHIAs have been in use throughout the Base's existence. As a result, the Quebec, Whiskey, and Zulu impact areas are off-limits to all ground activities and personnel, unless authorized by the Assistant Chief of Staff (AC/S) G-3/5 and preceded by a safety sweep (locate, detonate, and/or remove) by an Explosive Ordnance Disposal (EOD) team. Due to safety concerns over the potential presence of unexploded ordnance (UXO), the collection of biological information from these three impact areas has been extremely limited. Therefore, active management or survey of resources located in these areas is not conducted.

2.4.1.6 Training Support Facilities

Camp Pendleton has numerous training-related facilities to support the diverse sea and land-based training. These facilities range from Combat Towns (CBTs) and rappel towers to designated areas for the use of live fire, explosives, and other potentially hazardous training. Training facilities in support of aviation operations are discussed in Section 2.4.1.7 below.

Live Fire, Explosives, Blanks, Pyrotechnics, Smoke, Chemical Munitions, and Lasers

Live fire is defined to include the use of weapons or weapon systems that produce projectiles (e.g., small arms, artillery, aviation ordnance, and other dud- and non-dud-producing ordnance). For ease of coverage in this document, live fire does not include explosives, pyrotechnics, and other incendiary devices. Training operations that involve the use of live fire are restricted to impact areas (described above), established ranges, Artillery Firing Areas (AFAs), Mortar Positions (MPs), Mortar Firing Areas (MFAs), and LFAM areas (2-9 and 2-10). The Base currently operates nearly 100 established ranges, 53 AFAs, seven MPs, 11 MFAs, and 12 LFAM areas.

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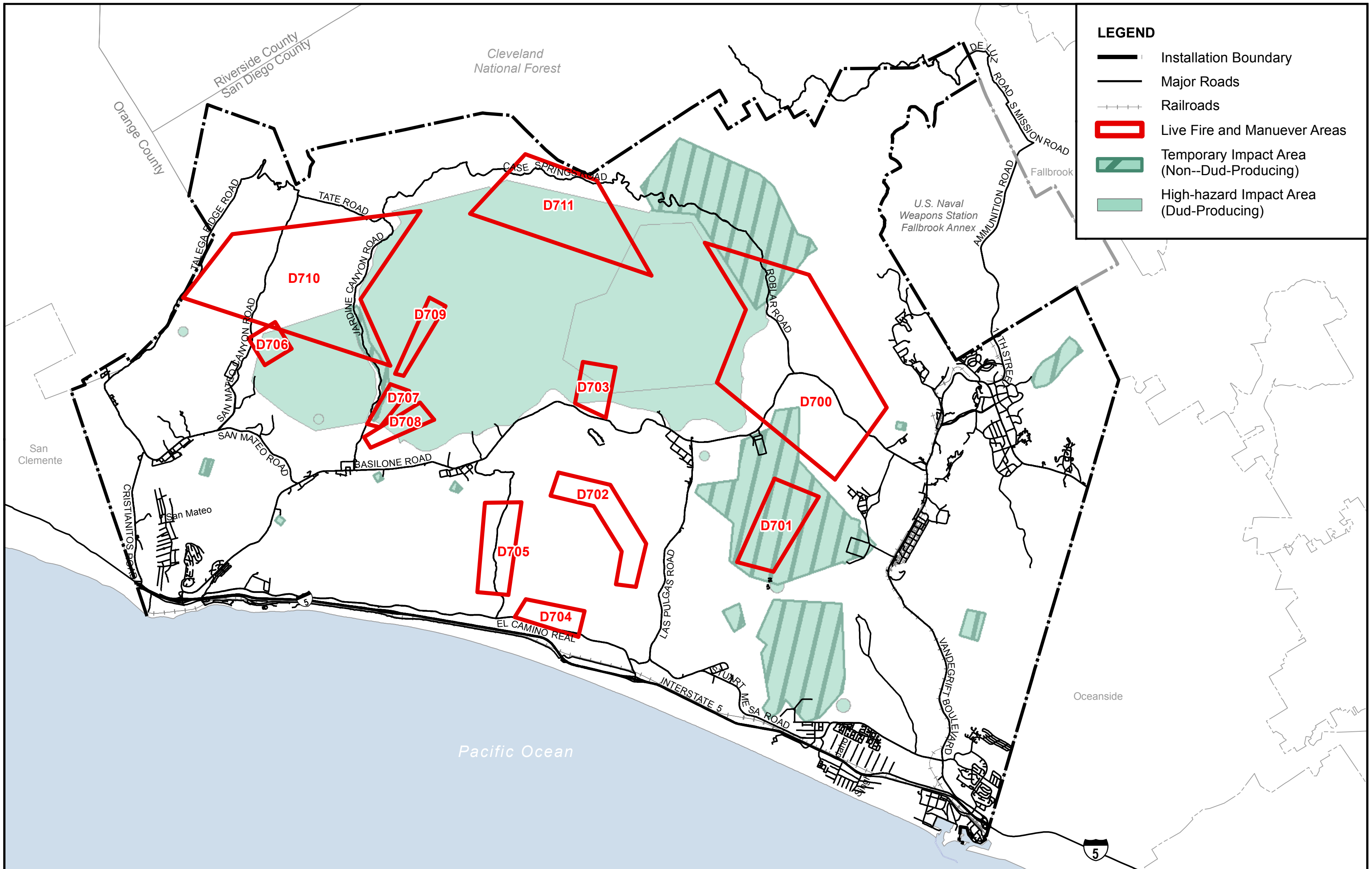

Source: Marine Corps Base Camp Pendleton

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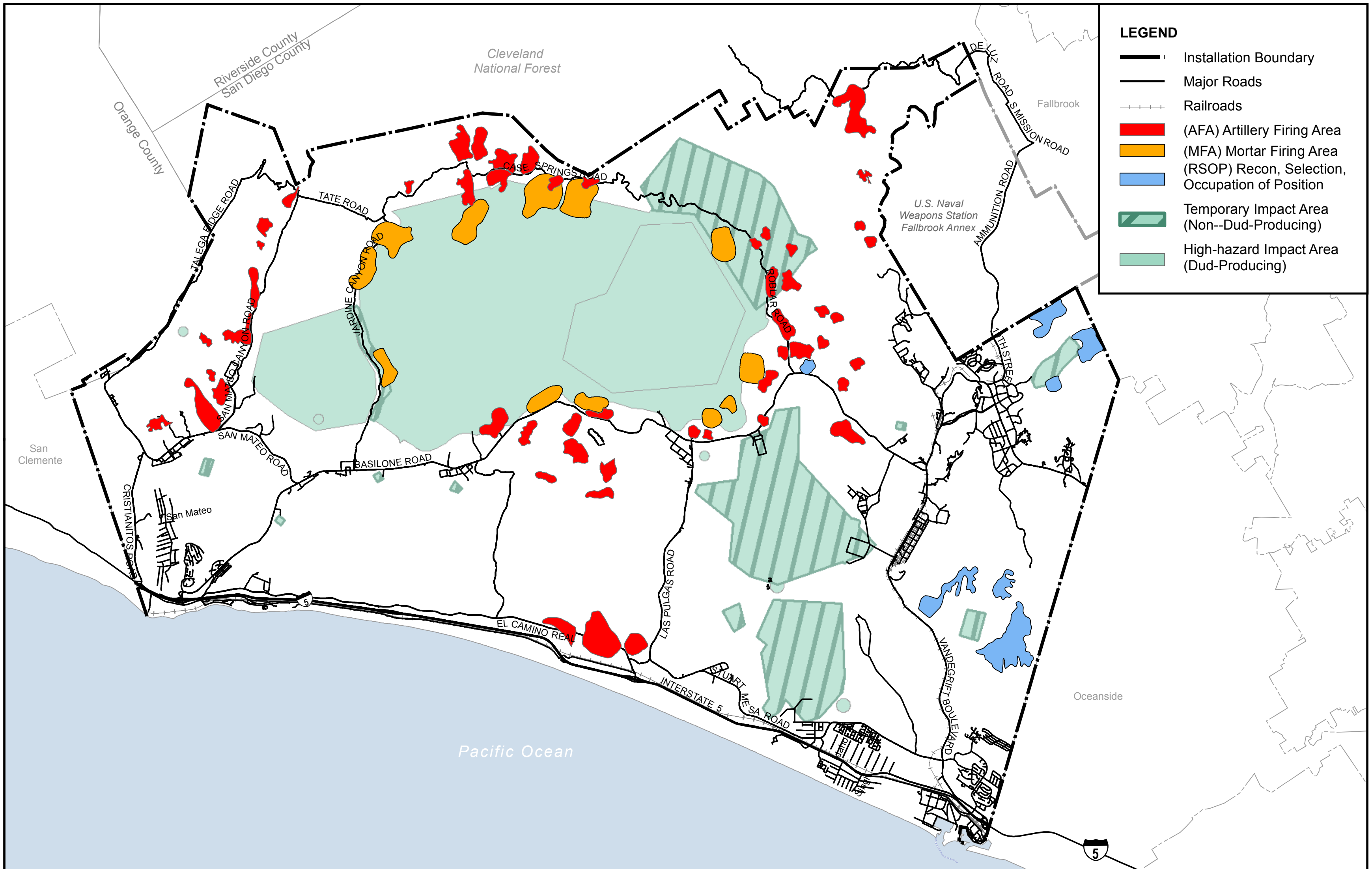
Scale: 1:190,080; 1 inch = 3 Miles

Figure 2-9
Live Fire and Manuever Areas



Source: Marine Corps Base Camp Pendleton

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Scale: 1:190,080; 1 inch = 3 Miles

Figure 2-10
Military Firing Areas and Mortar Firing Areas

A live-fire range is a designated area equipped with a variety of targets and monitoring/scoring devices for live-fire training. These ranges are designed to accommodate a broad spectrum of weapons including pistols, rifles, machine guns, mortars, antitank assault weapons, grenades, missiles, and artillery. Also included are man-portable weapons, vehicle-mounted weapons systems, and rotary and fixed wing aircraft systems. Ranges are designed to simulate combat conditions and scenarios, to train personnel and test the capabilities of weapon systems. As a result, live-fire ranges must be continuously upgraded to keep pace with evolving technology. With few exceptions, the firing ranges are located within and along the perimeter of the impact areas.

AFAs, MPs, and MFAs are designated locations for the firing of inert and explosive artillery and mortar ammunition into the impact areas. AFAs are fairly large and relatively flat areas, usually free of brush and shrubs. MPs are similar but much smaller in area. MFA sites are generally larger than MPs and are used for simulating emergency suppression tactics. Specially designated AFAs are also used in conjunction with live-fire operations by wheeled and tracked assault vehicles. AFA or MP training includes the burning of unused powder and charges, which is conducted in trenches and in accordance with the Range and Training Regulations, equipment technical manuals, and operation manuals. There are six nonfiring AFAs on-Base known as Reconnaissance, Selection, Occupation of Positions (RSOPs) that are used for AFA-types of training without live fire. RSOPs receive training-related impacts (less the firing noise and associated impacts) similar to AFAs. MP and MFA sites are located within and along the periphery of the Quebec, Whiskey, and Zulu impact areas. AFA and RSOP areas are located in training areas throughout the Base.

LFAM activities are field-training exercises that practice the coordination of infantry, vehicle, flight operations, and combat service support operations during various offensive assault and attack scenarios. LFAM operations enable personnel to experience realistic, combat scenario simulations. There are 12 specific locations on-Base designated for LFAM operations:

- LFAM 700 occupies an area that overlaps portions of several training areas, including India, Kilo One, and Kilo Two. This LFAM site has been selected to accommodate battalion-sized or larger units in mobile assault scenarios that integrate infantry, aviation, mechanized, and motorized units with direct, live-fire and supporting arms, live fire.
- LFAM 701 occurs within the X-Ray impact area. This LFAM site has been selected to integrate battalion-sized or larger infantry and mechanized, aviation, and motorized assault units with scenarios that include minefield breaching operations and both direct live-fire and supporting arms live-fire.

- LFAM 702 occupies a small canyon situated in overlapping portions of three training areas: Papa One, Two, and Three. This LFAM has been selected to integrate company- and platoon-sized or smaller infantry assault units with LFAM scenarios that include use of both direct live-fire and supporting arms live-fire.

- LFAM 703 primarily occupies lands within the Zulu impact area and is located northeast of Basilone Road across from the ASP facility, including a portion of AFA#10. This LFAM has been selected to integrate company- and platoon-sized or smaller infantry assault units within LFAM scenarios that include both direct, live fire and supporting arms, live fire.

- LFAM 704 occupies an area that lies exclusively within the Tango training area, overlapping with a portion of AFA#14, east of I-5. This LFAM has been selected to integrate company- and platoon-sized infantry maneuver activities within scenarios that include direct live fire. This LFAM will also integrate mechanized unsupported LFAM attacks.

- LFAM 705 occupies a portion of Horno Canyon that includes parts of several training areas: Papa Two and Romeo One and Two. This LFAM site has been selected to accommodate company- and platoon-sized mobile assault scenarios that integrate both mechanized and motorized units in live-fire, offensive attacks.

- LFAM 706 is primarily situated within a portion of the Quebec impact area but also includes portions of the Bravo One and Yankee training areas. This LFAM site has been selected to support platoon-sized or smaller infantry assault units within a live-fire, ambush scenario.

- LFAM 707 is exclusively situated within the Whiskey impact area, near Jardine Canyon. This LFAM site has been selected to support squad-sized infantry units within an offensive range, live-fire scenario.

- LFAM 708 is primarily situated along a hillside overlooking the south fork of San Onofre Canyon, east of the 52 Area near Jardine Canyon. This LFAM site has been selected to support squad-sized infantry units conducting live-fire assault scenarios.

- LFAM 709 is primarily situated along the drainage within the north fork of San Onofre Canyon, east of Jardine Canyon. This LFAM site has been selected to support aerial assaults on a mechanized enemy column using anti-armor weapons systems.

- LFAM 710A occupies a larger region of the northern part of the Base, overlapping portions of several training areas: Bravo One, Charlie, Yankee, Quebec impact area, and the northernmost reaches of the Whiskey impact area, including Jardine Canyon. This

LFAM site is designated as LFAM Area #4 and has been selected to accommodate company- and platoon-sized units in mobile assault scenarios that integrate infantry units with direct fire and aerial support live fire, including the use of ordnance.

- LFAM 710B is primarily situated adjacent to Echo training area and includes portions of the Whiskey-Zulu impact areas and its adjoining buffer zone. This LFAM site has been selected to support company-sized units in helicopter insertion of heavy weapons and coordinated, live-fire attacks in an offensive scenario.

Except for hand grenade training (the use of which is designated for specific hand grenade-compatible ranges), use of explosives is limited to demolition training and to simulate battlefield conditions. Typical explosive devices involve trinitrotoluene (TNT), C4, shape charges, 1,700-pound line charges, and demolition equipment. Demolition and explosives training involving quarter-pound blocks of TNT and C4 or smaller may be used on all ranges and training areas (or wherever a unit commander believes is safe), so long as usage complies with the fire danger rating and Base Order restrictions. Larger charges are permitted on Ranges 219 and 600, but require proper approvals for use on any other range or training area. Hand grenade training is restricted to Ranges 109, 202, 307, and 503, and specified Military Operations in Urban Terrain (MOUT) settings.

Blanks are nonprojectile firing rounds that may be used with an array of small arms to simulate weapons firing without the safety risks involved with the use of live ammunition. Blanks may be used base-wide in all training areas, so long as usage complies with the fire danger rating and Base Order restrictions.

Pyrotechnics are devices that create smoke and/or light for signaling or illumination (e.g., flares or smoke grenades) or for simulating battlefield conditions. Some devices are designed to produce smoke for targeting or for "self-screening" that is not typically considered pyrotechnics (e.g., white phosphorous, which is used largely for targeting, is not considered a pyrotechnic in the Range and Training Regulations manual). Pyrotechnics and smoke-producing devices are permitted in training areas throughout the Base, so long as usage complies with the fire danger rating and Base Order restrictions.

Chemical munitions used during infantry training refer, almost exclusively, to nontoxic tear gas (2-Chlorobenzalmalononitrile), which is used in designated nuclear, biological, and chemical (NBC) chambers, in CBTs, the MOUT, and throughout training areas, in general.

Camp Pendleton has been certified for the use of a variety of man-portable, vehicle-mounted, and airborne laser-targeting systems generally employed in target designation in ranges and

impact areas. Laser systems may be operated only from observation posts and live-fire ranges as specified in the Range and Training Regulations.

Combat Towns, Training and Improvise Explosive Device (IED) Facilities

The Base has a variety of enhanced areas for the training of DoD personnel. The 25 Area, 52 Area, Bravo Three, De Luz, and the Piedre De Lumbre Industrial Combat towns provide rudimentary facilities for initial MOUT training. The Kilo-2 Area training facility and the Infantry Immersion Trainer (IIT) facility in the Sierra training area provide enhanced MOUT training utilizing role players, training simulators, and video instrumentation for after action review. For backyard training facilities in support of remote units, there are the San Mateo and Horno Regimental Urban Facilities (RUF). In support of ongoing training for MEUs, there are the Special Operations Training Group (SOTG) Romero 2 and Bravo 2 Hit Sites that provide a facility to train for "in extremis" extractions or raids.

In the Bravo One training area, there is the Joint Improvised Explosive Device Defeat Organization (JIEDDO) facility, which provides training to DoD personnel in the techniques and tactics in locating, identifying, and disposing of IEDs through a myriad of scenarios.

All the above training may use blanks, Simunitions™, pyrotechnics, and breaching charges.

Obstacle Courses, Rappelling Towers and Gas Chambers

Individual skill set training is provided at 19 obstacle courses, five rappel towers, and four gas chambers.

2.4.1.7 Airspace and Aviation Operations

Camp Pendleton's Special Use Airspace consists of four Restricted Areas established to support military training and ground-weapons firing per agreement with the Federal Aviation Administration (FAA). Restricted Areas R-2503 A and R-2503 B are used on a regular basis and are approved for military use from 0600 to 2359, 7 days a week, year-round, and other times by Notice to Airmen (NOTAM); R-2503 C and D are available for special operations only.

Special Use Airspace over Camp Pendleton has been established by the FAA to segregate hazardous military air operations and ground-firing activities from nonparticipating civil aviation operations (2-11). Restricted Area R-2503 A overlies the Base's coastal area from the surface to 2,000 feet (610 meters) above mean sea level (MSL) (out to 1 nautical mile offshore);

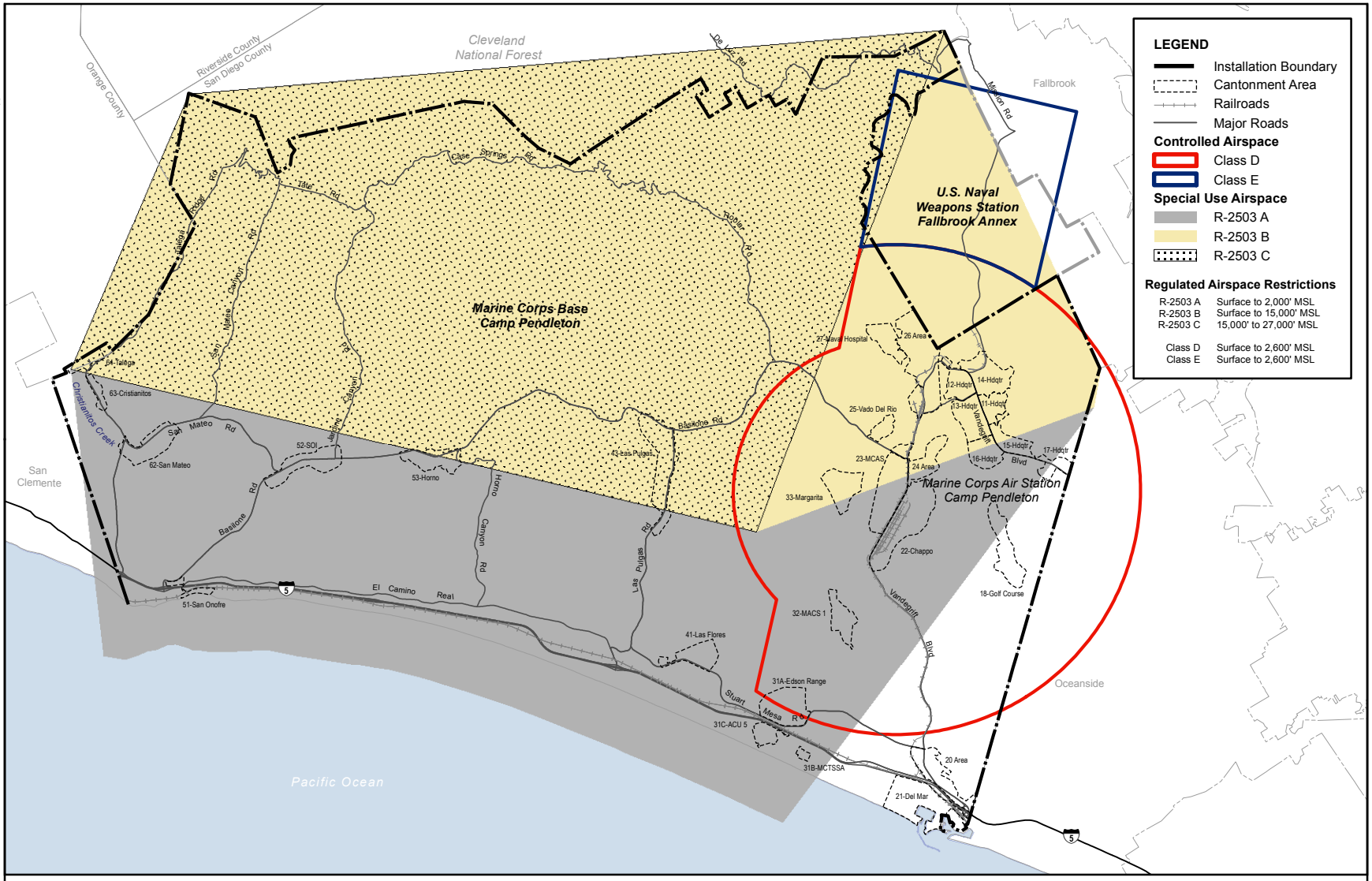


Figure 2-11
Regulated Airspace

while R-2503 B overlies most of the Base's landmass, including all of its inland training ranges up to 15,000 feet (4,572 meters) above MSL. The lateral boundaries of R-2503 C and D are consistent with R-2503 A and B, and are available up to 11,000 and 27,000 feet (3,353 meters and 8,230 meters) (Flight Level 270), respectively. The R-2503C is available 40 hours each year. Use of the R-2503D is limited to 20 days per year between the hours of 0600 to 2359 hours local time, and no more than 90 days per year between 0001 and 0559 local time. Both R-2503C and R-2503D are activated via NOTAM. The restricted area is available for joint-use and is scheduled for training operations on an as-needed basis subject to the maximum use limits. Adding to the situation, the commercial airway (V-23) located over the Camp Pendleton coastline is considered the busiest in southern California. At peak periods, a commercial aircraft operates in this airspace every 2 minutes, as well. The close location of intensively used commercial airspace with Camp Pendleton's Special Use airspace requires constant vigilance and visibility to maintain the mandated airspace training and operational requirements. Many unauthorized intrusions from private civilian aircraft into Camp Pendleton's airspace occur annually.

MCAS CamPen, with seven aircraft squadrons, 180 aircraft, and over 81,000 flight operations annually on a single runway, is the busiest helicopter airstrip in the Marine Corps (at peak periods, a military aircraft, usually a helicopter, takes off or lands at MCAS CamPen every 3 minutes).

Nearly 4,000 personnel and 180 rotorcraft are stationed at MCAS CamPen. Aircraft participating in flight operations include the Huey (UH-1), Cobra (AH-1), and two MV-22 tilt-rotor aircraft (Osprey) squadrons. Additionally, MV-22 aircraft and helicopters from MCAS Miramar routinely operate within the same training areas, ranges, and cantonments currently (and historically) used by all other rotary wing aircraft on Camp Pendleton. On a less frequent basis, aircraft from local Navy installations and ships, Coast Guard stations, Air Force Bases, and Army facilities utilize the aviation training facilities located throughout the Base.

Helicopter flight operations are typically conducted at 200 to 700 feet (61 to 213 meters) above ground level (AGL), depending upon the training scenario and the number of aircraft involved. Terrain Flight (TERF) routes afford aircraft low-altitude (50 to 200 feet [15 to 61 meters] AGL) navigation training. Aviation live-fire training events are restricted to the designated impact areas. Aviation operations occur year-round at the Base's various aviation facilities.

Aircraft operations include ordnance delivery (e.g., rockets, gunnery), air-launched antiarmor missile training, night vision goggle training, parachute drops of supplies and personnel, vertical replenishment (VERTREP) from ship-to-shore, external load training, door gunner training, Low Altitude Anti-aircraft Defense (LAAD) training, and TERF route operations. Take-offs and

landings are conducted from established landing zones (LZs), Confined Area Landing (CAL) sites, Vertical/Short Takeoff and Landing (V/STOL) pads, the Helicopter Outlying Landing Field (HOLF), and simulated amphibious assault ship flight deck pads.

At present, no fixed wing aircraft are permanently stationed at MCAS CamPen. However, fixed wing aircraft from MCAS Miramar and Yuma use the Zulu impact area and V/STOL landing areas located across the Base. Fixed wing aircraft participating in flight operations on-Base include the Harrier (AV-8), Hornet (F/A-18), Orion (P-3), Hercules (C-130), and Globe Master III (C-17), as well as numerous Unmanned Aerial Systems.

Flight operations involving fixed wing aircraft include CAS, command and control, air reconnaissance, transport of troops and equipment, parachute operations for the deployment of personnel and equipment, vertical and short take-off and landings, and LAAD training. Fixed wing aircraft, with the exception of AV-8Bs, confine their takeoff and landing operations to the air station. AV-8Bs can perform takeoffs and landings at the V/STOL pad located south of Red Beach, the simulated amphibious assault ship flight deck pad in the Tango Area, the V/STOL-2 pad in the Oscar Two Area, and the designated Road Operations Area on old Highway 101 east of I-5 in the Tango Area. Parachute operations occur within designated Drop Zones. Fighter and attack aircraft conduct CAS activities with live and inert ordnance in the Zulu impact area located in the center of the Base.

2.4.1.8 Base Infrastructure and Mission Support

A wide range of support activities and facilities sustain Camp Pendleton's military training mission. Similar to local municipalities, the Base provides Marines, Sailors, and their families with support facilities and services, including housing, water and sewage service, recycling, solid waste disposal, medical and dental services, schools, child care, employment assistance, and recreational opportunities. Providing these support functions in close proximity to housing areas and where Marines live and train is an important factor in maintaining quality of life for Marines and their dependents.

The Base is home to as many as 47,000 residents: 23,000 single service members, and 24,000 married service members and their family members. In addition, almost 10,000 civilian workers (e.g., DoD, California State Parks personnel, utilities personnel, contractors) transition on- and off-Base each day. Camp Pendleton currently has more than 2,800 buildings and structures, 530 miles (853 kilometers) of roads, and nearly 1,000 miles (1,609 kilometers) of utility lines base-wide. The current value of Base land and physical assets is over $5.3 billion, not including military equipment and material. These assets are located on approximately 10,000 acres (4,047 hectares) scattered across the Base in pockets of development. Much of the infrastructure

development of Camp Pendleton, over its 70-plus year history, has occurred on lands previously disturbed by cattle ranching and farming activities that covered approximately 82,500 acres (33,387 hectares) of the former Rancho Santa Margarita y Las Flores property.

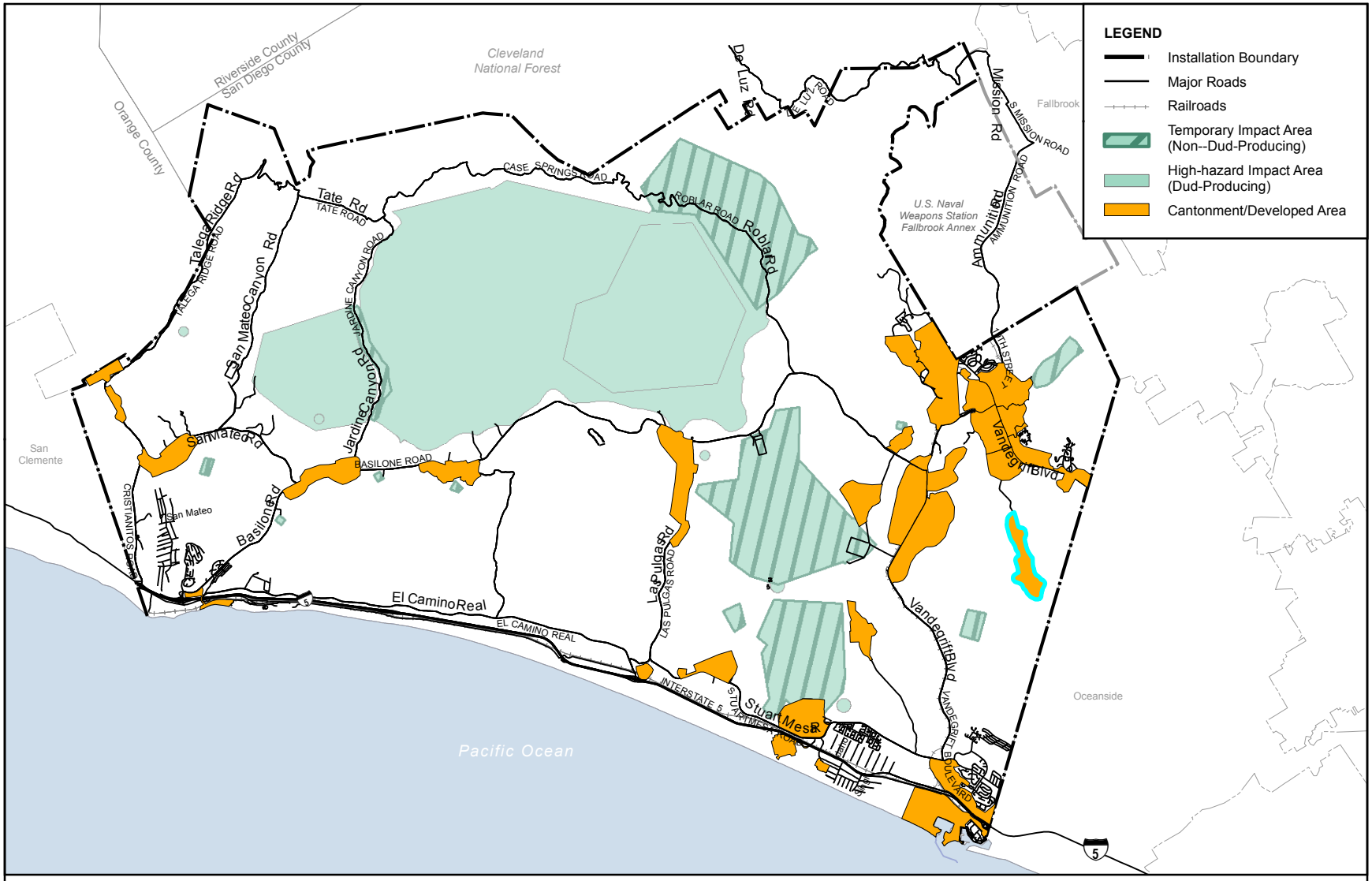
At Camp Pendleton, current and previous Base commanders have restricted infrastructure development to approximately 10 percent of the Base. When additional facilities have been required, the Base's preferred approach has been to refurbish or replace outdated facilities, or to build within existing developed areas.

Developed Areas

As of October 2011, developed areas (cantonment and housing areas) on-Base, not including roads, total approximately 9,400 acres (3,804 hectares). Cantonment areas are portions of the Base (2-12) that generally contain infrastructure development, including more than 2,800 buildings and other permanent structures. Some portions of designated cantonment areas on Base maps contain open space and may be used for training, recreation, etc. Likewise, designated training areas may contain some buildings and infrastructure development. Acreage designated as developed areas includes a cultural resource area (*Estancia de las Flores and Las Flores Adobe*) and the Marine Memorial Golf Course, adding 50 acres (20 hectares) and 331 acres (134 hectares), respectively, to the total.

Seven separate cantonment areas for infantry and artillery regiments and schools are located along Basilone and San Mateo Roads, namely San Mateo, San Onofre, Horno, Las Pulgas, Margarita, Vado Del Rio, and Talega. Two cantonment areas, Las Flores and Edson Range, are located on the coastal plain east of I-5 and three other cantonment areas (Del Mar, MCTSSA, and Assault Craft Unit 5) are located on the coastal plain west of I-5.

The largest concentration of development is in the southwestern corner of the Base. Just east of I-5 at the Oceanside gate, 12 family housing areas and major community support facilities exist, and include a new Naval Hospital and a Marine Corps Exchange facility. The second largest concentration of development occurs in the southeastern corner of the Base, close to the Fallbrook and San Luis Rey gates, where five family housing areas and major community support facilities exist that include the Naval Hospital (built in 1974), the Chappo industrial area, and MCAS CamPen. The Del Mar Boat Basin and an additional family housing area lie to the west of I-5, in the southern portion of the Base. The largest family housing community, Stuart Mesa, consisting of 1,670 homes, is located south of Edson Range, adjacent to the former agricultural field; up to an additional 775 homes are planned for future development in this housing community. San Mateo Point and San Onofre family housing areas and a shopping



Source: Marine Corps Base Camp Pendleton

3 0 3 Miles

Scale: 1:190,080; 1 inch = 3 Miles

Figure 2-12
Cantonment and Developed Areas

center are located near the San Onofre gate at the northwestern corner of the Base. Currently, the Base maintains a total of 7,538 standard family residential units, as well as eight General Officer Quarters and one Installation Commander Quarters. The projected housing end state for the Base could reach a total of 8,302 family homes.

Recreation Areas

The Base recreation program provides a variety of recreational opportunities for Base patrons and the public. Chapter 4 identifies the recreational activities on-Base and details the extent of public access allowed for the purpose of fish and wildlife-oriented recreation/education. Many recreational activities occur in cantonment areas (e.g., fitness centers, bowling, and cinemas), on roads or trails (e.g., jogging and bicycling), or training areas (e.g., hunting and camping). Few areas on-Base are appropriated for recreational use only. However, the Stepp Stables, the Championship Paintball Park, and the Marine Memorial Golf Course are dedicated solely for those purposes. Although the primary purpose of Lake O'Neill is as an aquifer recharge, the lake also provides recreational opportunities for fishing, camping, and boating. Even the land leased to California State Parks is not solely devoted to recreational usage because it also is available for training operations, with prior coordination.

Roads, Firebreaks, and Fuel Treatment Zones

Primary and secondary roads, parking lots, and culverts are widely distributed across the Base. Primary roads consist of paved and improved roads, while secondary roads are dirt roads with decomposed granite, gravel, or shale as a surface covering. Of the more than 530 miles (852 kilometers) of roadways that exist on-Base, approximately 103 secondary roads exist. In addition, the Base has established an extensive current network of firebreaks and fuel thinning zones, totaling over approximately 180 linear miles (290 kilometers). A firebreak is a barrier consisting of bladed or disked bare earth used to segregate, stop, and control the spread of fire or provide a control-line from which to work. A fuelbreak is a natural or constructed barrier that includes mowed or modified vegetation and is used to segregate, slow, and control the spread of fire.

Borrow Sites, Landfills, and Wood Yard

There are no active borrow sites on Camp Pendleton. Borrow sites were used in the past at various times for excavation of fill material or construction projects and maintenance actions, such as the extraction of shale material for use in resurfacing and repairing secondary roadways and unpaved parking lots.

Camp Pendleton operates and maintains two active Class 3 landfills, Las Pulgas and San Onofre, for the acceptance, disposal, and daily capping of nonhazardous, solid waste generated on-Base. A third landfill site, the Box Canyon, was closed in February 2003. The closure included the installation of a 6-foot-thick (1.8-meter-thick) evapotranspiration cap. After the closure activities were completed, land use restrictions and long-term post-closure monitoring and maintenance were put in place to ensure that the final closure cap performs as designed.

The Base maintains a "wood yard" as a central staging area for woody debris (e.g., tree stumps, logs, and limbs), not to include leaf matter, green waste, or lumber/scrap wood. The woody debris within the wood yard, generated from tree trimming, maintenance, and construction projects, provides a source of firewood for military personnel and avoids needless land-filling of this material.

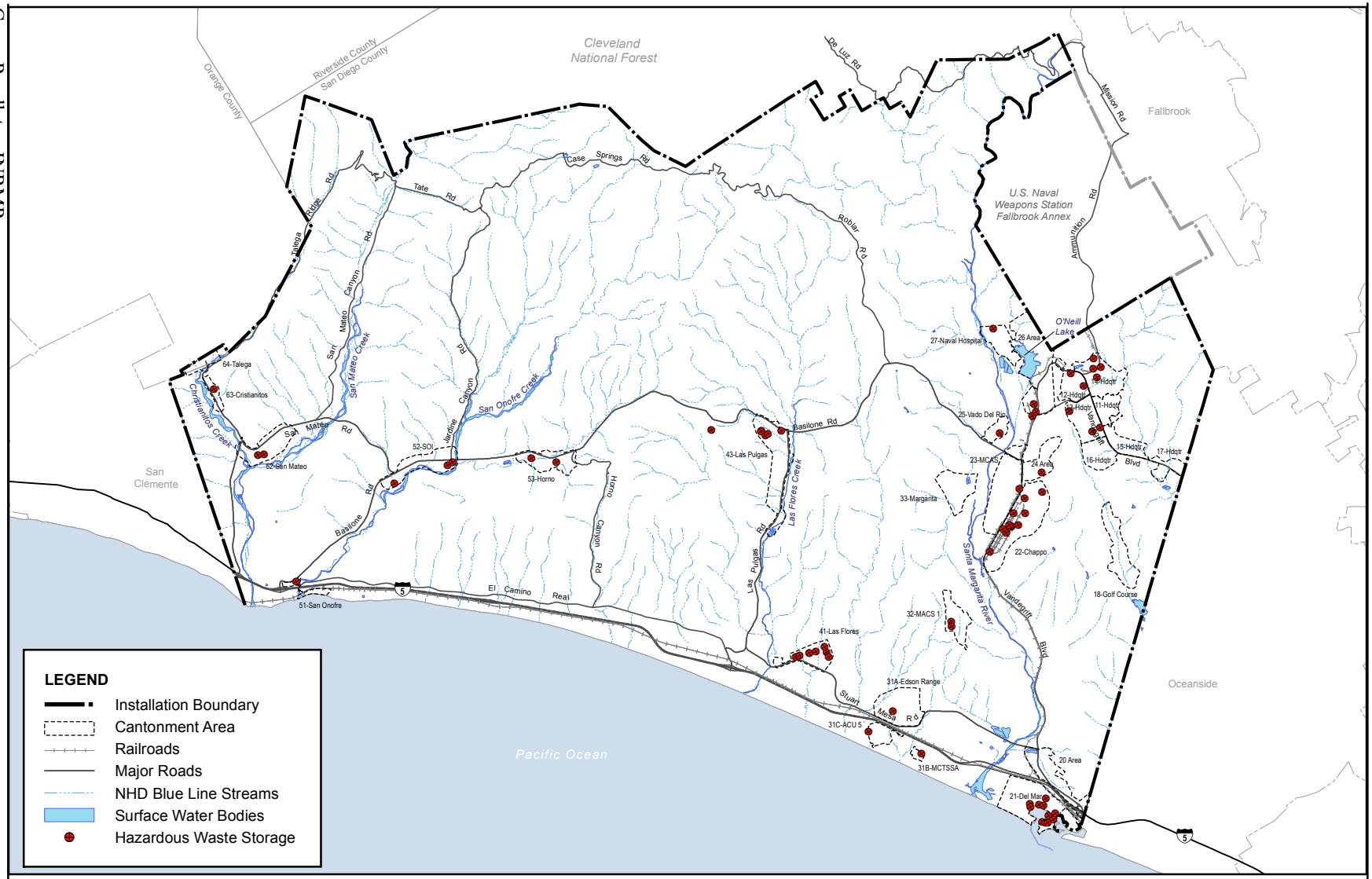
2.4.1.9 Hazardous Waste Sites

Camp Pendleton has a comprehensive hazardous waste (HW) management program consisting of 74 active HW management sites. (2-13). Each of the 74 sites requires and maintains a County of San Diego Health Permit obtained through MCI West Environmental Security, Hazardous Waste Section. According to state and federal regulations, accumulated HW may be stored for no longer than 90 days. However, the Base's HW management program is more stringent and requires that HW is removed for off-Base disposal at properly permitted receiving facilities within 60 days. This ensures that HW does not stay on-site longer than regulations permit and affords flexibility for unforeseen events such as inclement weather or deployed Marines. Inclusive of the 74 HW sites, 15 sites are co-located at medical/dental facilities that generate medical and/or dental waste. The Air Station has one 60-day site and satellite sites at each squadron site.

Installation Restoration Program

The Installation Restoration (IR) Program at the Base includes 80 sites grouped into five Operable Units based on similarities, such as types of environmental issues, selected cleanup methods, and/or physical location. To date, 64 of these sites have been cleaned up and/or closed. There are currently 16 active sites in the Base's IR Program, all in different phases of the cleanup process.

Contamination at the Base primarily resulted from past practices, relating to maintenance and repair of trucks, tanks, and aircraft that generated vehicular fluids and solvents, many of which are now out of date due to the development of environmental regulatory guidelines. Base support operations, such as pest control and dry cleaning, have also generated contamination.



Source: Marine Corps Base Camp Pendleton

3 0 3 Miles

Scale: 1:190,080; 1 inch = 3 Miles

Figure 2-13
Hazardous Waste

2.4.1.10 Real Estate Agreements and Leases

A number of long-term leases and easements have become part of the land use on the Base. Base real estate agreements (e.g., leases, easements, assignments) cover approximately 4,571 acres (1,850 hectares) of the Base. These agreements include easements for public utilities and transit corridors, leases to public educational and retail agencies, and State Beach leases. Leaseholder agreements require that each leaseholder comply with any and all applicable federal and state regulatory laws. Some of the real estate agreement acreage is also available to training (e.g., utility corridors and State Beach land).

Future requests for nonmilitary projects and leases on Camp Pendleton will be evaluated, with regard to potential impacts to the Base. Not only will proponents need to identify impacts from construction, they will also identify long-term and daily impacts to the Base. Lease reviews will envision Base interests 100 years from now and be implemented by requiring proponents to meet the following conditions:

- Proposal cannot adversely affect training.
- Proposal cannot degrade Camp Pendleton quality of life.
- Proposals must be environmentally nondegrading.
- Proposal must ensure safety of operating forces.
- Construction must be consistent with Base architecture.

Lessees are required to manage the natural resources on the lands leased for their use, consistent with the philosophies and supportive of the objectives of the Camp Pendleton INRMP and ICRMP (ASM 2017). Each lessee that manages and/or controls use of lands leased from Camp Pendleton is required to generate and submit a natural resources management plan for approval by the Base within 1 year of establishment of their lease or upon renewal. Lessees are also required to identify any activity that may affect federally regulated resources (listed species, wetlands, waters of the U.S., etc.) and provide information and mitigation that may be required to support consultation with the applicable regulatory agency.

Agriculture

No agricultural production leases, including row crop production, remain in effect on-Base. Each former agricultural lease specified soil and water conservation practices required to protect and improve land productivity and fertility, a schedule for application of the required practices, and provisions for restoration of the land upon termination of the lease. Approximately 6,000 acres (2,428 hectares) total of row crop parcels was leased for farming in the 1940s and 1950s. Even larger areas, as many as 10,000 acres (4,047 hectares), were farmed before the military purchased the property. The Base has reclaimed all historically farmed acreage over time to

support military training requirements. The last remaining lease for row crop production, totaling approximately 300 acres (121 hectares) located in the Stuart Mesa area on the west side of I-5, was terminated in 2010.

Special Use Permit

Special use permits have been let for the commercial harvest of native seeds on-Base since 1988. As part of the Special Use Permit, the collector pays an annual fee for a license to harvest native seed on-Base. The collector submits a proposed harvesting plan by the first of the year to Naval Facilities Engineering Command (NAVFAC) and LMS. LMS receives native seed bank credit for 15 percent of the clean seed value per species harvested on-Base annually (approximately $50,000 in credit per year). Camp Pendleton uses the seeds for native vegetation restoration, and erosion control projects. The use of seeds grown on-Base helps ensure a genetic stock that is adapted to the environmental conditions of the area, and reduces expenses on site restoration.

The harvest must rotate areas from which a species is collected from year to year; no species shall be harvested in the same location for more than 1 consecutive year. All seed harvesting is done by hand and/or with hand-carried vacuum-type devices. No mechanical harvesting or injury of plants is allowed.

Public Recreation – San Onofre State Beach

The largest single leaseholder on-Base is the State of California Department of Parks and Recreation, which accounts for approximately 2,000 acres (81 hectares), leased from DoN on 1 September 1971 (amended 1 May 2006) for a 50-year term ending 2021. The San Onofre State Beach includes (1) 3.5 miles 5.6 kilometers) of sandy beaches with six access trails cut into the bluff above; (2) a beachfront campground along Old Highway 101 adjacent to the sandstone bluffs; (3) Trestles and San Onofre surf beaches; and (4) San Mateo campground. The San Mateo campground lies inland within the San Mateo drainage, adjacent to and along the north side of the creek. State Parks-leased areas are used for public recreation. However, with advanced coordination, military training is permissible within the park.

Lease agreements require that California State Parks comply with any and all applicable federal and state regulatory laws. The State of California Department of Parks and Recreation has established general management guidelines for their leased lands. These guidelines exist as policy statements within the general plans for each facility operated by the State Parks system. These statewide policy statements provide necessary guidance for all staff and visitors for the operation, maintenance, and use of San Onofre State Beach campgrounds, hiking/biking trails, and beaches to ensure protection of natural resources within State Parks leased lands.

Maintenance operations in the parks include maintaining the existing camping and recreational facilities, landscape maintenance, and erosion control. In addition, California State Parks is required to conduct its natural resources management consistent with the philosophies and supportive of the objectives of this INRMP. Ongoing coordination and cooperative projects between the Base and San Onofre State Beach are conducted in line with the Base's ecosystem approach. State Parks and LMS coordinated in the development of a San Onofre Vernal Pool Management Plan to restore and conserve vernal pools and endangered fairy shrimp (Rick Riefner and Associates 2011).

San Diego Gas & Electric Company (Sempra Energy)

SDG&E, through its parent company Sempra Energy, holds more than 1,300 acres (526 hectares) of leases/right-of-way agreements with the Base for transmission lines and various associated support facilities.

San Onofre Nuclear Generating Station (SONGS)

The SONGS was authorized on Camp Pendleton in July 1963, when Congress passed Public Law 88-82 directing the U.S. Secretary of the Navy (SECNAV) to grant Southern California Edison and SDG&E an easement for the purpose of constructing and operating a nuclear power facility. The SONGS station consists of the plant site and mesa. SONGS West consists of SONGS, Units 1, 2, & 3 and common facilities. SONGS Mesa is located in the area south of San Onofre Creek, east of SONGS and east of I-5, and is used as a support area for SONGS West.

Unit 1, the first reactor, was completed in 1964 and operated until 1992. Over the years, the SONGS facility was expanded to include two more reactors (Units 2 and 3) and more land. Despite upgrades, Units 2 and 3 reactors had to be shut down in January 2012 and were permanently ceased on 7 June 2013, via a Certification of Permanent Cessation of Power Operations that begins the process for the overall decommissioning of SONGS. SONGS has prepared a shutdown plan that includes transferring and storing all spent fuel into dry cask storage on-site until the federal government puts in place a program to dispose of the materials. SONGS real estate rights on Camp Pendleton are vested in nine DoN-issued easements and two leases totaling 438 acres (177 hectares). Upon decommissioning, Camp Pendleton will take over SONGS Mesa.

Interstate 5

An easement of approximately 726 acres (294 hectares) has been granted by DoN to state and federal agencies for operating facilities on Camp Pendleton. It is used for the construction,

operation, and maintenance of I-5, along with additional easements for operation of two Interstate rest stop areas, a viewpoint, two California Highway Patrol truck weigh stations, and a U.S. Customs and Border Protection checkpoint facility. All of these easements have been granted in perpetuity.

The I-5 freeway stretches along Camp Pendleton's coastal area and is located adjacent to coastal bluffs and undeveloped beach areas. Currently, 11 separate underpasses (ingress/egress points) are located along the 17-mile (27-kilometer) Camp Pendleton portion of I-5 that are available for the transition of military personnel, vehicles, and equipment from the beachside of I-5 to inland training areas. These narrow underpasses were created during the initial I-5 construction through Camp Pendleton in the mid-1960s, and they currently do not reasonably accommodate today's inventory of USMC tracked and wheeled vehicles.

North County Transit District Rail Line and Maintenance Yard

North San Diego County Transit Development Board owns and operates a commuter rail train system between the City of Oceanside (Oceanside Transit Center) and the City of San Diego (Santa Fe Depot). This North County Transit District (NCTD) commuter rail system is also known as the Coaster. NCTD owns and maintains the rail line that runs between the San Diego/Orange County boundary line and the City of San Diego, including approximately 18 miles (30 kilometers) of rail line traversing Camp Pendleton. The Base rail line segment parallels I-5 along the coastal area of Camp Pendleton. NCTD's railroad corridor through Camp Pendleton is contained within a 100-foot (30.48-meter) right-of-way easement, granted to NCTD in perpetuity by DoN. It was initially constructed in the late 1880s, as the very first rail line connection between these two large metropolitan areas. Over the course of its 100-plus years of existence on land that is now Camp Pendleton, the alignment of the rail line has been adjusted on several different occasions. Generally speaking, however, this rail line has continued to remain a landmark and permanent fixture along the entire coastal portion of Camp Pendleton.

As owner of the rail line between the City of San Diego and the Orange County border, NCTD also coordinates and approves use of this rail line by other train operators including the Metrolink commuter rail trains that serve Orange and Los Angeles Counties, Amtrak trains, and Burlington-Northern Santa Fe (BNSF) freight trains. Currently, approximately 54 trains per day pass through Camp Pendleton on this track.

In support of their commuter rail operations, NCTD maintains and operates a 24-hour Commuter Rail Maintenance Facility located on Camp Pendleton. This Commuter Rail Maintenance Facility, located within the Stuart Mesa area of Camp Pendleton, is situated adjacent to NCTD's railroad right-of-way through the Base. Its presence has been authorized by a second and

separate easement in perpetuity, granted by DoN to NCTD in 1994. This NCTD easement also supports the operation of a BNSF railroad switching yard located adjacent to the Maintenance Facility. The easement for the NCTD Commuter Rail Maintenance Facility and BNSF switching yard operations totals approximately 20 acres (8 hectares).

2.4.2 MCAS CamPen

2.4.2.1 Military Training and Mission Support

MCAS CamPen's focus is to provide superior aviation ground support to MAG-39's squadrons and transient units and aircraft. To do this, the Air Station ensures that its personnel are trained to provide this service and are ready to deploy in support of contingency operations, if required. Its facilities and equipment to support its customers must be well maintained, updated, and, in some cases, built, to support and protect the preponderance of aircraft using MCAS CamPen. Current operations include the following:

- Ten squadrons and over 180 rotorcraft are currently based at MCAS CamPen.
- Nearly 150,000 flight operations from a single runway and an adjacent grass strip were made during the last 12 months.
- Ninety percent of total operations are related to the Air Station's tenants.
- Helicopters based at the Air Station include UH-1Y and AH-1W, and AH-1Z.
- Partial Basing (2-Squadrons) of MV-22 Aircraft supports 3rd MAW and IMEF tactical training, readiness, and special operations exercises.

Safety and environmental consciousness is intricately intertwined with all aviation ground support operations and becomes a part of every Air Station Marine and Civilian Marine's personal daily routine. Similarly, education, training, and the tight integration between the organization, family, and community are essential aspects of the Air Station's life and mission. With the safety of its pilots of paramount concern, the Air Station is pursuing full compliance of its Clear Zone with the DoD and DoN Airfield Safety and Planning Criteria related to obstructions to flight as outlined in the Airfield and Heliport Planning Criteria, 12 May 1981, and Facility Planning Factor Criteria for Navy and Marine Corps Shore Installations Airfield Safety Clearances, January 1982. If full compliance is not feasible, the Air Station will obtain a permanent waiver. See Section 2.4.1.7 for other details about the airspace and aviation operations aboard MCAS CamPen.

The Bird and Aircraft Strike Hazard (BASH) Prevention Program (Station Order 5100.7) was created aboard MCAS CamPen to ensure an integrated bird control and hazard abatement policy. It was designed to minimize aircraft exposure to potentially hazardous bird and animal strikes. The BASH Program is governed by the Bird and Animal Hazard Working Group (BAHWG) and is chaired by the MCAS CamPen Director of Safety and Standardization with the Environmental Department playing a critical role in the BAHWG. The Environmental Department has many tasks under the BASH Program but is responsible for maintaining an active bird hazard awareness program by identifying, collecting, and storing the remains of bird strikes and maintaining the Federal Fish and Wildlife Depredation Permit. Station Order 5100.7 for the BASH Prevention Program, the Air Station's Depredation Permits, and related documents are included in Appendix D.

MCAS CamPen is a specialized airport with active flight operations and little land that is not already built up. Some of the recreation and other programs integral to the Sikes Act (as well as for MCO P5090.2A CH 3) do not directly relate to the Air Station. The Air Station's land is not made available for uses such as recreation or hunting. Recreational access at any time (for either military or civilian personnel) would be inappropriate for reasons of security and would not be consistent with the safety of the public or Air Station personnel. Access for hunters would be inappropriate for the same reasons plus the lack of species to hunt and the undesirability of allowing hunting on an airport. Consequently, the Air Station does not offer any recreational access to the public or civilians, or to Marines.

2.4.2.2 Hazardous Waste Sites

Installation Restoration Program

MCAS CamPen currently has no IR sites. In the past, sites aboard the Air Station where hazardous materials disposal or discharge may have resulted in contamination were identified under the Installation Restoration Program, which addressed the identification, research, and cleanup of contaminated IR sites. Air Station natural resources staff participated, as appropriate, in the IR process to identify potential impacts to natural resources caused by the release of contaminants; communicate natural resource issues; review and comment on documents; and ensure that response actions, to the maximum extent practicable, were undertaken in a manner consistent with the goals and objectives set forth in this INRMP. In addition, natural resources staff reviewed IR maps and documents and coordinated with IR personnel to ensure that potential impacts from environmental contaminants were fully considered when planning and implementing natural resource conservation measures on the Air Station.

All of the following four previously identified/designated contaminated sites on MCAS CamPen have now been restored. This section serves to document their restoration and the need for no further action under the IR Program.

Drainage Ditch

This site consists of a drainage ditch (5-foot-deep by 20-foot-wide [2-meter-deep by 6-meter-wide]) located between the Air Station flight-line and the former Atchison, Topeka, and Santa Fe (AT&SF) railroad tracks along Vandegrift Boulevard.

The drainage ditch was used from the 1940s through the early 1980s for the disposal of liquid wastes generated by flight-line operations and also received contaminated runoff from spills and aircraft washing. The railroad tracks have been removed, an approximate 15-foot by 8-foot (5-meter by 2-meter) concrete stormwater drainage conveyance has been installed in the approximate same alignment, possibly the same location, immediately north, and the adjacent area of the present concrete conveyance has been turned into an asphalt paved parking lot. Concerns as to the soil at this site were addressed under a Record of Decision (ROD) dated 12 December 1995.

MCAS CamPen Concrete-Lined Surface Impoundment

In May 1990, this concrete-lined surface impoundment was designated as contaminated. It was approximately 250 feet (76 meters) by 50 feet (15 meters) and was located between the MCAS CamPen drainage ditch and southwest of Building 2378. It no longer exists and the fire suppression runoff it once caught has been reconfigured to run into underground tanks. Concerns related to the soil at this site were addressed under an ROD dated 12 December 1995.

Unlined Surface Impoundment

The Unlined Surface Impoundment referenced as having been contaminated within the 23 Area has been returned to unrestricted use, as stated in the ROD signed on 29 September 1997.

Old Fuel Farm

The subsurface soil and groundwater resources in the dismantled farm and fuel delivery areas (fuel farm interior, fence line areas, and pipeline alignments) were remediated for soil and groundwater contamination by released fuel hydrocarbons. The only remaining facilities, which are the fuel delivery and return lines located under the concrete apron, were previously backfilled with a slurry grout and were abandoned in place as it was not practical to remove them. The old

fuel farm site was remediated in conformance with the approved Corrective Action Plan (CAP), consistent with the Cleanup and Abatement Order (CAO) issued by the San Diego Regional Water Quality Control Board in 1995. The site was closed August 2005 with an ROD.

2.5 EMERGENT AND FUTURE TRAINING

U.S. military doctrine requires joint forces capably trained to conduct complex operations at sea and along the coastline, and to project military power ashore over vast distances in ways barely imaginable a generation ago. The Marine Corps, guided doctrinally by "Marine Corps Strategy and Vision 2025" and "Expeditionary Maneuver Warfare," charges bases such as Camp Pendleton with providing training resources, particularly land and airspace, that are sufficient to accommodate emerging training requirements (MCB CamPen 2008b).

2.5.1 Future Training Requirements and Capabilities

To support IMEF units, formal schools, Navy units, other services, and federal agencies, the Camp Pendleton Range Complex and training support services will be modernized, expanded, and adapted to attain the following characteristics by 2025:

- Reconfigurable, non-live-fire MOUT facilities to support platoon level training, located in the vicinity of the infantry regiment cantonment areas.
- Convoy operations training site to support live-fire training, including close air support.
- Mitigated fire danger conditions to open up training opportunities year-round.
- Mitigated environmental restrictions to lessen negative training impacts.
- Improved secondary road network to allow safe dependable access to ranges throughout the year.
- Green and White Beaches available for unencumbered training, with additional access points under the railroad and I-5, to the perimeter training areas.
- Red Beach available for unencumbered training with improved access points under the railroad and I-5.
- Expanded range of training support services such as role players, targets, scenarios, and after-action critiques to enhance the training experience while reducing the burden on units conducting training.
- Cleared and revitalized AFA 17, with a live-fire raid site constructed to support limited size MOUT training with combined arms fires, including close air support.

- MAGTF expeditionary command post exercise (CPX) site to support exercises from small- to large-scale including joint exercises.
- Instrumented training facilities with after-action feedback.
- Integration of unmanned aerial vehicles (UAVs) into training operations.
- Common, Fleet Marine Force (FMF)-compatible communications systems, avoiding stand-alone systems.
- Adequately funded range support infrastructure, including targetry, sound systems, and lighting, as necessary.
- Recapture of the leased agricultural fields for training.

The training continuum will change as needed to produce Marines capable of meeting diverse and challenging operational environments. Tasks, conditions, and standards for future MAGTF training requirements will be driven by anticipated operational contexts and principles employing new systems and weapons, and are characterized by the following:

- Extended range training operations to exercise capabilities.
- MEB live-fire and maneuver exercises.
- Increased requirements for both small- and large-unit MOUT training.
- Significant enhancements to training and feedback/evaluation through instrumented range and target systems.
- Increased reliance on MAGTF sustainment training during deployment.
- Increased joint training.

The Aviation Training and Facilities Survey, completed in October of 2005, identified the following projects to enhance the future aviation training on-Base:

- Insert sustainable aviation targets.
- Insert lighting at the HOLF.
- Establish additional LZs and CALs.
- Repair surfaces and markings of LZs, Heavy Lift LZ, and simulated flight decks.
- Establish a program to remove range debris (USMC 2009).

Camp Pendleton must also advance its effectiveness as the primary training venue for the IMEF-sourced MEUs; time frames for near, mid- and far-term recommended investments are 1 to 2, 3 to 8, and 10 to 25 years, respectively:

- Improve beach access/egress to enhance amphibious training operations: Red Beach (mid-term), White Beach (mid-term), and Green Beach (long-term).
- Refurbish R-800 to provide a company-sized live-fire and maneuver range (near-term).
- Establish a dedicated maneuver corridor through Aliso Canyon from R-131 to Basilone Road (long-term).
- Build an additional Multipurpose Machine Gun (MPMG) range (mid-term).
- Build a 40 mm machine gun qualification range (long-term).
- Modify R-103 to support combat marksmanship training fully, with built-up firing lines inside of the 100-yard line for the entire width of the range (near-term) (USMC 2009).

2.5.2 Future Range Availability and Management

Current and future training requirements and the capabilities necessary to support them while preventing encroachment, noncompliance with environmental regulations, obsolescence of range infrastructure, and fragmented management are discussed in Camp Pendleton's current Range Complex Management Plan (RCMP). The specific purposes of the RCMP are to:

- Provide an RCMP for use and expansion by the Base staff and external Marine Corps range organizations.
- Provide an inventory and condition assessment of the ranges, training areas, and facilities.
- Identify and analyze required capabilities (requirements) shortfalls derived from Fleet Marine Force and formal school's training needs.
- Outline investment needs for range improvement and modernization.
- Identify and analyze encroachment and sustainment challenges.
- Provide recommendations for further environmental planning.
- Develop a strategic vision for range operations with a 25-year planning horizon (MCB CamPen 2008b).

The problems associated with management, maintenance, and sustainability of military training ranges have escalated dramatically during recent years due to increasingly complex and multi-faceted range management issues such as:

- Urban and coastal encroachment.
- Air and noise pollution abatement.
- Environmental regulatory and compliance requirements.
- Land use considerations.
- Endangered species and critical habitat concerns.
- Natural resource use, conservation, and preservation.
- Competition for frequency spectrum.
- Competition for airspace.
- Stakeholder involvement.
- Munitions management, including UXO.
- Safety for surrounding communities.

According to the 2008 RCMP, of the 435 encroachment impacts identified by Camp Pendleton Range Complex Subject Matter Experts (SMEs), over 50 percent of all encroachment impacts were created by just two issues, Endangered Species (30.8 percent), and wildfires or high Fire Danger Ratings that precluded military trainings from being executed (21.6 percent). Additional encroachment impacts were created by Cultural Resources (7.4 percent), UXO/Munitions (5.2 percent), Frequency Encroachment (0.10 percent), Maritime Sustainability (3.0 percent), Airspace Restrictions (6.4 percent), Air Quality (2.8 percent), Clean Water (0.05 percent), Wetlands (10.4 percent), Airborne Noise (7.1 percent), and Urban Growth (4.1 percent) (MCB CamPen 2008). Currently, cultural resources occur on 0.5 percent of training lands. The Base currently supports approximately 51,000 annual training events. This is an increase from 40,000 to 45,000 annual training events in 2001, and represents a 13 to 27 percent increase in training activity over the past 15 years. During this same period, the Base has simultaneously provided for the conservation of 18 species listed as threatened or endangered under the ESA; the protection of waters of the U.S., including wetlands; migratory bird management; game management; and a host of other natural resources issues.

2.6 MILITARY TRAINING SUSTAINABILITY CHALLENGES

2.6.1 Encroachment

Camp Pendleton is, and will continue to be, affected by the geographic, socioeconomic, and ecological setting of the region within which it is located. Land use planning and growth

management efforts of local and regional jurisdictions have a potentially significant influence on the Base's land use, planning, environmental compliance, and natural resource utilization and management. For the past 50 years, the southern California region has been marked by rapid urbanization, development, and population growth. Projected population growth figures for the region suggest the situation will only intensify.

Rampant regional urbanization and development to support current and anticipated population growth ultimately have the potential to constrain the Base's ability to train Marines. The individual and cumulative effects of these regional issues represent encroachments that can impact the Base's ability to accomplish its mission. In this context, encroachment is defined as any non-DoD action that has the potential to impede or interfere with Camp Pendleton's responsibility for the military readiness of Marines that train there. Continually proposed, nonmilitary projects adjacent to or within Camp Pendleton's borders must be acknowledged by Base planners, military trainers, and the surrounding developing communities, as part of actual or potential encroachment. For example, leases and easements and, particularly, aboveground utilities such as the SONGS, SDG&E, I-5, and railway lines reduce the land available for military use, affect the use of aviation assets, and challenge the conduct of realistic military training activities. Constraints exist for amphibious landing exercises along the Base's entire western boundary and create artificial restrictions for maneuvers inland from the coast.

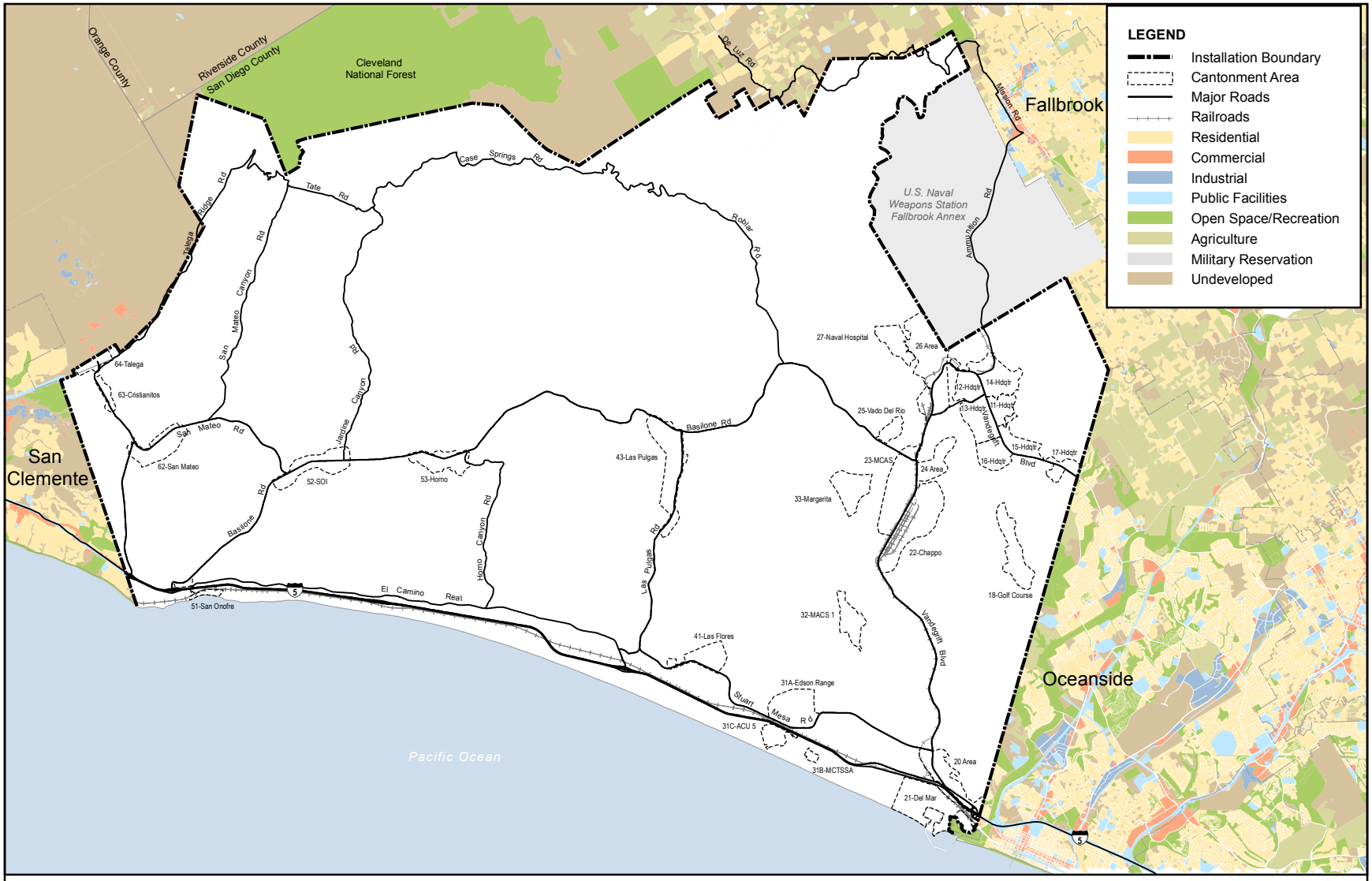
2.6.1.1 Regional Development

Increasingly rapid growth and development throughout the region (and up to the Base's boundaries) have resulted in intense competition for resources—such as land, airspace, sea space, and frequency spectrum—that are needed for military uses.

Throughout its 70-plus years in the region, Camp Pendleton has endeavored to work closely with surrounding communities, local jurisdictions, and private entities. However, Base lands have been, and continue to be, subject to both direct and indirect pressures from surrounding communities and the region for land use (e.g., leases and easements) and mission restrictions (e.g., noise) (2-14).

2.6.1.2 Public Interstate Freeways, Railroad Rights-of-Way, and Future Transportation Corridors

The I-5 easement presents an artificial barrier between the beach area and inland portions of the Base. Running the length of Camp Pendleton, its presence restricts the transition of amphibious training operations to the Base's interior training areas where the majority of field training



Source: Marine Corps Base Camp Pendleton

3 0 3 Miles

Scale: 1:190,080; 1 inch = 3 Miles

Figure 2-14
Adjacent Land Use

occurs. Small tunnels provide a limited capability to cross under the I-5. These underpass crossings, though, were constructed to support the movement of troops and equipment used at the time the freeway was built in the 1960s. While not totally preventing training operations, today's larger amphibious and general purpose vehicles, weapons systems, and large-scale movements of troops and equipment are greatly hindered due to the small size of these freeway underpasses. As a result of the increasing size of upgraded and modernized Marine Corps equipment over the last 40 years, only one of the 11 underpasses remains capable of supporting passage of all military vehicles and equipment. The I-5 freeway represents the only direct means of public highway access between San Diego and Los Angeles, two of the largest cities in the United States and, as such, this interstate highway will remain a permanent fixture on the Camp Pendleton landscape.

Running adjacent and parallel to I-5 is a railroad line that is part of the Los Angeles-San Diego-San Luis Obispo Rail Corridor that traverses the entire length of Camp Pendleton in a north to south direction. Like I-5 does for vehicles, this rail line provides the only direct rail linkage between the cities of Los Angeles and San Diego. This rail corridor, located parallel and adjacent to I-5, creates an access barrier between the beach landing areas of the Base and Camp Pendleton's inland training areas just as I-5 does. It presents one more man-made obstacle that must be negotiated (through crossing over or under) by military personnel and vehicles during amphibious training exercises, in a manner that is not normally consistent with the tactical exercise or training requirements. During the next 20 years, the San Diego Association of Governments plans to construct approximately $1 billion in improvements in the 60-mile (97-kilometer) San Diego segment of the Los Angeles-San Diego-San Luis Obispo Rail Corridor, which includes a primary effort to double-track the Orange County to downtown San Diego segment, including the 1.6-mile (2.57-kilometer) portion that traverses through Camp Pendleton. This project will not change the footprint of the rail corridor within Camp Pendleton.

The Southern Orange County Transportation Infrastructure Improvement Program (SOCTIIP) was a proposed four-lane toll road (with potential expansion to eight lanes), approximately 16 miles (26 kilometers) in length, deemed to run along the northern boundary of the Base. The SOCTIIP was planned and developed by the Transportation Corridor Agencies (TCA), a Joint Powers Agency in Orange County, to serve as a transportation alternative to I-5, to help alleviate existing traffic gridlock and mitigate the increased traffic growth forecast to occur in southern Orange County by the year 2010. It was intended to connect the inland portion of central Orange County with the northern portion of San Diego County. If built, the SOCTIIP would be the last of three new toll roads constructed in Orange County by the TCA. The TCA has already completed 51 miles (82 kilometers) of its planned 67-mile (108-kilometer) toll-way system.

In 1988, the Marine Corps agreed that the TCA could evaluate an on-Base alignment of the proposed SOCTIIP toll road project, subject to the following stipulations: (1) that other off-Base alignment alternatives must also be considered and evaluated in an equal manner; (2) that any planned Camp Pendleton alignment must closely adhere to the Base's northern boundary; (3) that any adverse environmental impacts created as a result of siting this route on the Base must be fully and properly mitigated; and (4) most importantly, that any on-Base alignment must not impact the Marine Corps' mission nor interfere with the Base's operational flexibility.

On 18 December 2008, the United States Commerce Department upheld the California Coastal Commission's decision to halt the project. Federal officials could only override California's decision if the project had no alternatives or was necessary to national security, and neither of those criteria was met.

2.6.1.3 Public Utilities

Easements for public utilities (and access roads/corridors to maintain those utilities) are located throughout the Base. These facilities include supporting structures for power lines, telephone lines, cellular towers, radio repeaters, fiber-optic cables, and pipelines. While each easement may not seem significant in its own right, when taken in aggregate they restrict or constrain amphibious, ground, and aviation training opportunities. The physical structures located in these easements (e.g., power poles and telephone poles) pose restrictions on ground and/or air movement and create artificial restrictions for maneuvers inland from the coast.

2.6.1.4 Commercial Airport Facilities

At least 40 airports exist within a 60-mile (97-kilometer) radius of Camp Pendleton. Most airports in southern California are operating at or near maximum capacity. It has been projected by San Diego County Regional Airport Authority that, by the year 2030, air travel passenger volume at San Diego International Airport will double (San Diego County Regional Airport Authority 2004). San Diego County Regional Airport Authority, San Diego County's regional aviation planning agency, is continuing the process of evaluating whether there is a potential to locate a new commercial airport facility somewhere within the regional area to meet San Diego County's future passenger and air cargo needs. As has occurred in several previous airport siting studies, Camp Pendleton has been suggested as a potential location for the siting of such an airport, or even if an airport were not to be sited here, the Base could serve as the host site for relocation of other military activities from other DoD installations considered more favorable as a commercial airport site.

There are no areas on Camp Pendleton where a large commercial airport could be located without a devastating impact on training operations and natural resources. An even greater negative effect than occupation of land by the airport would be the loss of control of airspace above Camp Pendleton, which is mandated to maintain aviation and combined arms training requirements. The relatively level coastal plain, where a commercial airport is most often proposed, is extensively occupied by many sensitive natural resources.

2.6.1.5 Recreational Use and Access

Camp Pendleton receives numerous requests every year from outside agencies, business entities, and individuals for access to the Base for recreational purposes. This is largely because the Base has one of the last remaining extensive tracts of undeveloped coastal land and beach in southern California, from the Mexican border to Ventura County; and the Base is situated between two of the largest population centers in California, San Diego and Los Angeles. Base policies support recreational access when it does not conflict with mission, security, and safety requirements. Chapter 4 provides detailed information on recreational and public access programs. Any proposed nonmilitary land uses along the coastal area or beach of the Base is of great concern because of the need to ensure continued access to landing beaches and inland access routes, in conjunction with amphibious training activities, and because most of the Base's northern beaches are already limited by the lease to State Parks for the San Onofre State Beach. On occasion, trespassing occurs on-Base by civilian beach users, campers, hikers, mountain bikers, and off-road vehicle operators that interferes with training operations, the Base's own recreational programs, and natural resources management actions. Unauthorized access continues to adversely impact sensitive habitat; damage trails, roads, and firebreaks; and increase the potential for erosion.

2.6.1.6 Environmental Encroachment Issues

The Marine Corps and Camp Pendleton are committed to the conservation of natural resources, particularly sensitive biological resources, conservation planning, and natural resource management efforts. The Base also must provide for *operational flexibility* and avoid the potential for creating preserves on lands specifically established by Congress for military training. The Marine Corps believes that most military activities can be generally compatible with the conservation of sensitive biological resources. However, many environmental laws and regulations have not considered the military's unique use of resources and, as written, create conflicts between congressionally mandated military training and congressionally mandated resource conservation.

In addition, depletion and degradation of biodiversity, caused by urban growth, has created encroachment pressure on the Base and has also helped to place San Diego County in the position of having more listed rare, threatened, and endangered plant and wildlife species than any other county in the continental United States. Urban growth has exacerbated the depletion and degradation of biodiversity by converting the natural landscape to developed hardscape (SRS Technologies 2003). Indirectly, this has created a form of encroachment pressure for Camp Pendleton, by creating an increasing dependence on the Base and any remaining off-Base natural areas for habitat for these species. Camp Pendleton is concerned that as regional development continues to deplete the region's natural landscape, Base lands will become increasingly and disproportionately important to regional habitat and sensitive species conservation. As more species in the region are federally listed as threatened or endangered (regardless of whether the species have thrived locally on-Base), the Base is faced with becoming burdened with additional regulatory requirements and management needs.

The federal ESA is a significant environmental law for Camp Pendleton because of the presence of many federally threatened and endangered species on the Base. In compliance with ESA Section 7(a)(2), the Base has established management programs, protocols, and regulations so that training activities and Base operations avoid and minimize adverse impacts to federally listed species and their habitats, provide compensatory mitigation for impacts that do occur, and ensure that Base actions do not jeopardize the continued survival of the species. Under ESA Section 7(a)(1), the Base as a federal agency utilizes its management programs in furtherance of the purposes of the ESA by including in those programs conservation measures to further the recovery of endangered species and threatened species. Most of these programs focus on protecting, expanding, and improving occupied and unoccupied ecosystems used by these species. However, these actions in support of ESA compliance also have been identified as the leading encroachment factors impacting military training and operations at Camp Pendleton.

As regional populations increase, the Base wants to ensure that its training lands do not become viewed as opportunities for further development expansion (e.g., for commercial airports and additional transit corridors) or as regional preserves in which training activities are then undesirably constrained or prohibited altogether.

Ultimately, the increased value of the Base's land as open space for regional projects and species recovery has the potential to jeopardize the long-term sustainability of the military mission. Ironically, it has been Camp Pendleton's military mission for over 70 years that has kept most of the Base as natural areas, while growth throughout the coastal southern California region has resulted in scarcity of available land and displacement of large tracts of species habitat.

As a result of the Sikes Act and the conservation benefits afforded protected species through INRMP implementation, critical habitat is not designated on Camp Pendleton. USFWS now considers DoD lands almost exclusively for exemption from critical habitat designation based on the adequacy of existing management under INRMPs. Therefore, although critical habitat designation was once considered a type of encroachment risk that could potentially delay or restrict training activities and impede the flexibility required to accomplish Camp Pendleton's military mission, through the implementation of actions identified under this INRMP, this risk is effectively managed.

2.6.1.7 Buffer Acquisition and Readiness and Environmental Protection Integration

Established in Section 2684(a) of the National Defense Authorization Act for fiscal year (FY) 2003, the DoD's Readiness and Environmental Protection Integration (REPI) Program reduces military-community-environmental conflicts resulting from urban sprawl and loss of habitat surrounding DoD's installations and ranges. Through the REPI Program, DoD enters into unique cost-sharing agreements with conservation organizations and state and local governments to protect compatible land uses and preserve critical buffer areas near military installations that may eliminate or relieve current or anticipated environmental restrictions that could interfere with military training, testing, or operations. These protected lands are not owned by the military for the purposes of military training or testing. For the military, they serve as compatible land use buffers, and can also reduce on-Base habitat restriction requirements by protecting additional off-Base species habitat. For the partner, the protected lands support their missions in a host of ways, including as described in the below.

REPI projects have delivered multiple benefits and shown the power of innovative partnerships in the following ways:

- Enhanced military readiness by limiting incompatible development near military installations;
- Protected valuable habitat and provided opportunities for endangered species recovery;
- Preserved open space, including working farms and forestland, that add value to surrounding communities;
- Strengthened military-community relationships and forged partnerships with new allies; and
- Spurred collaboration with other federal land conservation programs and landscape-scale initiatives.

Of Camp Pendleton's 125,448 acres (50,767 hectares), only 80,070 acres (32,403 hectares) is available for ground combat maneuver training due to other Base requirements, including dud-producing impact areas, cantonments, housing areas, leases, right-of-ways, and other infrastructure. The 80,070 acres (32,403 hectares) available for ground combat maneuver training is further constrained by 30,531 acres (12,355 hectares) of restrictions based on federally protected species and cultural resources, which only leaves 49,539 acres (20,048 hectares) for unrestricted training.

The goal of Camp Pendleton's encroachment control and REPI program is to protect the current 80,070 acres (32,403 hectares) of ground combat element (GCE) maneuver training areas and 23,196 acres (9,387 hectares) of dud-producing impact areas from further restriction and to obtain relief from restrictions based on threatened and endangered species.

PLN serves as Camp Pendleton's lead in the South Coast Conservation Forum (SCCF). The SCCF investigates opportunities to acquire an interest in lands that could assist in the conservation of many of the federally protected species in the region and achieve the maximum potential of the authorization provided in the 2003 National Defense Authorization Act. Participating in the SCCF are representatives of Orange, Riverside, and San Diego Counties; the State of California; San Diego State University; Trust for Public Land; Sierra Club and Endangered Habitats League; Fallbrook Land Conservancy; Riverside Land Conservancy; Western Rivers Conservancy; and nongovernmental conservation organizations such as The Nature Conservancy.

Camp Pendleton's goal is to acquire restrictive or conservation easements to control and prevent encroachment, provide a buffer to the Base's training and readiness operations, provide conservation of habitat for species that currently restrict or impede military operations, maintain a regionally significant wildlife corridor between Camp Pendleton and other preserved and open spaces in San Diego and Riverside Counties, and protect the watershed of the Santa Margarita River. Six encroachment partnering projects have been executed so far totaling 1701 acres (688.37 hectares). Nine additional transactions totaling 2,671.15 acres (1,080.97 hectares) have been and are pending approvals and real estate transactions.

The desired end state is to maximize use of the available training space onboard Camp Pendleton through the use of off-Base mitigation credits and REPI acquisitions/conservation easements to ease environmental restrictions. Most of the encroachment facing Camp Pendleton is driven by environmental regulations and project mitigation requirements, as well as from DoN and California State energy programs, and from previous higher headquarters' directed lease of Base land to the State Parks for creation of the San Onofre State Beach.

A key component in reaching the Base's desired end state is to relieve as much of the available training space as possible from ESA compliance restrictions. Although Marines are able to complete required training, the training is often segmented, which degrades the realism and flow of the event. Threatened and endangered species and/or rare plant sites are found in 34 of 35 training areas and associated restrictions cover approximately 38 percent of the total training land area. Seasonal and year-round restrictions limit off-road vehicle and foot traffic, bivouac/command post/field support, digging, and earth-moving activities.

Restrictions targeted for initial removal are 10,328 acres (4,180 hectares) of occupied coastal California gnatcatcher habitat; 8379 acres (3,391 hectares) of occupied arroyo toad upland habitat; 364 acres (147 hectares) of occupied Stephens' kangaroo rat (*Dipodomys stephensi*) habitat; and several hundred acres of the 9,806 acres (3,968 hectares) covered by the Programmatic Riparian Management Plan. The Base is planning on maintaining the existing level of training restrictions and management on the three thread-leaved brodiaea (*Brodiaea filifolia*) priority areas (i.e., Horse Pasture, Lima, and Finch), and removing the 49 remaining occurrences from any training limitations.

Reducing ESA restrictions to training will be accomplished by a combination of habitat preservation off-Base and an on-Base stewardship program that will ensure the continued existence of listed species on-Base after training restrictions are lifted. Off-Base habitat preservation under the REPI program complements local government habitat conservation plans and utilizes information and priorities developed under those programs and from USFWS to identify annual projects. The Project Area of Interest was established in conjunction with USFWS and MCAS Miramar to include habitat for targeted species that will support their recovery in southern California. Priority areas for each species were identified as currently occupied habitat for each species and locations that could provide high-quality habitat.

Progress will initially be evaluated and success measured by the percentage of restrictions removed and eventually by the number of training areas completely freed from ESA compliance restrictions.

2.6.2 Climate Change

DoD recognizes that climate change will play a significant role in its ability to fulfill its mission and undermine the capacity of our military installations to support training activities. As climate change will affect both the natural landscape and built infrastructure, which impacts readiness and environmental stewardship responsibilities at installations across the nation, DoD must employ creative ways to address the impact of climate change to remain ready to operate in a changing environment amid the challenges of climate change and environmental damage (DoD

2014). Potential climate change impacts to the DoD mission and operations are identified as rising temperatures, changes in precipitation patterns, increases in storm frequency and intensity, rising sea levels and associated storm surge, increased frequency and severity of wildfires, and soil loss on coastal bluffs. However, more comprehensive and region- or base-specific vulnerability assessments are needed to determine what adaptive responses are the most appropriate at individual bases.

In California, in accordance with the Governor's EO S-03-05, biannual climate change assessments have been conducted and reported by the California Energy Commission's California Climate Change Center using probabilistic forecasting models since 2006 (State of California 2015). Analyses conducted during the 2009 and 2012 California Climate Change Assessments used a number of widely accepted global climate models (GCMs) to forecast climate change through 2100 for two greenhouse gas emissions scenarios. One scenario was based on relatively low emission rates and the other used medium-high emissions rates (Cayan et al. 2012). A brief summary of the forecasts from the 2012 California Climate Change Assessment relevant to Camp Pendleton trainers and natural resources managers follows.

2.6.2.1 Temperature

Temperature change has been increasing throughout the state over the last century. Statewide average temperatures in California rose about 1.7 degrees Fahrenheit (°F) (0.4 degree Centigrade [°C]) between 1895 and 2011 and are forecasted to continue to rise significantly during this century (Moser et al. 2012). Overall, warming projections from the 2012 California Climate Change Assessment range from about 1.8°F to 5.4°F (1°C to 3°C) by mid-century and 3.6°F to 9°F (2°C to 5°C) by the end of the twenty-first century (Cayan et al. 2012).

Forecasted changes in temperature are not even throughout the year, with greater warming occurring in summer and early fall than in winter and spring. By the end of the twenty-first century, winter (January–March) temperature changes range from 1°C–4°C (1.8°F–7.2°F), whereas summer (July–September) temperature changes range from 1.5°C–6°C (2.7°F–10.8°F). The simulations also indicate that heat waves will become more frequent as climate changes. Under the high emissions scenario, the number of hot days exceeds 40 days per year—more than 10 times the historical occurrences by the end of the twenty-first century (Cayan et al. 2012).

Environmental impacts of rising temperatures are likely to include shifts in vegetation communities including any rare, threatened, or endangered species they support; increases in wildfire risk; and soil warming and drying. Potential impacts to the Camp Pendleton mission from increases in average yearly temperature and more frequent heat waves include increased occurrence of test/training limitations due to high heat days and wildfires; reduced military

vehicle access; degrading infrastructure and increased maintenance costs for roads, utilities, and runways; reduced airlift capacity; reduced live-fire training, and increased energy costs for building and industrial operations; and increased operational health surveillance and risks (DoD 2012).

2.6.2.2 Precipitation

Precipitation in most of California is characterized by a Mediterranean pattern with most of the annual precipitation occurring between November and March. The climate change simulations from the GCMs indicate that California will retain its Mediterranean climate, with relatively cool and wet winters and hot, dry summers. The simulated annual precipitation models indicate that the high degree of variability that is historically characteristic of the region will be continued during the next century. This suggests that the region will remain vulnerable to drought and flooding; however; an overall increase in dry year occurrences is present in both the high emissions and low emissions simulations.

Several GCMs show that the 30-year average precipitation in the San Diego region will decrease by more than 8 percent compared to historical totals by mid-century and by late-century half of the projections suggest 30-year average precipitation will decline by more than 10 percent below the historical average (Moser et al. 2012). All of the GCMs resulted in a loss of spring snow pack in California (Cayan et al. 2012), which would reduce water availability during the summer months.

The central and southern parts of the state can be expected to be drier from the warming effects alone as the spring snowpack will melt sooner, and the moisture contained in soils will evaporate during long dry summer months (Moser et al. 2012).

Changes in precipitation amounts and patterns are likely to result in increased wildfire risk and altered burn regimes; impacts to air quality; increases in storm frequency and intensity; stream bank erosion and gullying; impacted soil function; soil loss; water supply constraints; impacted groundwater quality; increased dust; protected species stress and potential for more species placed at risk; and spread of invasive species.

Potential impact to the Camp Pendleton mission from changes in precipitation include reduced land carrying capacity for vehicle maneuvers; increased maintenance costs for roads, utilities, and runways; reduced live-fire training; reduced water availability and greater competition for limited water resources; reduced training land access; reduced training carrying capacity; operational health surveillance and risks; and increased flood control/erosion prevention measures (DoD 2012). Other impacts include military personnel safety; temporary or prolonged

disruption of military operations or test and training activities due to intense storms and resulting storm damage; inundation of and damage to coastal infrastructure; reduced access to military water crossings and river operations; reduced off-road maneuver capacity; increased maintenance costs; increased flood control/erosion prevention measures; and transportation infrastructure damage (DoD 2012).

2.6.2.3 Sea Level Rise

Historic sea level rise along the California coast is estimated to be about 6 to 8 inches (17 to 20 centimeters) per century (Cayan et al. 2012; NOAA 2015). Forecasting models used in the 2012 California Climate Change Assessment, which tie sea level rise to global mean surface temperature increases, result in a set of possible sea level rise trajectories from the GCM projections. Depending on the forecasted global air temperature, sea level rise ranges from 11.8 inches to 17.7 inches (30 to 45 centimeters) by 2050 and from 35.4 inches to 55.1 inches (90 centimeters to 140 centimeters) by 2100. As an example of impacts related to sea level rise, a sea level rise of 1 foot (0.3 meter) would cause minor flooding along the shoreline, within the Santa Margarita River floodplain, and at the Del Mar Boat Basin, whereas a rise of 3 feet (1 meter) would flood an area of approximately 270 acres (109 hectares) (2-15), impacting piers, open land, and other coastal infrastructure. Additionally, as sea level rises, the elevated mean water levels will result in an increased rate of extreme high sea level events, which would imply a greater threat of coastal erosion and other damage (Cayan et al. 2012).

Loss of some coastal land and damage to physical infrastructure and protected resources, increased saltwater intrusion, and reduced capacity of protective barrier islands and coastal wetlands may be expected with increases in sea level. Potential impacts to the mission from sea level rise include loss of coastal land; damage to physical infrastructure (roads, targets, ranges) and protected ecosystem resources; saltwater intrusion; and reduced capacity of protective barrier islands and coastal wetlands (DoD 2012).

2.6.2.4 Wildfire Risk

Climate changes projected for California in the next century imply dramatic alteration of fire frequency from what has been experienced in the recent past. Earlier snowmelt, higher temperatures, and longer dry periods over a longer fire season will directly increase wildfire risk. Indirectly, wildfire risk will also be influenced by potential climate-related changes in vegetation and ignition potential from lightning. Human activities will continue to be the biggest factor in ignition risk. Previous research estimated that the long-term increase in fire occurrence associated with a higher emissions scenario is substantial, with increases in the number of large

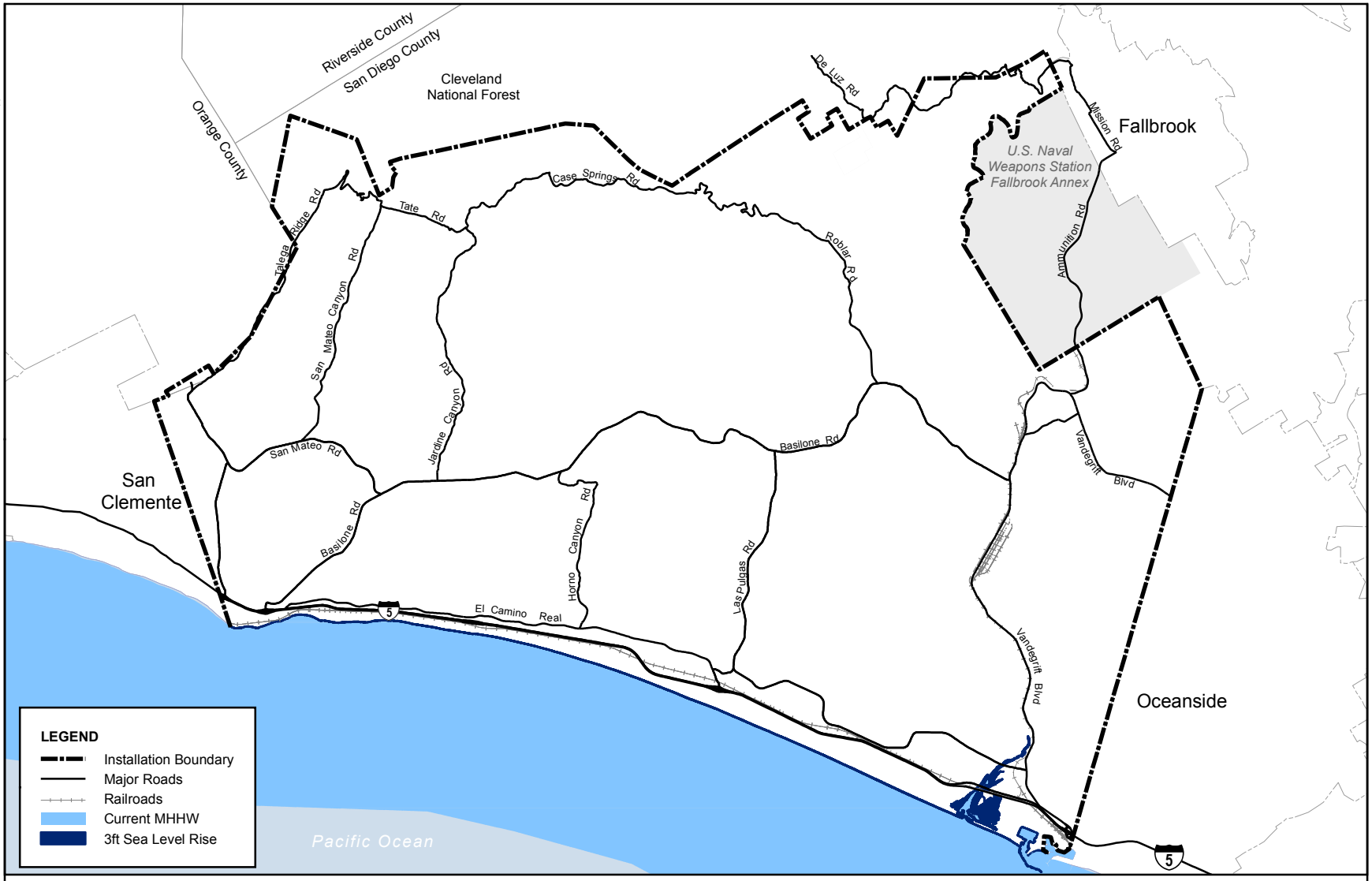


Figure 2-15
Sea Level Rise

fires statewide ranging from 58 percent to 128 percent above historical levels by 2085. Under the same emissions scenario, estimated burned area will increase by 57 percent to 169 percent, depending on location (Moser et al. 2012).

2.6.2.5 Vulnerability Assessments

Climate change vulnerability assessments are a means of preparing for and coping with the effects of climate change. A vulnerability assessment is a key element in identifying which species or systems are likely to be most strongly affected by projected changes in climate and provides a framework for understanding why particular species or systems are likely to be vulnerable, often depending on factors such as exposure, sensitivity, and adaptive capacity (Glick et al. 2011). Vulnerability assessments inform conservation planning by identifying climate-related threats and resulting stresses, which then become part of the decision-making process undertaken to identify and prioritize conservation strategies. Camp Pendleton Environmental Security personnel proactively identify the likely effects of climate change to adapt and maintain cost-effective programs and meet legal requirements to manage natural resources. Climate change and vulnerability assessments for ecosystems and individual species will be discussed further in Section 4.2.10 as part of the Base's Sustainable Ecosystem Management Program.

2.6.3 Energy Security

DoD's Energy Policy Directive, DoDD 4180.01 of April 2014, which is aimed at improving DoD's energy security through increasing efficiency and diversifying energy resources, will result in a major reduction in the use of fossil fuels and thereby reduce greenhouse gas emissions greatly. DoN's energy policy specifically requires the Navy to use all measures to minimize energy consumption, reduce energy expenditures, and utilize alternative energy resources and environmentally sustainable technologies where it is reasonable, affordable, and practical to do so. This instruction applies to the Offices of SECNAV; the Chief of Naval Operations (CNO); the CMC; and all Navy and Marine Corps activities, installations, and commands.

To improve energy security and increase energy independence, DoN established energy goals that will move the Navy and Marine Corps away from a reliance on petroleum and will dramatically increase the use of alternative energy sources. In accordance with Secretary of the Navy Instructions (SECNAVINST) 4101.3, these goals are:

- Energy Efficient Acquisition: Evaluation of energy factors will be mandatory when awarding contracts for systems and buildings.

- Sail the “Great Green Fleet”: DoN will demonstrate a Green Strike Group in local operations by 2012 and sail it by 2016.
- Reduce Non-Tactical Petroleum Use: By 2015, DoN will reduce petroleum use in the commercial fleet by 50 percent.
- Increase Alternative Energy Ashore: By 2020, DoN will produce at least 50 percent of shore-based energy requirements from alternative sources; 50 percent of DoN installations will be net-zero.
- Increase Alternative Energy Use DoN-Wide: By 2020, 50 percent of total DoN energy consumption will come from alternative sources.

Signed in 2015, EO 13693 – Planning for Federal Sustainability in the Next Decade also requires federal agencies to promote building energy conservation, efficiency, and management by reducing agency building energy intensity by 2.5 percent annually through the end of FY 2025, relative to the baseline of the agency's building energy use in FY 2015.

Over the past 10 years, Camp Pendleton has executed several initiatives to improve energy efficiency, reduce dependence on nonrenewable resources, and increase use of renewable energy resources. Examples include the installation of solar hot water and photovoltaic systems at 53 Area and 62 Area training pools, a photovoltaic array at the Box Canyon Landfill, and a rooftop photovoltaic system on the Chappo and Edson dining halls. Natural gas-powered vehicles have also been added to the fleet of Base vehicles at Camp Pendleton, and the Base is partnering with commercial enterprises and the State of California in researching the future use of hydrogen-powered vehicles. Electric car recharge stations are currently on-Base.

To ensure compliance with environmental statutes, avoid impacts to sensitive resources, and ensure cost effectiveness over the course of their lifetime, NEPA analyses must be conducted during the planning phase of any future Base activities. The Base’s Environmental Security Department will have input in the site selection and review of potential impacts of any such project.

CHAPTER 3.0
EXISTING CONDITIONS

3.1 PHYSICAL ENVIRONMENT

3.1.1 Climate

Camp Pendleton has several climatic zones that roughly coincide with the three geomorphic regions present: coastal plain, coastal valley, and mountain. In general, Camp Pendleton has a semiarid Mediterranean climate with warm, dry summers and mild, wet winters. Daytime temperatures rarely exceed 95˚F (35°C) in the summer, and nighttime temperatures usually remain above freezing in the winter.

Seasonal rainfall along Camp Pendleton's coast averages between 10 and 14 inches (25 to 36 centimeters) per year. Average annual precipitation in the mountains on Camp Pendleton ranges up to 22 inches (56 centimeters) in the wettest locations (e.g., Case Springs), depending upon slope and elevation. Approximately 75 percent of the Camp Pendleton's precipitation falls between November and March, with the greatest annual average precipitation in January. Winds generally originate from the west or southwest, carrying in cool, moist offshore air.

Night and early morning cloud cover is common on Camp Pendleton throughout the spring and summer. Low clouds frequently extend inland over the coastal foothills and valleys but usually dissipate during the morning. Afternoons are generally clear. Coastal fog averages 29 days per year, being heaviest during the fall and winter months.

An important characteristic of local weather is its year-to-year variability. The native vegetation is adapted to periodic drought, flooding, and fire. "Fire season" occurs from May through November, with extreme fire conditions occurring when very dry, warm "Santa Ana winds" blow and there is a heavy fuel load of dry vegetation. Camp Pendleton's geography creates up-canyon winds because its northeast-southwest-trending canyons are able to pull in marine air each day as land surfaces become heated. At night, the breezes are pulled back down-canyon and seaward as land surfaces cool (MCB CamPen 1992).

Local weather data are collected from six Remote Automated Weather Stations (RAWS) on Camp Pendleton: Case Springs, Mateo Ridge at Talega Ridge, Cristianitos, Las Flores, Wire Mountain, and Roblar Canyon. The Cleveland National Forest (El Carrizo Station) and the National Weather Service (Oceanside and San Clemente) also maintain records.

Current climate trends are anticipated to produce warmer temperatures, more frequent droughts, and earlier spring snow pack loss in California, with extreme weather events potentially degrading existing habitats (Cayan et al. 2012). As one consequence of climate change, it is predicted that the distribution of species within ecosystems will shift with increasing temperatures to new suitable habitats, especially in bird species that inhabit scrub-chaparral habitats. This will result in new combinations of species within habitats that usually do not interact, which will consequently confront species with new competitors, predators, and parasites. The proliferation of invasive species is also predicted. While animals will shift to new suitable habitats relatively rapidly, plant species are anticipated to shift much slower, if at all, potentially leading to permanent loss of many plants, on which many animal species are currently dependent for their lifecycles (DoD 2010).

3.1.2 Topography

Camp Pendleton lies on the coastal plains at the southern end of the Santa Ana Mountains, within the Peninsular Range of southwestern California. The massive Peninsular Range completes the coastal mountain system of California, extending south from the Los Angeles Basin to the tip of the Baja Peninsula, and includes the steep, narrow, and northwest-trending San Jacinto, Santa Rosa, Agua Tibia, and Laguna Mountains that plunge into the Coachella and Imperial Valleys.

The terrain of Camp Pendleton is varied and includes sandy shores, seaside cliffs, coastal plains, rolling hills, canyons, and mountains rising to elevations of nearly 2,700 feet (823 meters) (3-1). Two major physiographic provinces occur on Camp Pendleton: coastal plains, which rise steeply from the coast inland into fairly level terraces, and the rolling foothills of the Santa Margarita Mountains. The break between these two provinces occurs generally along Basilone Road.

Characteristic of the Peninsular Range, natural erosion over time has formed a series of southwest-trending stream valleys across the generally northwest-trending hills and mountains. Each stream has developed its own valley fill deposits, including an alluvial fan at its mouth near the coastline. The marine terraces, inland from the coast, slope uniformly to the southwest at inclinations of 5 percent or less with the majority of the rest of Camp Pendleton exceeding 15 percent slope.

Part of the coastal area consists of steep, low-lying hills known as the San Onofre Hills, which are dissected by the major stream systems of Camp Pendleton. The highest elevation of the range is 1,720 feet (524 meters) atop San Onofre Mountain. Other areas contain low, wave-cut terraces

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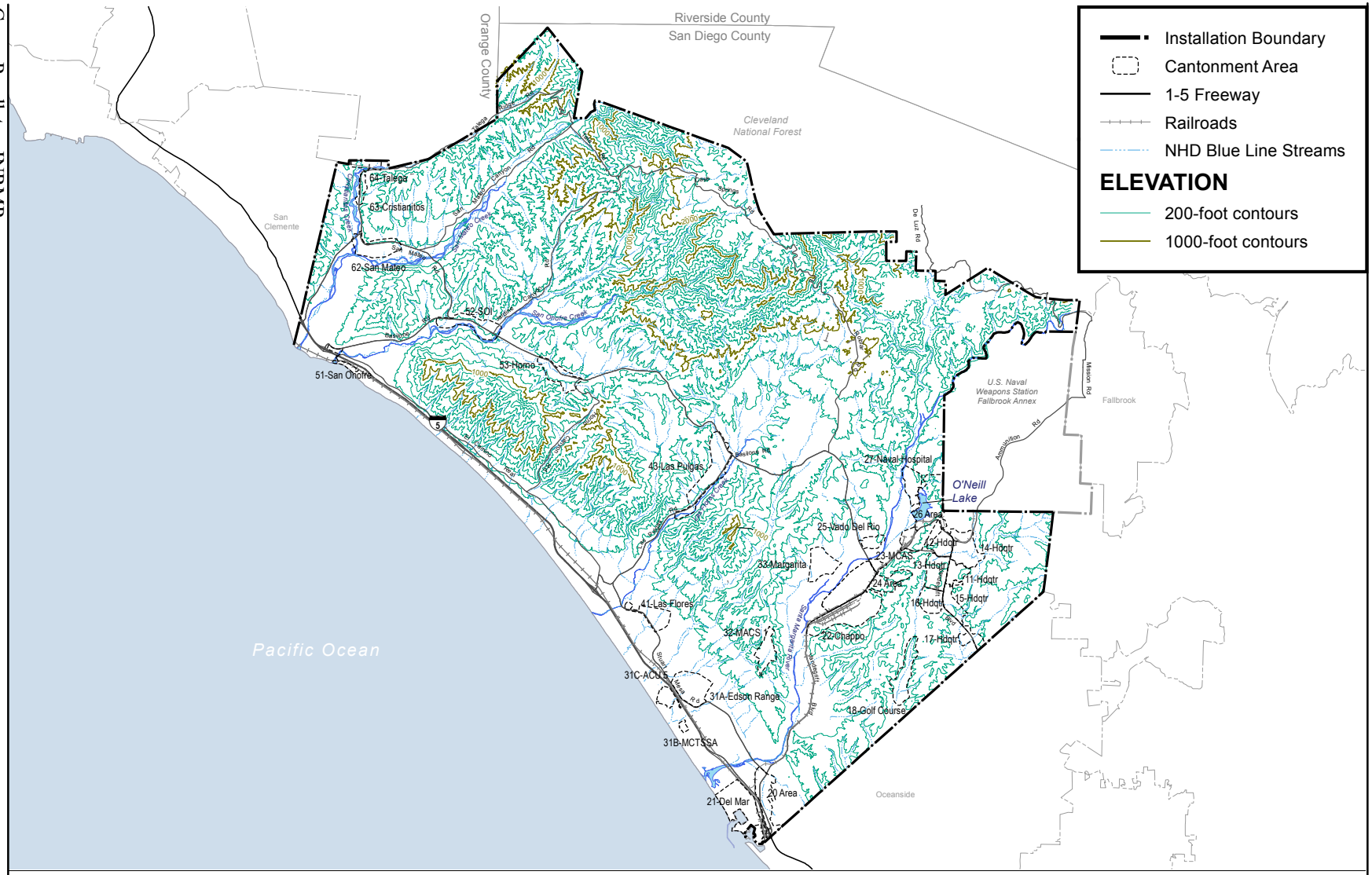


Figure 3-1
Topography

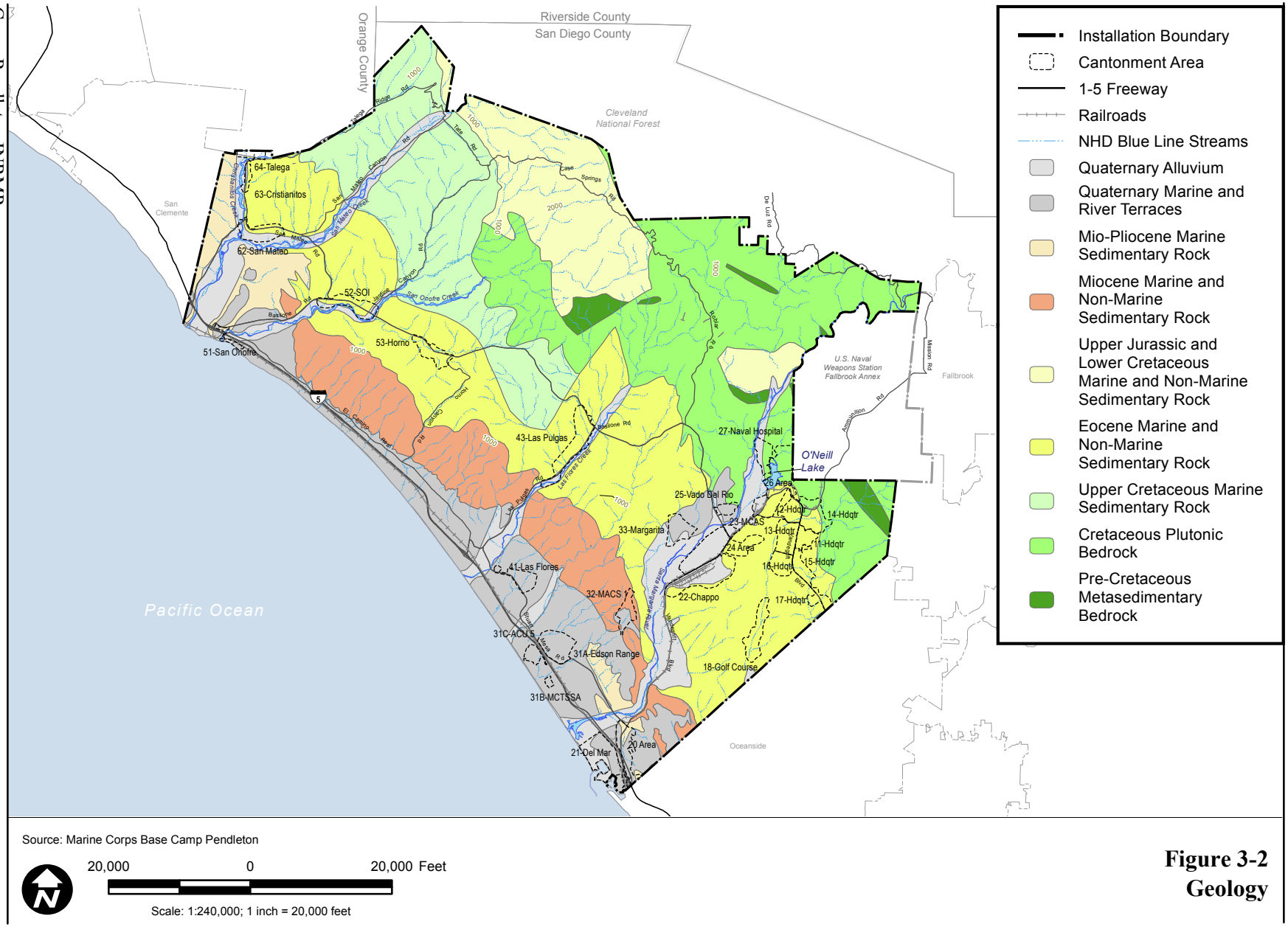
that have distinct cliffs or escarpments along the seaward edge. East of the San Onofre Hills is gently rolling topography with soils deep and level enough to support some agriculture. The San Onofre Hills give rise to the Santa Margarita Mountains, part of the Peninsular Range that extends from Orange and Riverside Counties to the Mexican border. Margarita Peak, at 3,189 feet (972 meters), is just east of Camp Pendleton and about 10 miles (16 kilometers) inland from the coast.

3.1.3 Geology and Soils

The topographical features of Camp Pendleton are largely the result of the Base's underlying geologic composition. The oldest stratum on-Base is pre-Cretaceous and Cretaceous plutonic bedrock of the Santa Margarita Mountains, made up of granitic, igneous, and metamorphic rock (3-2). The intermontane area separating the Santa Margarita Mountains and the San Onofre Hills is mainly composed of soft sandstones and shales of marine origin, formed during the Upper Cretaceous, Eocene, Upper Jurassic, and Lower Cretaceous Periods (3-2). The San Onofre Hills consist of resistant conglomerates, sandstones, shale, and breccia (angular conglomerates) formed during the Miocene Period.

The Base's northernmost hills are composed of middle Miocene to lower Pliocene marine shales and siltstones (3-2). Moving south and west, Quaternary materials (mainly unconsolidated terrace and alluvial deposits) underlie most of the coastal plain and stream valleys on-Base (3-2). These nearly horizontal deposits are either marine or alluvial in origin. Quaternary alluvial terraces can be found exposed in the coastal plain area and as terrace remnants on the top of both coastal bluffs and hills adjacent to major streams (3-2). The coastal plain also includes a small area of sand dunes formed in the Quaternary Period; these dunes are made up of fine, windblown sand deposits. Layers up to 100 feet (30.5 meters) thick of Quaternary alluvial deposits of gravel, sand, and silt with cobbles and boulders make up the active stream channels and overbank areas.

Soil erosion and sedimentation are common on Camp Pendleton. Soil erosion and sedimentation patterns are largely influenced by the year-to-year climatic variability, with most soil loss occurring perhaps once in every 20 years. The pattern of winter storms determines whether there is enough antecedent soil moisture before an intense storm to cause significant soil loss. Intense storms have little impact if the soil is dry enough to absorb water quickly. Soil type, slope, and the frequency of fire occurrence also influence erosion rates. Slopes left denuded by fire are particularly susceptible to accelerated erosion. In addition, fires of a very high temperature can result in hydrophobicity of the soil surface, allowing less water to enter the soil and increasing the amount of runoff, resulting in more erosion and sedimentation.



Source: Marine Corps Base Camp Pendleton

20,000 0 20,000 Feet

Scale: 1:240,000; 1 inch = 20,000 feet

Figure 3-2
Geology

Causes of accelerated soil erosion at Camp Pendleton are largely attributed to unpaved roads and trails, firebreaks, and excessive fire frequency (Kellogg and Kellogg 1988). Because of the high percentage of accelerated erosion resulting from excessive fire frequency on Camp Pendleton, fire mapping is essential in documenting fire data over time and to more efficiently plan erosion control techniques. Additionally, surveys are conducted following wildfires (e.g., along steep slopes) to determine where and when to apply erosion control efforts.

Natural erosion also occurs in areas such as sea cliffs, bluffs, and canyon heads along Camp Pendleton's shoreline where erosion can be catastrophic. To document the problem of erosion on Camp Pendleton along San Onofre State Beach, Kuhn (1999) documented the landslide movement between old Highway 101 and the shoreline since 1980 and the stormwater runoff effects as a result of natural and anthropogenic diversions such as roads, railroad installations, agricultural activities, military operations, fires, seismic activity, and heavy rainfall. This study provided confirmation of the natural aspect of the problem and that it does not require human intervention.

Over 50 soil series are found on Camp Pendleton (Appendix E). Coastal plain soils are composed mostly of poorly consolidated marine sediments, while foothill soils are granitic with some metasedimentary and metavolcanic inclusions. A detailed description of Camp Pendleton soils can be found in the San Diego County Soil Survey (U.S. Soil Conservation Service 1973). The level of resolution for Soil Survey maps is appropriate for preliminary planning purposes only. For activities where soil properties are important, such as construction projects, remediation projects, or biological surveys where species with specific soil requirements are being surveyed for, testing should be done to confirm the nature of the soil on-site.

3.1.4 Hydrology

The hydrology of Camp Pendleton is influenced by several factors, including those that are natural (topographic, geologic, climatic, etc.) and human influenced (land use, dams, etc.). Proper management and stewardship of water resources are fundamental to natural resource and land use sustainability. This section provides a cursory overview of fundamental hydrologic features that characterize Camp Pendleton, including watersheds, precipitation, and runoff. Camp Pendleton's water quality, supply, and use programs are also introduced in this section.

3.1.4.1 Watersheds

Mountain ranges divide Camp Pendleton into three major drainage areas or hydrologic units (HUs); San Juan, Santa Margarita, and San Luis Rey (3-3 and Table 3-1). Surface waters

Source: Marine Corps Base Camp Pendleton 2007
California Coastal Commission 2006
CAWRCB 2006, 2004

3 0 3 Miles

Scale: 1:190,080; 1 inch = 3 Miles

Figure 3-3
Watersheds

are discussed in relation to the HUs that they occur in because their condition and quality are affected by the areas and activities that drain into them. Over half (approximately 67 percent or 84,000 of 125,250 acres [33,994 of 50,687 hectares]) of the Base is within the San Juan HU. The Base also lies within the Santa Margarita and San Luis Rey HUs. These HUs are further divided into hydrologic areas (HAs) based on water-bearing and non-water bearing formations, typified by a major tributary of a stream, a major valley, or a plain along a stream containing one or more ground water basins, and having closely related geologic, hydrologic and topographic characteristics.

Table 3-1
Camp Pendleton Watersheds

Hydrologic Unit (HU)	Hydrologic Areas (HA)	Basins	Total Approximate Acreage (Hectares) of Watershed	Approximate Acreage (Hectares) on-Base	Percent of Watershed within Base
San Juan	San Mateo Canyon	Talega Creek	85,464 (34,586)	18,675 (7,557)	21.9
		San Mateo Creek			
		Cristianitos Creek			
	San Onofre	San Onofre Creek	65,474 (26,496)	65,208 (26,389)	99.6
		Las Flores Creek			
		Horno Creek			
		Aliso			
		Coastal Drainage			
		French			
		Cocklebur			
Santa Margarita	Ysidora	Santa Margarita River	27,962 (11,316)	21,469 (8,688)	76.8
	De Luz	Santa Margarita River	72,967 (29,529)	10,517 (4,256)	14.4
		De Luz Creek			
		Roblar Creek			
San Luis Rey	Lower San Luis	San Luis Rey	119,662 (48,425)	9,749 (3,945)	8.1

The two largest drainages on Camp Pendleton, Santa Margarita HU and San Juan HU, form broad alluvial plains as they approach the Pacific Ocean. As the streams reach the sea, sloughs or estuarine lagoons form due to sand bars or narrow tidal barriers. These impound low stream flows but are breached during high-flows caused by storm events and normal tidal fluctuation. Based on water quality data, measurements, and observations for the

Santa Margarita River estuary, incoming tides are generally able to top the sandbar once or twice a day, while a small natural channel in the sandbar allows water to drain back out when the water level of the outgoing tide falls below the elevation of sand accumulated on the sandbar. The sandbar blockages subsequently re-form by sedimentation and normal wave action.

The three largest estuaries on Camp Pendleton are situated at the mouths of the Santa Margarita, Las Flores, and San Mateo streams. Review of U.S. Geological Survey (USGS) data for the period 1988 through 2012 indicates that the Santa Margarita River estuary does not close every year, but typically does close for 1/4 to 1/3 of the year, usually the summer to fall timeframe. Occasionally, the Santa Margarita River estuary has been observed to remain open throughout the year. Even when "closed," overtopping of tide still feeds ocean water into the lagoon during high tide (tide higher than berm height) (Cook 2015). Aliso Creek and Hidden Creek estuaries are also tidally influenced. The San Onofre and San Mateo estuaries have large sand bars that separate them from the ocean for most of the year. Occasionally, intense storm events can open the estuaries to the ocean. While they do not get as much tidal influence as the aforementioned estuaries, they do get salt intrusion from subsurface flow.

Headwaters for Camp Pendleton's HUs originate on the western slopes of the Peninsular Ranges. The Santa Margarita is the largest of these HUs and the Santa Margarita River flows southwesterly to the Pacific Ocean from the Palomar, Santa Ana, and Santa Margarita Mountains, and the Santa Rosa Plateau. The Santa Margarita HU drains Murrieta and Temecula Creeks (or the upper Santa Margarita basin), and Rainbow, Sandia and De Luz Creeks (or lower Santa Margarita basin).

San Mateo Creek, although smaller than the Santa Margarita River, is the next largest basin draining through Camp Pendleton. This creek also drains through nonmilitary land before flowing onto and through Camp Pendleton. Activities upstream of Camp Pendleton along both of these drainages create significant water quality and sedimentation issues for Camp Pendleton. The next two large creeks, San Onofre Creek and Las Flores Creek, are completely contained within Camp Pendleton. Las Flores Creek is formed less than a mile from the Pacific Ocean where Las Pulgas Creek and Piedra de Lumbre Creek converge.

Domestic water for Camp Pendleton is supplied by wells that extract groundwater from four of the five aquifers on Camp Pendleton. These aquifers or groundwater basins are composed of saturated deposits of alluvium overlying impervious bedrock. Camp Pendleton produces domestic, agricultural, and industrial water from groundwater aquifers, which are recharged by percolation from overlying rivers and streams. The aquifers are also recharged through the exercise of the Base's water rights. The water rights allow the Base to divert Santa Margarita River water into percolation basins for recharge and into Lake O'Neill for storage, release, and

recharge. Unlike most other water systems in southern California, Camp Pendleton does not currently rely on imported water to meet the Base's water requirements. However, the Base does purchase approximately 100 acre-feet/year (12.3 hectare-meters/year) (less than 1 percent of the Base's water requirements) for use at San Mateo Point Housing near the northern boundary of the Base.

Santa Margarita River wells provide water to the Headquarters Area, Naval Hospital, Camp Del Mar, and all points in-between, representing about 73 percent of the total water consumed on-Base. The Las Flores Creek wells produce water for Camp Pulgas and Camp Las Flores, while the San Onofre Creek wells produce water for Camp Horno and Camp San Onofre. Camps Talega, Cristianitos, San Mateo, the San Onofre Housing and School, and the 51 Area Marine Corps Exchange complex are all served by wells from San Mateo Creek (MCB CamPen 1993). Production levels have remained below the safe yield limits determined for the four Basins.

For Camp Pendleton, safe yield has been calculated in two basic reports, the USGS report by Worts and Boss in 1954 and the Leedshill-Herkenhoff report in 1989. The USGS reports determined basic hydro-geologic information for Camp Pendleton, and the Leedshill-Herkenhoff report increased the USGS safe yield figures. Safe yield volumes from the Leedshill-Herkenhoff study were utilized for the current Camp Pendleton drinking water permit for the Santa Margarita (7,640 acre-feet/year [942.4 hectare-meters/year]) and Las Pulgas (700 acre-feet/year [86.3 hectare-meters/year]) groundwater basins (Worts and Boss 1954).

3.1.4.2 Precipitation and Runoff

Since 2014, local weather data on Camp Pendleton have been collected at the six RAWS units noted in Section 3.1.1; these units have replaced most of the older, less reliable weather stations. Precipitation records dating back to July 1876 for the lower area of Camp Pendleton from the Lake O'Neill weather station reveal an average of 13.84 inches (35.15 centimeters) of precipitation per year, with a minimum of 4.51 inches (11.45 centimeters) and a maximum of 38.23 inches (97.10 centimeters). In the mountains at Case Springs at 2,300 feet (701 meters) elevation, the 1965 to 2005 records indicate an average of 21.86 inches (55.52 centimeters) per year, with a minimum of 6.08 inches (15.44 centimeters) and a maximum of 50.42 inches (128.07 centimeters). Table 3-2 shows precipitation data from weather stations located throughout Camp Pendleton.

The potential for large floods on Camp Pendleton is particularly high because of the extreme variability of precipitation and runoff. Successive soil-saturating storms in early 1993, combined with intense rainfall (6.8 inches [17 centimeters] in 24 hours) in the upper watershed, led to record flooding in the Santa Margarita River on 16 January. At the damaged gauging station at

Table 3-2
Precipitation Data from Camp Pendleton Weather Stations

Weather Station	Maximum Precipitation Year	Amount (inches/ centimeters)	Minimum Precipitation Year	Amount (inches/ centimeters)	Years of Record	Year of First Record
Lake O'Neill	1992-93	38.23 / 97.10	1960-61	4.51 / 11.46	132	1876
Case Springs	1968-69	50.42 / 128.07	2001-02	6.08 / 15.44	43	1965
San Mateo	2004-05	39.15 / 99.44	1960-61	5.38 / 13.67	51	1957
Cristianitos	1997-98	33.75 / 85.73	2001-02	4.87 / 12.37	26	1982
Las Flores	2004-05	20.54 / 52.17	2001-02	3.46 / 8.79	24	1984
Ammo Dump	2004-05	29.78 / 75.64	2003-04	7.51 / 19.08	6	2002
Target Range 408	1997-98	26.51 / 67.34	2001-02	3.39 / 8.61	13	1995
Talega	2004-05	26.20 / 66.55	2003-04	7.46 / 18.95	6	2002
Oceanside Pumping Plant	1977-78	29.90 / 75.95	1960-61	4.37 / 11.10	64	1950

[a] Precipitation Year runs from 1 July to 30 June of the succeeding year.

Ysidora, the estimated peak discharge of 44,000 cubic feet per second (cfs) was the highest in 68 years of record keeping, exceeding the previous record (16 February 1927) by about 12,000 cfs or 34 percent (Bowers 1993).

The variability in annual runoff for the major streams on the Base can be seen by reviewing the minimum, maximum, and average flows recorded in the annual hydrologic records maintained for each gauging station on or near Camp Pendleton (Appendix F). A discontinuous collection of flow data, however, hinders the accuracy of some of these historical records.

Peak discharges will likely increase in future years due to the effects of expanded urbanization in the upper watershed. Since the Leedshill-Herkenhoff 1989 study, the Base reexamined these 100-year flow computations, particularly during the design of the levee and bridge project that was constructed from 1998 to 2001 to protect MCAS CamPen and the 22 Area Industrial Complex. The 100-year design was initially computed to be 57,000 cfs but a severe storm in 1998 caused a revaluation of the river's hydrologic characteristics resulting in an increase in the estimation of the 100-year flow to 64,000 cfs.

During the summer months and periods of extreme drought, the frequency of extremely low flows within unregulated streams is particularly high throughout Camp Pendleton. It is not unusual for the San Mateo, San Onofre, and Los Flores Creeks to be dry from July through October. Historical data show that the Santa Margarita River fails to flow to the ocean approximately 25 percent of the time (Leedshill-Herkenhoff 1989).

3.1.4.3 Floodplains and Surface Waters

Camp Pendleton completed several hydrologic and hydraulic studies of the major stream systems on-Base. The Santa Margarita River study was completed in July 2000 and studies for the Las Flores, Horno, Aliso, San Mateo and San Onofre Creeks were completed during 2004. These studies determined the flow rate that would predict 100-year flood conditions for each of the major streams on-Base (Table 3-3).

Table 3-3
Flow Rate Predicting 100-Year Flood Conditions for Major Drainages on Camp Pendleton

Drainage	100-year flow (cfs)	Author/Date
Santa Margarita River	64,000	WEST Consultants 2000
Aliso Creek	2,659	WEST Consultants 2004
Las Flores Creek	7,803	WEST Consultants 2004
Horno Creek	1,404	WEST Consultants 2004
San Onofre Creek	14,158	URS 2004
San Mateo Creek	56,697	URS 2004

Source: MCB CamPen 2012

In the winter of 1978, severe channel-bed scour to a depth of at least 10 feet (3 meters) below the riverbed of the Santa Margarita River removed one of the Basilone Road bridge footings during a 21,200 cfs flood (Chang and Stow 1988). Before the January 1993 flood, it was predicted that the existing bridges at Basilone Road and Stuart Mesa Road would be overtopped by a 100,000 cfs flood and that a nondamaging flood would have to be less than 11,000 cfs (Leedshill-Herkenhoff 1989). The 1993 flood was computed at 44,000 cfs at Ysidora and represented a 62-year flood event. The flow destroyed the bridge at Basilone Road and damaged the Stuart Mesa Road Bridge.

Damage was exacerbated as a result of the early 1993 storms noted above, because immense amounts of sediment and debris, estimated at 300,000 cubic yards, largely from off-Base sources, were deposited on the wide, flat floodplain of the Santa Margarita River, as the flood passed through Camp Pendleton (California RWQCB 1993). In addition to the loss of bridges, railroad tracks were washed out and the Air Station was severely impacted by sedimentation. Drinking water quality was in question as a result of the flood's impact on the water supply wells

within the floodplain and some of the sewage treatment plants were flooded and oxidation ponds destroyed.

Concern has been raised about the possibility of more frequent and damaging flood events occurring on-Base as a result of increased upstream urbanization in the Santa Margarita watershed. Previous damaging floods have occurred at Camp Pendleton in 1951–52, 1956, 1968–69, 1978, and 1980 (Leedshill-Herkenhoff 1989).

While three major dams, at Vail Lake, Skinner, and Diamond Valley Reservoirs, are located far upstream in the Santa Margarita watershed, Camp Pendleton has only a low-flow impoundment on this river that is used to divert water to Lake O'Neill and off-channel recharge ponds. Lake O'Neill, a small lake constructed across Fallbrook Creek in 1883, was historically used primarily to store water for farm irrigation. After the Base was purchased, the operation of the lake continued, but now the water is released to recharge downstream aquifers that are used to provide the majority of the Base's water supply. An additional use of the water, before being released, is providing recreational benefits to the Marines. The capacity of the reservoir is 1,200 acre-feet (148 hectare-meters), with its sources supplied by the Santa Margarita River (through the O'Neill Ditch diversion), Fallbrook Creek, and rainfall/runoff.

In addition, small ponds are located throughout the Base, including Case Spring Ponds and Pulgas Lake (within San Onofre HA); Broodmare Ponds, Pilgrim Creek Pond, and Windmill Lake (within the Lower San Luis HA); and Wildcat Ponds/India Ponds and Lake O'Neill (within Ysidora HA) (see also Section 3.2.1 for additional discussion on perennial water bodies).

3.1.4.4 Water Quality, Supply, and Use

Water Quality

Water quality has always been a high priority for Camp Pendleton since nearly all of the drinking water consumed by the Base is drawn from local aquifers. The Camp Pendleton Requirements (MCB CamPen 2016) include potable water requirements. The quality of Camp Pendleton's drinking water generally meets the State of California and federal health-related drinking water standards.

Upstream users can affect the water quality of surface waters on-Base since Camp Pendleton is the last water user on the extensive Santa Margarita River system and San Mateo Creek. River Nutrient levels in the Santa Margarita, particularly nitrogen, have been observed to be above the Water Quality Objective in the last few years (Stetson 2010). This increase may be due in part to intensive agricultural use of fertilizers in the upper watersheds. In addition, the dramatic

expansion of residential, commercial, and industrial development during the past decade in the upper part of this drainage has produced more urban runoff and wastewater discharge, and may also be responsible for the increase in nutrient levels. However, surface waters are not used as a potable water supply for the Base (Stetson 2010).

In the past and continuing today, water samples are collected on-Base and upstream from the Base within all watersheds, but especially from the Santa Margarita River and San Mateo Creek watersheds. These data are used as part of Camp Pendleton's water quality monitoring program and support the Base's efforts with off-Base organizations and regulatory agencies, and as part of cooperative agreements to reduce the levels of contaminants that reach the Base in surface waters.

There is always concern about potential seawater intrusion into the Base wells resulting from water extraction exceeding the safe yield of the individual basins. For instance, by 1952, the Ysidora Narrows well in the Santa Margarita River basin showed evidence of seawater advance as far as 3 miles (4.8 kilometers) upstream due to pumping in the basin (California Department of Water Resources 1956). However, frequent monitoring and extraction control of key sentinel wells appear to have helped prevent such contamination from occurring in recent years. By maintaining a 5-foot (1.5-meter) static water level at this critical well site, seawater intrusion has apparently been avoided (Leedshill-Herkenhoff 1989).

Excessive levels of sediment, particularly in the Santa Margarita River, is another water quality issue confronting the Base. Until the 1993 flood, studies had predicted that the Santa Margarita would be a low sediment producer due to its lower average rainfall and higher percolation rates compared to other large rivers in the region (Brownlie and Taylor 1981). In January 1993, intensive rainfall in the headwaters, combined with over 5,000 acres (2,023 hectares) of bare ground from unfinished and unprotected construction sites upstream, helped yield a river of virtually "liquid sandpaper" which scoured channels and left 4- to 8-foot (1.2- to 2.4-meter) deposits of sand and gravel in the Camp Pendleton floodplain and estuary, despite several upstream dams trapping sediment (California RWQCB 1993; Bell 1993).

Soil and groundwater contamination has been detected at various locations on-Base. In 1989, Camp Pendleton was placed on the National Priorities List for cleanup of hazardous waste. Contamination from solvents, metals, petroleum, and other wastes were released on-Base by past waste handling and disposal practices. A cleanup program is currently in operation, and groundwater monitoring indicates that contamination has not migrated to groundwater supplies at concentrations in excess of California drinking water standards at any location, nor has it migrated off-Base (Battelle 2006). See Section 2.4.1.9 for additional details.

Water Supply and Use

Camp Pendleton's domestic and industrial water supply is produced from underground aquifers that are recharged by percolation from overlying rivers and streams. Unlike most other water systems in southern California, Camp Pendleton does not currently rely on imported water and only purchases less than 1 percent (100 acre-feet/year [12.3 hectare-meters/year]) of the Base's total annually, for use in the San Mateo Point Housing area. Additionally, the State Parks lease area is supplied potable water by the South Coast Water District and therefore is not dependent upon Base groundwater supplies. Santa Margarita River wells provide water to the Headquarters Area, Naval Hospital, Camp Del Mar, and all points in between, representing about 65 percent of the total water consumed on-Base. The Las Flores Creek wells produce water for Camp Pulgas and Camp Las Flores, while the San Onofre Creek well produces water for Camp Horno and Camp San Onofre. Camps Talega, Cristianitos, San Mateo, the San Onofre Housing and School, and the 51 Area Marine Corps Exchange complexes are all served by wells from San Mateo Creek (MCB CamPen 1993). Agricultural wells have historically supplied raw water for irrigation of leased sites on-Base at an average of 1,760 acre-feet/year (217 hectare-meter/year). Agriculture in the northern portion of the Base was discontinued toward the end of 2005 and agriculture in the southern portion was discontinued at the end of 2010. Since then, no land has been leased for agricultural purposes.

Since complete well production records began in 1944, base-wide total annual water use has ranged from a low of 5,850 acre-feet (722 hectare-meters) (1991) to a high of 9,891 acre-feet (1,120 hectare-meters) (2000), with a total annual average use of 8,531 acre-feet (1,052 hectare-meters). Military consumption represents an annual average of 6,398 acre-feet (798 hectare-meters) (65 percent of the total 2000 average annual use). Fluctuation in use is related to water conservation efficiency during drought years, troop mobilization levels, water system leaks, crop water needs, and other factors.

3.1.5 Wildland Fire

Fire has a critical influence on the biological structure, composition, and health of Camp Pendleton's landscape and vegetation communities. It can play a positive, even necessary, role in the maintenance of native vegetation, natural community structure, and training land capability. Fires can create a mosaic of seral stages within a particular vegetation community that promotes habitat diversity and stand sustainability, and can reduce hazardous fuel loading.

Vegetative, topographic, and climatic factors in the region have also favored fire since the emergence of the Mediterranean climate after the end of the Pliocene Epoch (approximately 2.6 million years before present) (Axelrod 1988). Semiarid Mediterranean climates like that of Camp

Pendleton are some of the most fire-prone environments in the world (Lawson and Goodman 2014). During the winter, rain promotes vegetative growth, and then in the summer, drought dries the vegetation and creates a high fire risk (Keeley et al. 2012). The fire season begins several months after plants have stopped growing and the live fuel moisture has dropped (Dennison and Moritz 2009; Minnich 2006; Sugihara et al. 2006). However, large fires can occur at any time given the correct rainfall, wind, and humidity conditions (Keeley and Fotheringham 2003). Therefore, the coastal southern California fire season is year-round (Lawson and Goodman 2014).

However, an unnaturally high fire frequency and burned area severity can permanently change the vegetation type (type conversion) of a given site by reducing shrub cover and allowing invasive plants to invade, reducing it to an earlier and irregular seral stage. This process is then exacerbated with the addition of ground disturbance activities, specific to the training mission of Camp Pendleton. The use of pyrotechnic devices and live-fire ammunition during training creates an additional risk of increased fire occurrence relative to other areas of southern California and even the country. It is this combination of a fire-prone southern California landscape with the unlimited ignition potential from military training activities that gives rise to, and justification for, a very high level of natural resources management with subsequent fire management and planning. These circumstances have resulted in a fire frequency at some locations on Camp Pendleton higher than in other areas in southern California (MCB CamPen 1998).

Peak fire conditions at Camp Pendleton, as a factor of fuels, weather, topography, and ignition potential, typically occur from May through November. Extreme fire conditions will persist when strong, hot, dry Santa Ana winds blow over vegetation with critically low live fuel moisture levels. The Base's topography intensifies the problem because the northeast-southwest-trending canyons can pull marine air inland each day as land surfaces warm, creating up-canyon winds. At night, when temperatures cool, the breezes are pulled back down-canyon and seaward. Compared to inland portions of California, the fire hazard (in the coastal region of Camp Pendleton) is generally lower in the summer because winds typically originate from the ocean and are moisture laden (Steinitz 1996).

Fire mapping is primarily conducted by contracted aerial photo flights. The digitized fires from aerial photos are used to determine the perimeter of a fire in conjunction with other data collected by the LMS Fire Management Program, such as size, zones, weather, behavior, type, source, cause of ignition, and point of ignition. LMS maintains GIS-based fire records from 1973 to the present; however, to improve fire occurrence tracking and understanding, an annual wildland fire mapping project was established in 1997.

Since 1973, an average of 12,000 acres (4,856 hectares) per year of land on Camp Pendleton has burned according to Space and Naval Warfare Systems Control (SPAWAR) and Conservation Biology Institute (2012). The frequency of fire is influenced by three factors: presence of frequent ignition sources from weapons firing, explosions, utility lines, and pyrotechnic devices; biological and climatic conditions conducive to fire in the late summer and fall; and large areas of open space with abundant vegetation (i.e., fuel). From 1996 to 2013, the trend of prescribed burns on-Base steadily decreased while the wildfire trend increased. From 2013 through 2015, 95 percent of the total fires on Camp Pendleton were wildfires and 5 percent were prescribed burns (Table 3-4). This is due to conducting prescribed burns only within prescriptions in the prescribed burn plan, such as wind speed and fuel moisture. During the 2013 through 2015 time period, 78 percent of ignitions were related to the mission (e.g., firing weapons and explosions), 10 percent were caused by utilities, 6 percent by recreational activities, and less than 1 percent by natural causes. Although the number of mission-related ignitions was larger than all other causes, the average area burned by utilities-related fires was greater. This was primarily because of an extremely large area (20,988 acres; 8,494 hectares) burned in 2014 from utilities-related ignitions. In 2015, the areas burned by utilities-related ignitions were reduced to 2,054 acres (831 hectares).

Table 3-4
Wildland Fires (2013–2015)

Cause	Number of Ignitions	Average Ignitions	Number of Acres/Hectares	Average Area
Mission	392	78%	26,595 / 10,763	49%
Utilities	48	10%	25,460 / 10,303	47%
Prescribed Burn	27	5%	1,502 / 608	3%
Recreation	32	6%	377 / 153	<1%
Natural	2	<1%	<1 / <1	<1%
Total	501	100%	53,934 / 21,826	100%

Source: MCIWEST-MCB CAMPEN Annual Wildland Summary, 2013–2015

Most of the fires on Camp Pendleton have had a moderate fire danger rating, although some of the fires have been rated high, very high, or even extreme danger. Grass and forb-dominated vegetation types generally have the lowest fire severities, whereas open scrublands may have intermediate severity fires, and dense coastal sage scrub and chaparral often have the highest severity fires (Tierra Data Systems 2005).

A majority of the environments that burn are perennial grasslands and coastal sage scrub. From 2005 through 2012, 43,156 acres (17,465 hectares) of perennial grasslands burned and 42,677 acres (17,271 hectares) of coastal sage scrub habitat burned. The burned land overlaps the habitats of several threatened and endangered species, including arroyo toad, coastal California

gnatcatcher, thread-leaved brodiaea, least Bell's vireo, Riverside fairy shrimp, Stephens' kangaroo rat, and southwestern willow flycatcher.

An essential component of fire prevention is fuels management. The management of fuels is in three forms: prescribed burns, firebreaks, and mowing to prevent fires. Pre-suppression fuels management involves the maintenance of defensible space, firebreaks, and fuel breaks to limit or slow the spread of fire. The Base has established an extensive current network of firebreaks and fuel thinning zones, totaling over 180 linear miles (290 kilometers). Firebreak locations and requirements are periodically reviewed and are eliminated from the network if considered unnecessary by the Camp Pendleton Fire Department (CPFD). LMS monitors the firebreak system closely and makes recommendations to the Facilities Maintenance Department (manage the firebreaks) concerning firebreak best management practices and status. Since 2012, approximately 7 linear miles (11 kilometers) of firebreaks have been taken out of the firebreak network with more being planned. All requirements for new firebreaks are reviewed through the NEPA process before they can be constructed on-Base.

Another important pre-suppression fuels management measure involves the use of prescribed burns. LMS and the CPFD submit an annual burn plan (a subset of the Wildlife Prevention Plan) to target high fuel areas that, if not treated, may cause significant wildfires.

Fire suppression occurs year-round throughout Camp Pendleton as needed. Fire suppression activities include fire line construction, backfires, direct suppression, and "mop-up" activities. Where possible, fire vehicles use existing roads or firebreaks; however, suppression actions may include driving off-road, including over burned areas. Past fire patterns indicate the location of the majority of the fire suppression activity on-Base. Due to the frequency of these fires and subsequent suppression activities, LMS provides qualified Resource Advisors to meet natural resources objectives such as reducing fire in coastal sage scrub. The Resource Advisor also proposes Fire Department Minimum Impact Suppression Tactics in sensitive areas.

In many cases, existing paved and dirt roadways can be used as firebreak lines to contain a wildland fire. The location of vulnerable habitats or listed species is considered when carrying out all forms of fire suppression actions, especially if an area is to be bulldozed or hand-cut for a fire line. CPFD personnel collaborate with the Resource Advisor when regulated natural resources may be affected by suppression activities. The Resource Advisor responds to such calls and provides guidance to the Incident Commander on avoidance and minimization of impacts to identified natural resources. Fires of 5 acres (2 hectares) or larger are mapped for historical reference. As of 2010, all Points of Ignition have also been determined and mapped by the Fire Ecologist.

The CPFD is responsible for the operations piece of wildland fire management; they have the equipment and personnel to suppress the wildfires. Fire suppression is conducted on-Base using in-house resources with additional cooperative support from local and regional firefighting agencies. In-house firefighting resources include 10 standard wildland firefighting vehicles (5-ton, six-wheel drive), 10 light attack vehicles (High Mobility Multipurpose Wheeled Vehicle [HMMWV] and/or four-wheel-drive pickup trucks mounted with water tanks), two water tenders (10-ton, six-wheel drive), and four D-8 or equivalent military bulldozers. Cooperative resources include air tankers, helicopters, hand crews, fire engines, and bulldozers.

The CPFD has cooperative resource agreements in place with U.S. Forest Service (USFS), California Department of Forestry, and Orange County and San Diego County firefighting agencies to effectively support suppression actions on-Base. However, these resources are not always available due to their commitment to other regional fire activities taking place at the time of request.

3.2 BIOLOGICAL ENVIRONMENT

Southern California is one of the most biologically diverse regions in the continental United States. It supports a variety of habitat types and contains the greatest number of plant and wildlife species in the nation identified by the federal government as threatened or endangered (Dobson et al. 1997). Natural resources on Camp Pendleton reflect the rich diversity of species and habitat types formerly present within the region. The great diversity and abundance of plant and wildlife resources on Camp Pendleton provide many ecological, aesthetic, recreational, and military values to the Base, its residents, and the general public.

This section provides an introduction to the diversity of plant and wildlife species (including descriptions of federally listed threatened and endangered species) found on Camp Pendleton. Broad plant communities and unvegetated habitats are also introduced in this section. This section also includes a discussion of the importance, and present situation, of landscape linkages and corridors relative to Camp Pendleton.

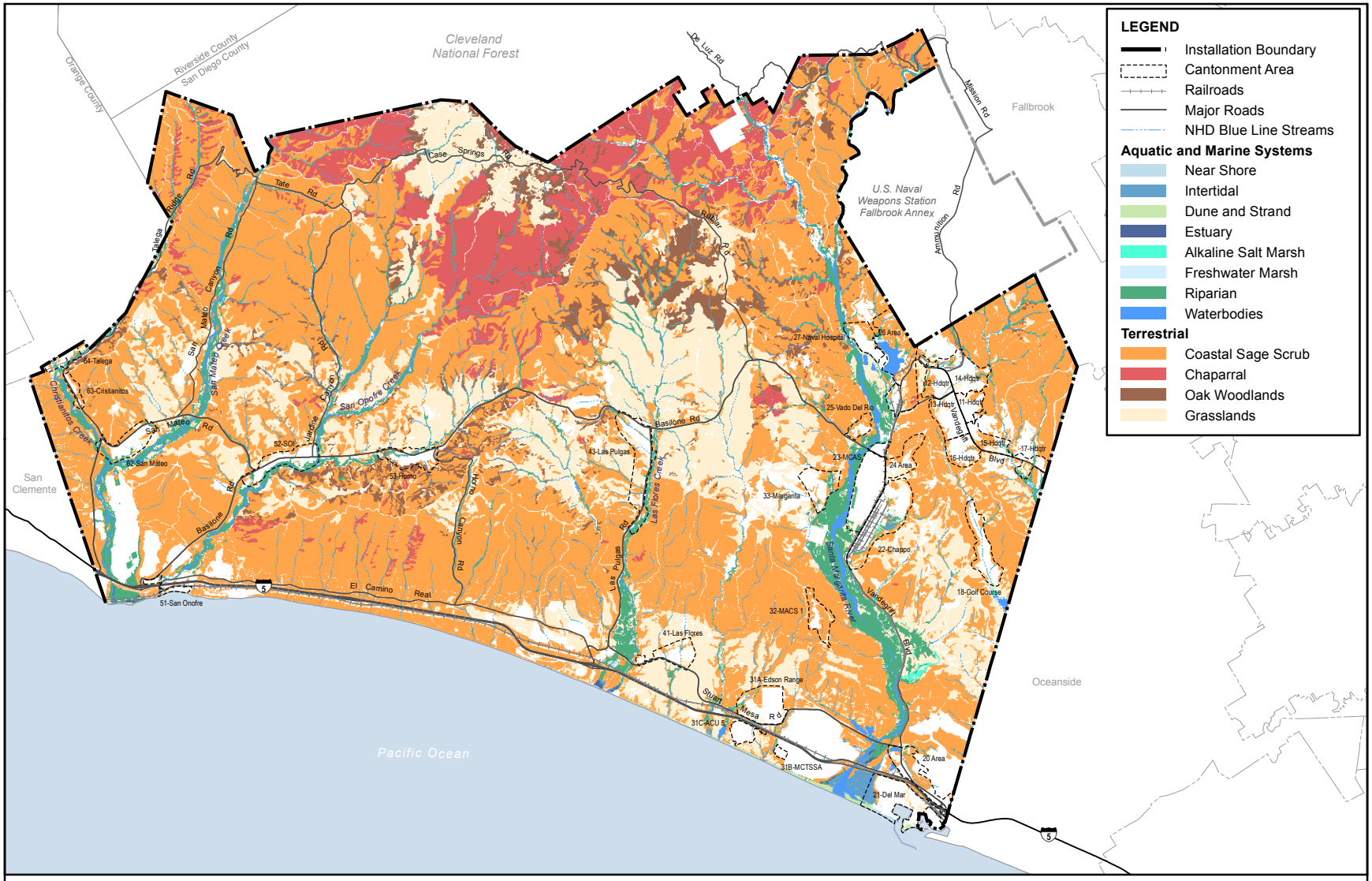
Nomenclature used for plants within this document follows the "*Checklist of the Vascular Plants of San Diego County*" 5th Edition) (Rebman and Simpson 2014) (unless state or federally listed under an alternate name). Nomenclature used for plant communities and unvegetated habitats within this document generally follows the *Draft Vegetation Communities of San Diego County* (Oberbauer et al. 2008 [based on "Preliminary Descriptions of the Terrestrial Natural Communities of California," Robert F. Holland, Ph.D., October 1986]). Nomenclature used for amphibians, birds, mammals, and reptiles within this document follows the California Wildlife Habitat Relationships System (CDFW 2015a) and the California Natural Diversity Database

(CDFW 2015b) (unless state or federally listed under an alternate name). References to base-wide survey efforts assume exclusion of restricted areas (i.e., Quebec, Whiskey, and Zulu impact areas for safety reasons) and, depending upon the species, may assume efforts were focused within areas of potential habitat (e.g., surveys for beach species are conducted within beach habitats).

3.2.1 Ecosystems

Camp Pendleton views the management of its natural resources using an ecosystem approach. Supporting this approach, Camp Pendleton has identified two major ecosystems: the Terrestrial Upland Ecosystem and the Wetland, Aquatic, and Marine Ecosystem. In taking this approach, Camp Pendleton recognizes the following biological principles: (1) ecosystems are dynamic by nature; (2) the functioning of ecosystem components operates at different rates; (3) all components are interrelated, especially the human component; (4) the ecosystem is a complex, dynamic system functioning as a whole, not as a collection of parts; and (5) ecosystem integrity may be disrupted by excessive "interference" of any single component.

The two primary ecosystems are composed of the primary vegetation communities and unvegetated habitats that are summarized in Table 3-5 and depicted in Figures 3-4a and 3-4b. Numerous subtypes of these broad vegetation communities are recognized on Camp Pendleton and more detailed descriptions of these different cover types are provided in Appendix G. Vegetation distribution within vegetation communities is primarily determined by climate, available moisture, and substrate. Thus rainfall, temperature, soil type, topographic position, and elevation are all important predictors of vegetation. All of these vary substantially on-Base because of its coastal location, diverse geology, and pronounced topography. These characteristics allow for a diverse inventory of native plant and wildlife species, with 1,015 plant species (Appendix H) and 559 wildlife species (Appendix I) known to occur on-Base as of 2016. Elevation on-Base ranges from sea level to 3,189 feet (972 meters). Annual precipitation is lowest at the coast, around 10 inches (25 centimeters) average, increasing to the east to a high of 24 inches (61 centimeters) near Case Springs. Most rain, 70 percent, falls from February through March. Temperature varies from the low 100s (°F) in summer to just below freezing in some areas during the winter, with mean temperature decreasing with elevation (Zedler et al. 1997).

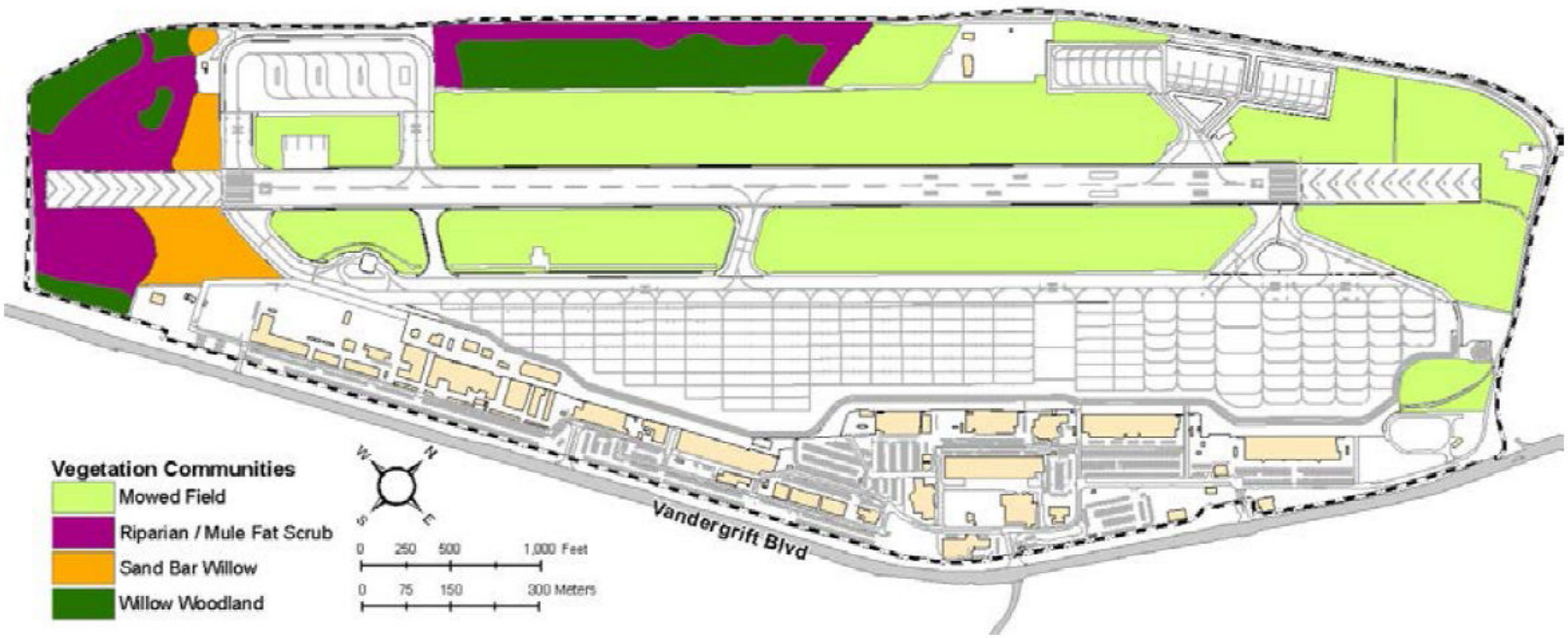


Source: Marine Corps Base Camp Pendleton

3 0 3 Miles

Scale: 1:190,080; 1 inch = 3 Miles

Figure 3-4a
Plant Communities
MCB CamPen



Source: Marine Corps Air Station Camp Pendleton 2013 INRMP.

Scale: Not to Scale

Figure 3-4b
Plant Communities
MCAS CamPen

Table 3-5
Ecosystems and Associated Plant Communities and Unvegetated Habitats

Terrestrial Upland Ecosystem	Wetland, Aquatic, and Marine Ecosystem
Coastal Sage Scrub	Nearshore
Chaparral	Intertidal
Oak Woodlands	Dune and Strand
Grasslands	Dune Wetland
	Estuary
	Stream
	Alkali Marsh
	Freshwater Marsh
	Riparian
	Waterbodies
	Vernal Pools

The two primary ecosystems are managed through various actions and management plans as described below. Existing species management plans are included in Appendix J; others are in preparation and will be appended to this INRMP when complete as part of the annual INRMP review process (see Section 5.5 for annual process).

3.2.1.1 Ecosystem Management

Terrestrial Upland Ecosystem Management

The emphasis of Terrestrial Upland Ecosystem management is on managing threatened and endangered species and their habitats to assist in the conservation and recovery of those species, while not constraining the ability of operational commands to accomplish established military training requirements. The Base manages threatened and endangered species primarily through management plans such as the Stephens' Kangaroo Rat Management Plan (draft plan in progress) and the Pacific Pocket Mouse Management Plan (draft plan in progress). In addition, management activities also focus on preserving valued plant communities such as coastal sage scrub, oak woodlands, and native grasslands by mapping, monitoring, and treating invasive plant species, and also implementing actions to reduce fire and erosion thereby minimizing undesired type conversion.

Wetland, Aquatic, and Marine Ecosystem Management

Management of Camp Pendleton's Wetland, Aquatic, and Marine Ecosystem is covered by two conservation plans, as discussed below.

Estuarine and Beach Ecosystem Conservation Plan

The Base's Estuarine and Beach Ecosystem Conservation Plan (Appendix K) is designed to sustain and enhance Camp Pendleton's natural resources along its coastline with an emphasis on dune systems and their connecting strands, coastal lagoons, and the Santa Margarita River estuary. This includes conservation of listed species and their associated habitat, and maintaining and enhancing the functionality and biodiversity of the estuarine community. The conservation plan focuses on protecting and maintaining California least tern (*Sternula antillarum browni*) and western snowy plover (*Charadrius nivosus nivosus*) nesting areas and protecting the tidewater goby (*Eucyclogobius newberryi*) and designates specific management zones along the coastline for these purposes. These management zones are summarized below (see Appendix K for additional details):

- Santa Margarita River Management Zone – This zone includes the beach area extending from the southern edge of White Beach (Military Grid Reference System [MGRS] Coordinate 594795) to the southern end of the Santa Margarita River estuary delineated by the dirt access road running seaward at the southern edge of the estuary (MGRS Coordinate 621758). This management zone encompasses the Cocklebur Creek outlet and the Santa Margarita River estuary extending east to Stuart Mesa Bridge. Per the USFWS Riparian and Estuarine/Beach Biological Opinion (1-6-95-F-02) (Riparian BO) (USFWS 1995), this management zone excludes the White Beach and French Creek breeding sites utilized by least terns and snowy plovers. However, these breeding areas are nevertheless protected by fencing, signage, monitoring, and predator control. No protection is provided to foraging areas along the beach at White Beach and French Creek for snowy plovers; however, the French Creek lagoon in this area is virtually off-limits to Base activities and does provide forage utility.
- Other Management Zones – Habitats for listed species within the coastal lagoon systems of French, Aliso, Las Flores, San Onofre, and San Mateo Creeks.

Within the land areas designated as management zones, programmatic instructions and impact minimization measures (e.g., fencing, signage, predator and exotic species management, and salinity/tidal conditions monitoring) are enforced to protect these areas from permanent intrusion or adverse effects that would disrupt the balance that has been achieved between Marines pursuing training activities and threatened and endangered species residing in these areas.

One of the programmatic instructions identified for these zones is to implement the dune restoration plan that was developed for Camp Pendleton by The Nature Conservancy (1994a, 1994b). The guidance developed by The Nature Conservancy focuses on the dune system in the vicinity of the Santa Margarita estuary.

To enhance functionality and biodiversity, the Estuarine and Beach Ecosystem Conservation Plan requires the Base to restore the dune system, via invasive plant removal, and to monitor the dune plant communities every 5 years. It also guides the Base to protect rare dune plants. Restoring dune habitat within species nesting area supports the goal of the Estuarine and Beach Ecosystem Conservation Plan to maintain the ecosystem's ability to support listed species.

Riparian Ecosystem Conservation Plan

Other plant communities and unvegetated habitats that are part of the Wetland, Aquatic, and Marine Ecosystem are managed through the Base's Riparian Ecosystem Conservation Plan (Appendix L). The primary purpose of this conservation plan is to manage fish and wildlife resources in riparian areas, and the management actions identified are designed to sustain and improve the biological diversity of the riparian ecosystems on-Base. A stated goal regarding habitat management is to enhance riparian ecosystem value through the eradication of exotic plant communities and promotion of successional stages of riparian scrub and woodland habitats. The philosophy behind this goal is to remove giant reed (*Arundo donax*), also called arundo, and tamarisk (*Tamarix ramosissima*), also called salt cedar, to restore riparian ecosystem dynamics, such that natural plant and animal communities on-Base are sufficiently resilient to withstand the array of disturbances and incursions occasioned by military training activities. To date, 1,300 acres (526 hectares) of arundo and tamarisk have been removed and these areas are passively recovering as evidenced from the riparian habitat monitoring program and the increase in least Bell's vireo. Several active riparian restoration projects have been conducted in areas that were not naturally recovering. The components of the Riparian Ecosystem Conservation Plan, particularly compliance with programmatic instructions and execution of management programs, are anticipated to offset current and planned training requirements and infrastructure maintenance activities. In the case of major construction projects, the conservation plan is supplemented by additional measures established in the reasonable and prudent measures, and terms and conditions of the Riparian BO (USFWS 1995) (Appendix M) that covers the plan. The Base has stated its commitment to achieving these goals through active management programs (see Chapter 4).

The Riparian Ecosystem Conservation Plan has an established set of "programmatic instructions" to avoid and/or reduce and minimize adverse impacts to the ecosystem. Military training and facilities' maintenance units follow the guidance given in the programmatic instructions such as scheduling activities outside of the breeding season, if feasible, or selecting construction sites that would impact the least amount of riparian habitat possible to avoid incidental take and adverse impacts. When adverse impacts cannot be avoided, the Base offsets species/habitat loss of value and function through a habitat enhancement program. Camp Pendleton also monitors habitat and species populations, conducts predator control, and/or

conducts other management actions, as appropriate, and thereby establishes "baselines" from which to track progress toward goals.

To provide for proper management of fish and wildlife, the Riparian Ecosystem Conservation Plan identifies benchmarks for monitoring and evaluating the integrity and functioning of the ecosystems aboard Camp Pendleton. Specific habitat and species goals were established in consultation with USFWS and aim at contributing to threatened and endangered species recovery. The conservation plan also provides for adapting management objectives and strategies, as needed, to meet changing circumstances and requirements that may be identified through periodic assessments.

Accurate and current data regarding riparian species and habitat status and trends are critical to sound management, and species and habitat monitoring is important toward meeting the management goals identified in the Riparian Ecosystem Conservation Plan. Goals that riparian species and habitat monitoring support include (1) updating the inventory of riparian habitat approximately once every 5 years (frequency dependent upon circumstances and as mutually agreed to); (2) achieving greater biological diversity and distribution of sensitive species populations in the San Mateo, San Onofre, and Las Flores drainages; and (3) establishing self-sustaining populations of listed species that require little human intervention for maintenance (see Appendix L for details and other goals). In addition, the Riparian Ecosystem Conservation Plan includes compensation procedures that consist of a "Compensation Bank," managed by PLN, to mitigate for habitat losses and other indirect adverse impacts as a result of Base activities. The Riparian Ecosystem Conservation Plan does not cover impacts to wetlands under the CWA. Wetland impacts under the CWA are covered under separate permits obtained from the U.S. Army Corps of Engineers (USACE) (see Section 4.2.6 for other drivers associated with the protection of wetlands).

3.2.1.2 Primary Ecosystem Plant Communities and Unvegetated Habitats

The focus of the following section is to describe the primary plant communities and unvegetated habitats aboard Camp Pendleton. However, additional notes regarding existing resource-specific management applicable to habitats are also provided.

Terrestrial Upland Ecosystem

The primary plant communities within the Terrestrial Upland Ecosystem (Table 3-5) are described below. These plant assemblages occur from just inland of the coastal bluffs to the higher elevations of the Santa Margarita Mountains. Because upland areas in southern California

are generally moisture-limited, receiving almost all of their moisture in the winter, terrestrial vegetation differs distinctly, functionally, and visually from season to season.

Coastal Sage Scrub

The coastal sage scrub vegetation on Camp Pendleton is subcategorized, although dominant species may vary by site. The Base GIS, which reflects vegetation mapping efforts from 2003 and 2005, indicates that the Base supports approximately 63,138 acres (25,551 hectares) of coastal sage scrub and its subtypes. Coastal sage scrub was originally the dominant vegetation in San Diego County. Today, nearly 70 percent of its original area has been lost and much of what remains exists in small patches of isolated habitat (City of San Diego 1998). It can be found mostly on south- and west-facing slopes, from Camp Pendleton to the lower slopes of Palomar Mountain and around Escondido, the San Pasqual Valley, El Cajon, and Jamul, to the area surrounding Otay Mountain. Coastal sage scrub habitat is important because it contains a variety of rare and endangered species (City of San Diego 1998). It is the primary breeding and foraging habitat for the coastal California gnatcatcher. Unlike chaparral, it is drought deciduous, dropping leaves and twigs as a strategy to survive the summer dry period.

Chaparral

Chaparral types are dominated by evergreen species with small, thick, leathery, dark green, sclerophyllous leaves and do not lose their usually softer, larger, and grayish-green leaves over the summer. Chaparral types tend to be most abundant at higher elevations, particularly above 3,000 feet (914 meters), where temperatures are lower and moisture supplies are more ample while coastal sage scrub types are more common at lower elevations where higher temperatures, lower rainfall, and a more pronounced summer drought exist. The Base supports approximately 9,074 acres (3,672 hectares) of chaparral subtypes.

Oak Woodlands

The primary woodland communities on Camp Pendleton are oak woodlands. Oak woodlands are one of the more important plant communities on Camp Pendleton and include either coast live oak (*Quercus agrifolia*) or Engelmann oak (*Q. engelmannii*) woodlands, or a mix of these species. The southern California coastal climate is not generally favorable to tree growth, but oaks are particularly well adapted to survival in difficult conditions. Even so, tree-sized oaks are common only where some factor ameliorates drought conditions. Live oaks are most abundant on north-facing slopes protected from the maximum intensity of the sun, in drainages and below rock faces or boulder-covered areas where runoff is concentrated, in areas of deep soil that can hold a moisture reserve through the summer, and at the higher elevations where it is cooler and

rainfall is generally more abundant. Rare summer rainfall drives the sprouting of Engelmann acorns and thus recruitment is episodic in nature.

Engelmann oak and coast live oak are drought-hardy and tolerant of fire. Both will resprout vigorously from the branches and the base when the crowns are severely burned or killed. Engelmann oak is a species restricted to southern California and adjacent Baja California. It is considered rare and though it is not in any immediate threat of extinction, its preservation is of special concern to land managers. Camp Pendleton contains one of the largest and healthiest populations in the region, with over 5,552 acres (2,247 hectares) mapped as this type. Coast live oak is the most widely distributed of the evergreen oaks. It is capable of achieving large size and great age and the widely spreading crowns of old, open grown trees are one of the distinctive features of the natural California landscape and especially of Camp Pendleton. Coast live oak occurs at the fringes of riparian woodlands, scattered in grassland or coastal sage scrub, and in solid stands on the north side of the front range, and as an element of Engelmann oak woodlands.

Oak woodlands are a unique resource that provides valuable military training opportunities for maneuver and concealment, and habitat for a suite of wildlife species. Statewide, over 330 species of birds, mammals, and reptiles utilize oak woodlands. Oaks may be the single most important tree for wildlife food and cover statewide. The differences in fire effects in the Base's oak woodlands are primarily a result of variations in fuel loading based on understory vegetation (oak litter, grass, or shrubs) and weather (higher elevations receive more rainfall).

Because both Engelmann oak and coast live oak are long lived, demographic patterns of reproduction, recruitment, and death can play out over periods longer than typical management horizons. Therefore, managing these species in the face of multiple threats including fire, invasive plant species, and changing climate is challenging. Long-term conservation and management strategies have been developed to enhance woodland persistence and associated ecological and military training values. The primary issues related to this community on the Base are whether recruitment is sufficient to maintain stand density and distribution; whether fire and invasive plants threaten persistence of the woodlands; and whether climate change threatens their survival through changing establishment, recruitment, or mortality rates.

Grasslands

There are two types of grasslands on Camp Pendleton, the purple needlegrass perennial grasslands and nonnative annual grasslands, and both are important features of Camp Pendleton. Grasslands occur on approximately 24,496 acres (9,913 hectares), or approximately 20 percent of the Base and 119 acres (48 hectares) or nearly 25 percent of the Air Station. The Air Station grasses are within the airfield clear zones and mowed regularly.

At Camp Pendleton, fine-textured soils of coastal terraces are largely covered with grassland, as are the rolling hills with deeper soils at higher elevations. Trees or shrubs mostly cover the rocky and thinner soils where moisture can penetrate to depth. Like most of southern California, introduced grasses and forbs are now major components of the vegetation found in grasslands, resulting in an increasing amount of nonnative grasslands occupying the Base.

Wetland, Aquatic, and Marine Ecosystem

The primary plant communities within the Wetland, Aquatic, and Marine Ecosystem (Table 3-5) are described below. These plant assemblages and unvegetated habitats occur along the coast from the nearshore to the coastal bluffs, and inland within and along stream courses, near riparian wetland areas, and within and around water bodies.

Nearshore

The nearshore is defined as an indefinite zone that extends seaward from the low tide line to and including the depth that supports canopy forming kelps given the proper substrate, usually 120 feet (37 meters) (Oberbauer et al. 2008). It defines the area where the current system is caused primarily by wave action. The nearshore provides a unique habitat for a variety of plants and animals. Sea grasses, such as eelgrass (*Zostera marina*), and other aquatic plants that grow in Camp Pendleton's nearshore waters provide food and shelter for many species of fish and shellfish. Eelgrass also occurs in the Del Mar Boat Basin. Eelgrass functions as a nursery area for many commercially and recreational important finfish and shellfish species, including those that are resident within bays and estuaries, as well as oceanic species that enter estuaries to breed or spawn.

Many marine organisms, including most commercially valuable fish species, depend on nearshore waters at some point during their development. Phytoplankton, algae, and canopy forming macroalgaes persist in the nearshore environment if there is suitable substrate. One species of flowering plant, surf grass (*Phyllospadix scouleri*) can occur in the nearshore zone (Oberbauer et al. 2008).

Intertidal

The intertidal zone is regularly inundated by the ocean; it is the area that includes the area exposed by low tide up to and including the spray zone (Oberbauer et al. 2008). Intertidal communities can be found on sandy beaches, in bays and estuaries, and along rocky shorelines. Organisms that live within the intertidal zone are constantly enduring regular periods of

immersion and emersion, essentially living both underwater and on land. As a result, intertidal organisms have adapted to a range of climatic conditions and must have the ability to cope with a wide range of temperatures and salinity levels. Characteristic vegetative species include algae and surf grass, although these areas are often unvegetated (Oberbauer et al. 2008).

Dune and Strand

Approximately 17 miles (27 kilometers) of undeveloped coastline exists within the borders of Camp Pendleton. The coastline is mostly a relatively narrow stretch of sandy beach lying below typically steep coastal bluffs and mesas. The bluffs have a very distinct type of coastal sage scrub called maritime succulent scrub. The limited area of natural coastline left in southern California makes the Camp Pendleton shoreline of special interest. The strand or beach is subject to wave action, and deposition and removal of sand and gravel. Foredunes are the first line of dunes subject to sand deposition, high winds, and salt deposition, but only rarely subject to wave action or overwash. Backdunes may be stable (not subject to deposition or erosion by the wind) or moving (having sand deposited or removed). Where cliffs face the ocean, the exposure to high-winds and high salt deposition creates coastal bluffs, another distinctive habitat with a distinct upland maritime coastal sage scrub plant community.

The dune and strand system on Camp Pendleton is rich in plant life and includes a unique set of species making up the southern foredune, backdune, and strand communities. The foredune community occupies the actively moving sand dunes. The strand community links the dune communities and is considered the beach. It is pure sand up to extreme high tide line, then slowly is stabilized by dune vegetation. Coastal dunes include the southern foredune, a sparsely vegetated community with plant cover ranging from 30 percent to 60 percent. On Camp Pendleton, this plant community is dominated primarily by beachbur (*Ambrosia chamissonis*; 10 percent to 30 percent cover), and populations of red sand verbena (*Abronia maritima*), and beach evening-primrose (*Camissonia cheiranthifolia* ssp. *suffruticosa*), which cumulatively account for 5 percent to 15 percent cover. On Camp Pendleton, this community is estimated to occupy less than 165 acres (67 hectares).

Per the Riparian BO (USFWS 1995), the Base monitors the dune systems through their Dune Habitat Mapping and Monitoring Project to classify dune vegetation; map dune plant communities; and determine vegetative cover, species distribution, and density. In 2007, the project was implemented over a representative 75-acre (30-hectare) area near the mouth of the Santa Margarita River. The results of the 2007 dune monitoring effort illustrated that the dune scrub habitat is expanding through natural colonization by indicator dune species. Dune scrub species are colonizing areas once mapped as beach habitat and ice plant (*Carpobrotus edulis*).

Dune habitat is often lost where natural coastal erosion processes remove portions of beach, foredune scrub, and other communities (RECON 2008).

The Base implements programmatic instructions and habitat enhancement measures specified in the Estuarine and Beach Ecosystem Conservation Plan (Appendix K) for the protection and management of dune and strand habitat. This includes conservation of listed species and their associated habitat, and maintaining and enhancing the functionality and biodiversity of the beach and strand community. Specific dune and strand enhancement activities have included removal of invasive plant species and associated thatch that adversely affect the growth and cover of native plants, followed by applying pure sand and seed of native species.

Dune Wetlands

Dune wetlands are formed when water seeps from the hardpan subsoil at the coastal bluffs and forms small wetlands on the strand and dunes that are classified as Palustrine Emergent Wetlands in the Cowardin system (Cowardin et al. 1979). Plants observed in these wetlands are cattail (*Typha* spp.), salty Susan (*Jaumea carnosa*), and salt marsh fleabane (*Pluchea odorata*).

Estuary

Camp Pendleton's estuarine and beach ecosystems include eight coastal lagoons and estuaries. This includes the Santa Margarita River estuary and the coastal lagoons located at Cocklebur, French, Aliso, Las Flores, San Onofre, Hidden, and San Mateo Creeks. The coastal communities receive the lowest average rainfall; however, they benefit from frequent fog and the moderating influence of the ocean, which reduces heat and moisture stress during the summer.

As previously noted, management of Camp Pendleton's estuaries is covered by the Base's Estuarine and Beach Ecosystem Conservation Plan (Appendix K), the primary purpose of which is to manage fish and wildlife resources in the estuarine and beach areas of Camp Pendleton. This includes maintaining and enhancing the functionality and biodiversity of the estuarine community, and the conservation of listed species dependent on this habitat through the designation of specific management zones (see Section 3.2.1.1). A primary goal in managing the complex of lagoons associated with the Santa Margarita River estuary and the coastal lagoons located at Cocklebur, French, Aliso, Las Flores, San Onofre, Hidden, and San Mateo Creeks is to maintain suitable habitat for the tidewater goby.

Stream

Freshwater streams, and their associated natural drainages, provide a unique habitat for aquatic organisms and vegetation within Camp Pendleton. Streams are communities that include benthic (bottom feeding) organisms and include the aquatic vegetation that has adapted to living in an environment where flowing water is constantly occurring. Management of freshwater streams is covered by the Base's Riparian Ecosystem Conservation Plan (Appendix L). Noteworthy streams on-Base include Talega Creek, San Mateo Creek, Cristianitos Creek, San Onofre Creek, Las Flores Creek, Horno Canyon Creek, Aliso Creek, French Creek, Hidden Creek, Cocklebur Creek, De Luz Creek, Roblar Creek, and Pilgrim Creek, and the Santa Margarita and San Luis Rey Rivers.

Alkali Marsh

The alkali marsh community is found where low freshwater influx and high evaporation rates combine to create alkaline soils. These areas typically have saturated soil or subsoil for much of the year and support plant species such as alkali-heath (*Frankenia salina*), pacific pickleweed (*Sarcocornia pacifi*ca), and western sea-purslane (*Sesuvium verrucosum*), which are tolerant of the alkaline conditions. In areas where surface soils are dry for much of the year, alkali marsh often co-occurs with the much more sparsely vegetated community, alkali playa. In these areas, salts have accumulated due to evaporation and often form a crust at the soil surface. The plant species composition is similar for these two communities and may include other halophytic species such as spreading alkali weed (*Cressa truxillensis*); however, the vegetation density is much lower for alkali playa. A representative area of alkali marsh and playa occurs in Ysidora Basin, where a large playa is fringed with alkali marsh. The width of the alkali marsh margin and the density of vegetation within the playa vary with annual fluctuations of water input and evaporation. A more inland area representative of alkali marsh occurs in Pueblitos Canyon, upstream of Vandegrift Boulevard and the confluence of this canyon with the Santa Margarita River.

Freshwater Marsh

The freshwater marsh community is found along stream courses and near riparian wetland areas. This vegetative community is dominated by perennial, emergent monocots up to 13–16 feet (4–5 meters) tall and often consisting of uniform, dense stands with closed canopies. Freshwater marsh occurs in wetlands that are permanently flooded by standing freshwater lacking a significant water current. Prolonged saturation of such areas permits the accumulation of deep, peaty soils. Characteristic species include cattails (*Typha domingensis* and *T. latifolia*), bulrushes (*Schoenoplectus* spp.), sedges (*Carex* spp.), and flatsedges (*Cyperus* spp.). Coastal freshwater

marsh communities occur in scattered locations along the immediate coast; in coastal valleys near river mouths; and around the margins of rivers, creeks, lakes, and springs. This community is now much reduced throughout its entire range due to urban and agricultural expansion, river channelization, and through the implementation of flood control measures. Representative areas of freshwater marsh on Camp Pendleton are common along most stream courses on the Base.

Riparian

The riparian ecosystems include approximately 8,200 acres (3,318 hectares), of the approximately 9,800 acres (3,966 hectares) of floodplain located on MCB CamPen. MCAS CamPen has approximately 47.5 acres (17 hectares) of riparian ecosystems. A high proportion (approximately 84 percent) of the riparian acreage on Camp Pendleton is still relatively intact, in comparison to the rest of coastal southern California, where more than 95 percent of the riparian habitat historically occurring has been lost to agriculture, development, flood control, channel improvements, and other human-caused impacts (Bell 1993).

The lower Santa Margarita River floodplain is approximately a mile (1.6 kilometers) wide in places and supports extensive riparian forest, woodland, and scrub habitats from the edge of the braided channel to the base of riverine terraces. The upper Santa Margarita River, from the confluence of Murrieta and Temecula Creeks (off-Base) to the lower floodplain, is contained within a gorge varying from less than 100 to over 1,000 feet (30 to 305 meters) in width. The Santa Margarita River is the most biologically intact riparian corridor remaining in southern California (USFWS 1995). Other areas on-Base that support riparian communities include the drainages of the San Mateo, San Onofre, Las Flores, Aliso, and French watersheds and portions of Pilgrim Creek (San Luis Rey watershed).

Riparian ecosystems contain a wide variety of plant communities (e.g., riparian woodlands, riparian scrublands, freshwater marsh, and open water/gravel) and occur in drainages, seepages, and riverine areas where water availability is high. Because upland areas in southern California are generally moisture-limited, riparian vegetation is distinctly different, functionally and visually, from that of the surrounding more xeric vegetation. In contrast to oak woodlands and sage scrub, riparian vegetation is dominated by winter-deciduous trees such as willows, cottonwoods, alders, and sycamores. At MCAS CamPen, the riparian areas include a willow woodland community dominated by several willow species (*Salix exigua*, *S. gooddingii*, and *S. laevigata*). Common understory species include mulefat (*Baccharis salicifolia*), Douglas mugwort (*Artemisia douglasiana*), and salt heliotrope (*Heliotropium curassavicum*).

Management of Camp Pendleton's riparian communities is covered by the Riparian Ecosystem Conservation Plan (Appendix L). This conservation plan is designed to manage fish and wildlife resources in riparian areas. This plan addresses long-term requirements of the riparian resources

with a programmatic manner; i.e., habitat management actions are to be planned and evaluated in the context of achieving and maintaining a "healthy ecosystem" for sensitive species. It is the intention to apply this programmatic approach to all ongoing and future actions at Camp Pendleton, as they potentially affect the integrity of riparian ecosystems.

Water Bodies

The freshwater habitats on Camp Pendleton include water bodies such as the perennial lakes and ponds listed in Table 3-6, which together total 151.17 acres (61.15 hectares) of water body habitat.

Table 3-6
Freshwater Bodies on Camp Pendleton

Watershed Hydrologic Area*	Freshwater Body Name*	Acres/Hectares
Lower San Luis	De Luz Pond	3.8/1.53
	Windmill Lake	28.54/11.55
	Pilgrim Creek Pond	4.42/1.79
	Broodmare Ponds (*aka* Horseshoe Lake or Horse Lake)	1.09/0.44
San Onofre	Case Spring Ponds (North and South; South *aka* Whitman Pond)	5.62/2.27
	Pulgas Lake	5.16/2.08
Ysidora	India Ponds (*aka* Wildcat Ponds)	0.73/0.29
	Lake O'Neill	101.81/41.20
	Total	151.17/61.15

*See also 3-3.

In support of recreation and fishing programs on Camp Pendleton, WMS provides management for freshwater lakes, such as Lake O'Neill, for the purpose of freshwater game species. WMS manages these freshwater habitats by removing exotic aquatic species and oxygenating the water in Lake O'Neill for sports fishing. Larvicide is used for mosquito abatement on the ring of vegetation that circumnavigates the water bodies; however, no larvicide is used on open water.

Freshwater bodies consist of open water with aquatic vegetation, including aquatic plants and algae that are adapted to an environment where water is the dominant feature. Aquatic vegetation provides food and shelter for a variety of aquatic wildlife species and is therefore important to the overall health of the aquatic community.

Vernal Pools

A vernal pool is a type of isolated ephemeral wetland. Vernal pools are shallow, ephemeral wetlands with very specific hydrologic characteristics, occurring within a Mediterranean climate

region, but only within soil types where there is a seasonally perched water table. Vernal pools provide habitat for aquatic macroinvertebrates, such as Riverside fairy shrimp (*Streptocephalus woottoni*) and San Diego fairy shrimp (*Branchinecta sandiegonensis*), and aquatic flora such as American pillwort (*Pilularia americana*) and Orcutt's quillwort (*Isoetes orcuttii*). In many pools, emergent aquatic species typical of wetlands also occur, such as Mariposa rush (*Juncus dubius*). In the spring as the rains diminish and the pools dry, plants that tolerate some inundation but require the dry phase enter their flowering stage, such as spreading navarretia (*Navarretia fossalis*), little mousetail (*Myosurus minimus*), and San Diego button-celery (*Eryngium aristulatum* var. *parishii*). Most species in this community survive the dry summer as dormant seeds; others die back to underground corms or rhizomes.

Vernal pools on Camp Pendleton occur naturally on hummocky soils, with impervious subsurface layers in swales between "mima mounds" or in other depressions that impound water. They occur primarily on coastal terraces within about 3 miles (5 kilometers) from the beach, which include, but are not limited to, Cocklebur Mesa, Las Pulgas bluffs, Las Flores Mesa, Stuart Mesa, and Wire Mountain.

The Base has conducted several inventories of vernal pools and human-caused features (e.g., road ruts); in total, approximately 3,696 vernal pool depressions, and road ruts that are temporarily ponded have been mapped on the Base. No vernal pools are known to occur on the Air Station (MCAS CamPen 2013).

The vernal pools located on Camp Pendleton are considered an important resource regionally because they are among the few remaining representatives of this habitat that still exist in San Diego County. Efforts to preserve vernal pool habitat in the private sector have been largely unsuccessful. Between 1979 and 1986, about 68 percent of the vernal pools on privately owned land within the City of San Diego were lost. The vernal pool resource at Camp Pendleton is the second largest in San Diego County, behind only MCAS Miramar, supporting some of the most important examples of endangered and sensitive species dependent on vernal pools in the region. Approximately 10 percent of the known vernal pools remaining in San Diego County occur on Camp Pendleton; this is based on the current estimate of approximately 20 acres (8 hectares) of vernal pool basin area mapped on-Base and the (somewhat outdated) estimate of 202 acres (82 hectares) remaining in the County. On Camp Pendleton, four species associated with vernal pools are federally listed as threatened or endangered: Riverside fairy shrimp, San Diego fairy shrimp, San Diego button-celery, and spreading navarretia.

Surveyed vernal pools on-Base have been given a classification value based on the relative level of disturbance and a diversity index derived from the presence, diversity, and abundance of indicator species. The diversity index is the sum of weighted indicator species as follows:

Diversity Index Formula: $I = 4e + 2w + 1m$, where:

I is the weighted diversity index
e is the number of endemic vernal pool taxa observed
w is the number of wetland taxa observed
m is the number of mesic clay taxa observed

This diversity index is considered low, moderate-1, moderate-2, or high based on the following system:

Diversity Index:

1–15 is low
16–25 is moderate-1
26–35 is moderate-2
36+ is high

The level of disturbance is calculated by determining the number of disturbance types and the extent these disturbances are affecting the basin in which the vernal pools occur (Table 3-7).

Table 3-7
Disturbance Factor Determination

Disturbance Level*	Disturbance Type	Extent of Basin Affected
None to Low	1 or less	Less than 25%
Moderate	1 or less	Less than 50%
High	2 or more	Less than 75%
Very High	2 or more	More than 75%

*Note: Disturbance types include fill, scraped, weeds, thatch, trash, and tire/track ruts

The diversity index, disturbance level, and field data information on the quality of the pools are used to determine their class as follows:

Class I – disturbance factor low to high, high diversity
Class II – disturbance factor low to very high with moderate to high diversity
Class III – disturbance factor low to very high with moderate diversity
Class IV – disturbance factor low to very high with low diversity

Of the vernal pools on the Base that have been assessed, approximately 3 percent are classified as Class I, 6 percent as Class II, 24 percent as Class III, and 31 percent as Class IV. The remaining pools have not been classified (Table 3-8).

Table 3-8
Vernal Pools by Areas and Class

Area	Class*				No Classification	Total
	I	II	III	IV		
Bravo One				11	1	12
Bravo Two	1		22	38	78	139
India			1		1	2
Kilo One			1	7	37	45
Kilo Two			1		31	32
November		18	5			23
Oscar One	7(1)	43 (15)	98 (23)	11 (4)	149	308
Oscar Two		3(3)	203 (20)	281 (84)	182	669
Red Beach			1	9 (6)	167	177
Tango			1	29	74	104
Uniform		1	13	36 (4)	48	98
Victor			52 (25)	109 (31)	15	176
Cocklebur Mesa Area		1(1)	83 (6)	96 (5)		180
Las Pulgas Area			21 (5)	20 (5)		41
State Parks Lease			1	55 (4)	54	110
Wire Mountain Area	55 (14)	83 (23)	39 (2)	12		189
O'Neill Lake Area			3	7		10
Total	**63**	**149**	**545**	**721**	**837**	**2,315**

* The number of vernal pools in an area occupied by the San Diego or Riverside fairy shrimp is notated in parentheses.

3.2.2 Threatened and Endangered Species and Species of Regional Concern

The large natural areas within Camp Pendleton provide habitat to a variety of species, 18 of which are threatened and endangered species including 14 wildlife and four plant species as noted below in Table 3-9 (Figures 3-5 through 3-10).

Table 3-9
Federally Listed Threatened, Endangered, Terrestrial Wildlife and Plant Species and Ecosystem Affinities at Camp Pendleton

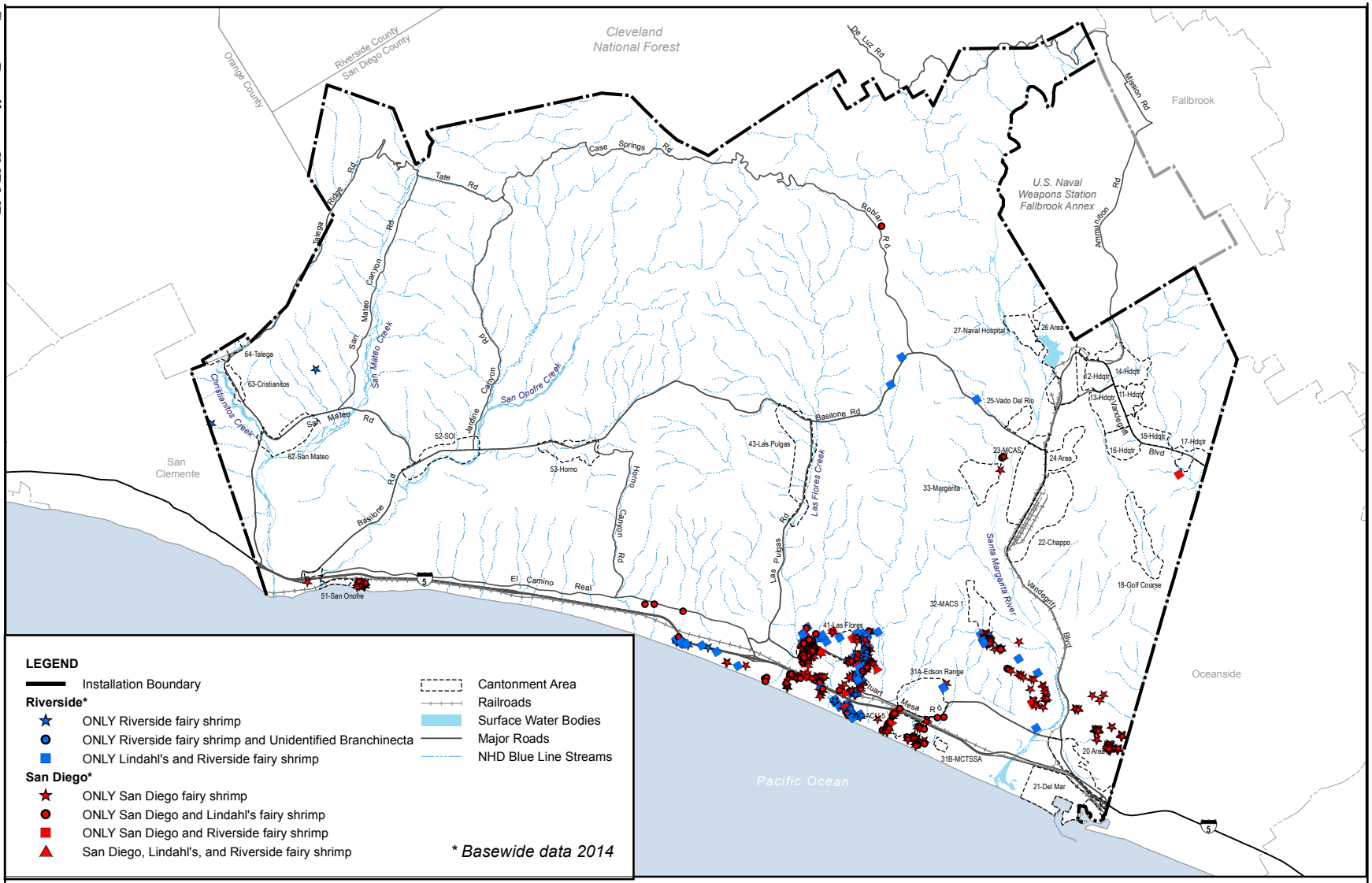
Common Name	Scientific Name	ESA Status	Ecosystem	
			Terrestrial Upland	Wetland, Aquatic, and Marine
Invertebrates				
Riverside Fairy Shrimp	*Streptocephalus woottoni*	Endangered	-	X
San Diego Fairy Shrimp	*Branchinecta sandiegonensis*	Endangered	-	X
Fish				
Southern California Steelhead	*Oncorhynchus mykiss*	Endangered	-	X
Tidewater Goby	*Eucyclogobius newberryi*[1]	Endangered	-	X
Amphibians				
Arroyo Toad	*Anaxyrus californicus*	Endangered	X	X
Birds				
California Least Tern	*Sternula antillarum browni*	Endangered	-	X
Western Snowy Plover	*Charadrius nivosus nivosus*	Threatened	-	X
Light-footed Ridgway's Rail[2]	*Rallus obsoletus levipes*	Endangered	-	X
Least Bell's Vireo	*Vireo bellii pusillus*[3]	Endangered	-	X
Southwestern Willow Flycatcher	*Empidonax traillii extimus*	Endangered	-	X
Yellow-billed Cuckoo, western DPS	*Coccyzus americanus*[4]	Threatened	-	X
Coastal California Gnatcatcher	*Polioptila californica californica*	Threatened	X	-
Mammals				
Pacific Pocket Mouse	*Perognathus longimembris pacificus*	Endangered	X	-
Stephens' Kangaroo Rat	*Dipodomys stephensi*	Endangered	X	-
Plants				
San Diego Button-celery	*Eryngium aristulatum* var. *parishii*	Endangered	X	X
Spreading Navarretia	*Navarretia fossalis*	Threatened	X	X
Thread-leaved Brodiaea	*Brodiaea filifolia*	Threatened	X	-
Encinitas Baccharis	*Baccharis vanessae*	Threatened	X	-

[1] A recent study classifies the southern populations of tidewater goby as a new species, the southern tidewater goby (*Eucyclogobius kristinae*) from the northern tidewater goby (*Eucyclogobius newberryi*) (Swift et al. 2016). No formal recognition of southern tidewater goby as a separate species has yet been published by USFWS in the Federal Register.

[2] Formerly light-footed clapper rail. The name change has not been formally published by USFWS in the Federal Register; however, CDFW has adopted the new name.

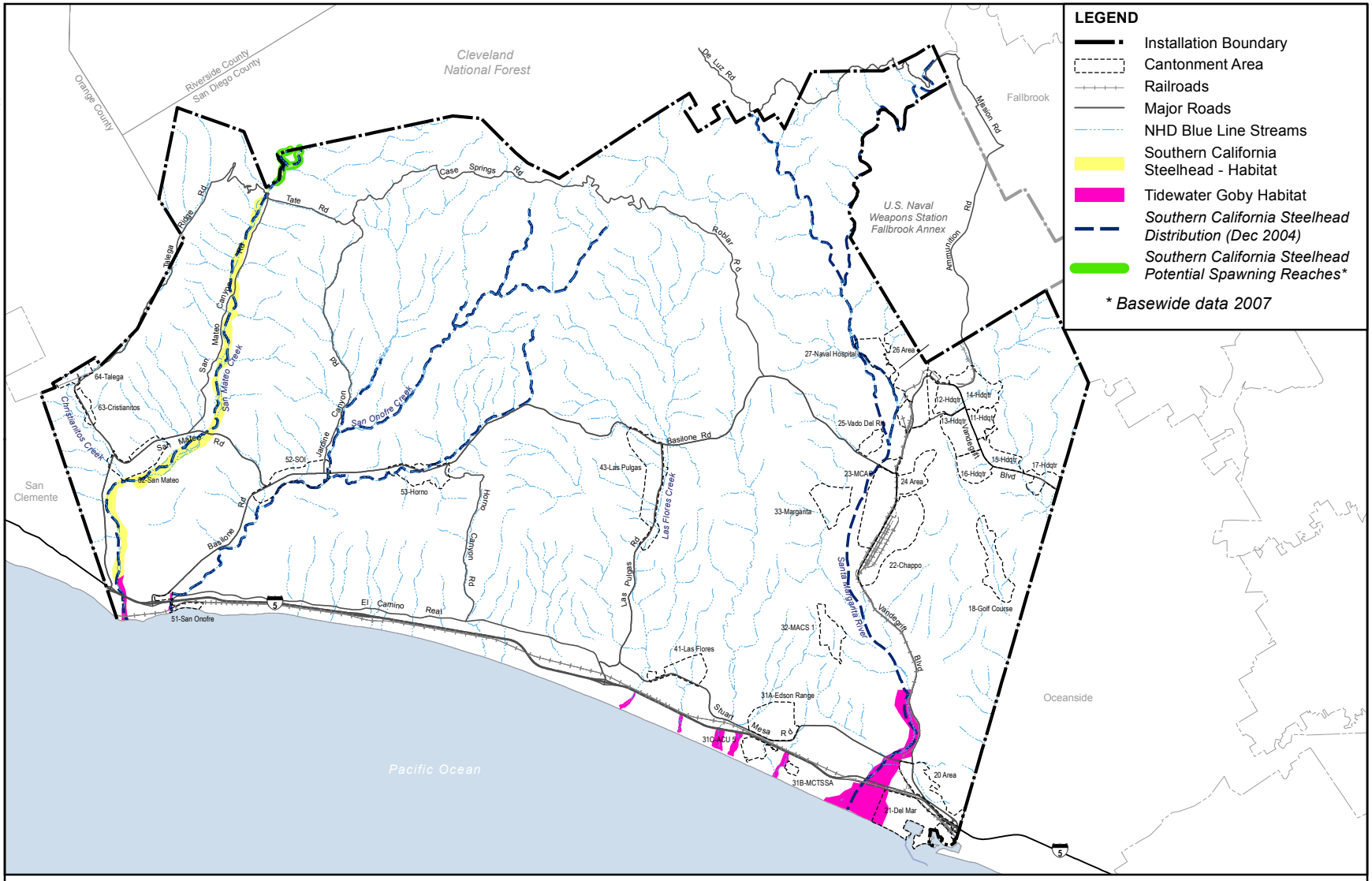
[3] A proposed taxonomic change has been made from least Bell's vireo (*Vireo bellii pusillus*) to California least vireo (*Vireo pusillus pusillus*) for populations occurring in San Diego County including MCB CamPen (Klicka et al. 2016). No formal change has been published in the Federal Register by USFWS.

[4] USFWS is listing a "distinct population segment" (DPS) rather than a species or subspecies. The western DPS of the yellow-billed cuckoo coincides with the range of the proposed subspecies boundary of the ''western'' yellow-billed cuckoo (*Coccyzus americanus occidentalis*). However, because there is some scientific uncertainty to the validity of the subspecies, USFWS is not listing the subspecies, but rather is listing the western DPS.



Source: Marine Corps Base Camp Pendleton 2007-2014.

Figure 3-5
Federally Listed Fairy Shrimp Species Occurrences



Source: Marine Corps Base Camp Pendleton

3 0 3 Miles

Scale: 1:190,080; 1 inch = 3 Miles

Figure 3-6
Federally Listed Fish Species Occurrences

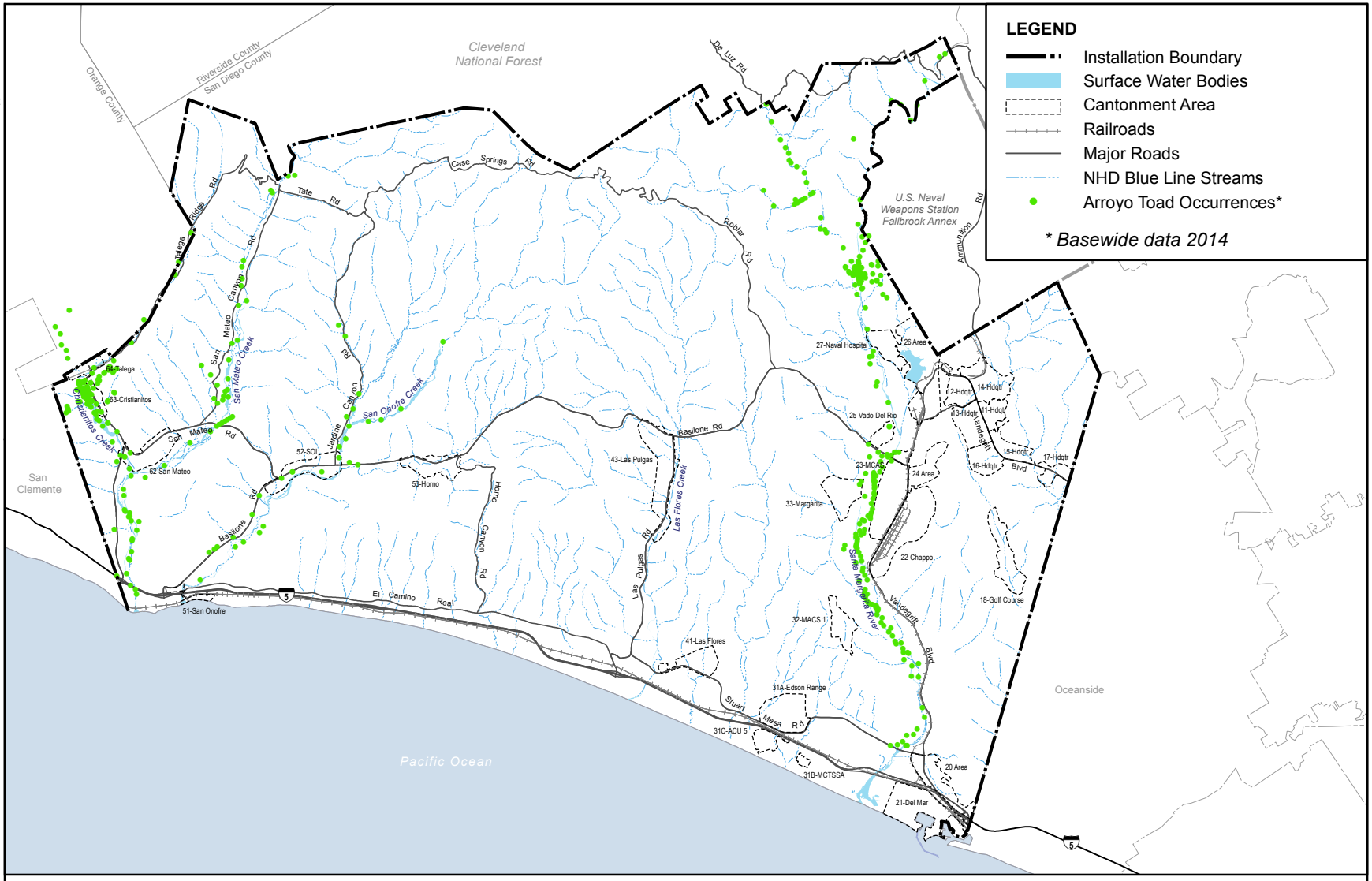
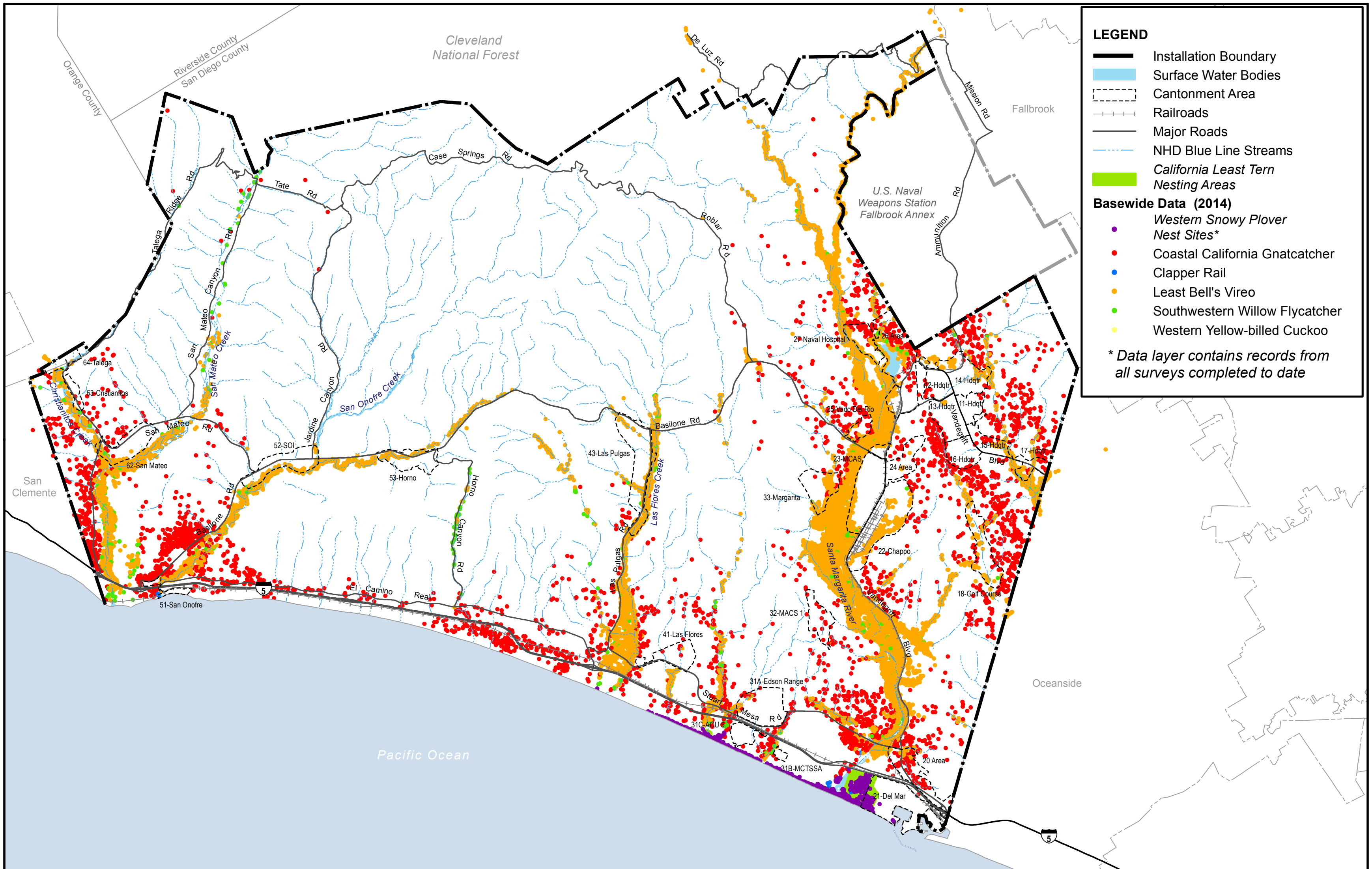


Figure 3-7
Federally Listed Amphibian Species Occurrences

Path: \\ussdg1fp001\DATA\projects\60337020\60337020_CPen_INRMP\900-CAD-GIS\920 GIS\922_Maps\Draft\Birds.mxd, 3/11/2016, Paul_Moreno

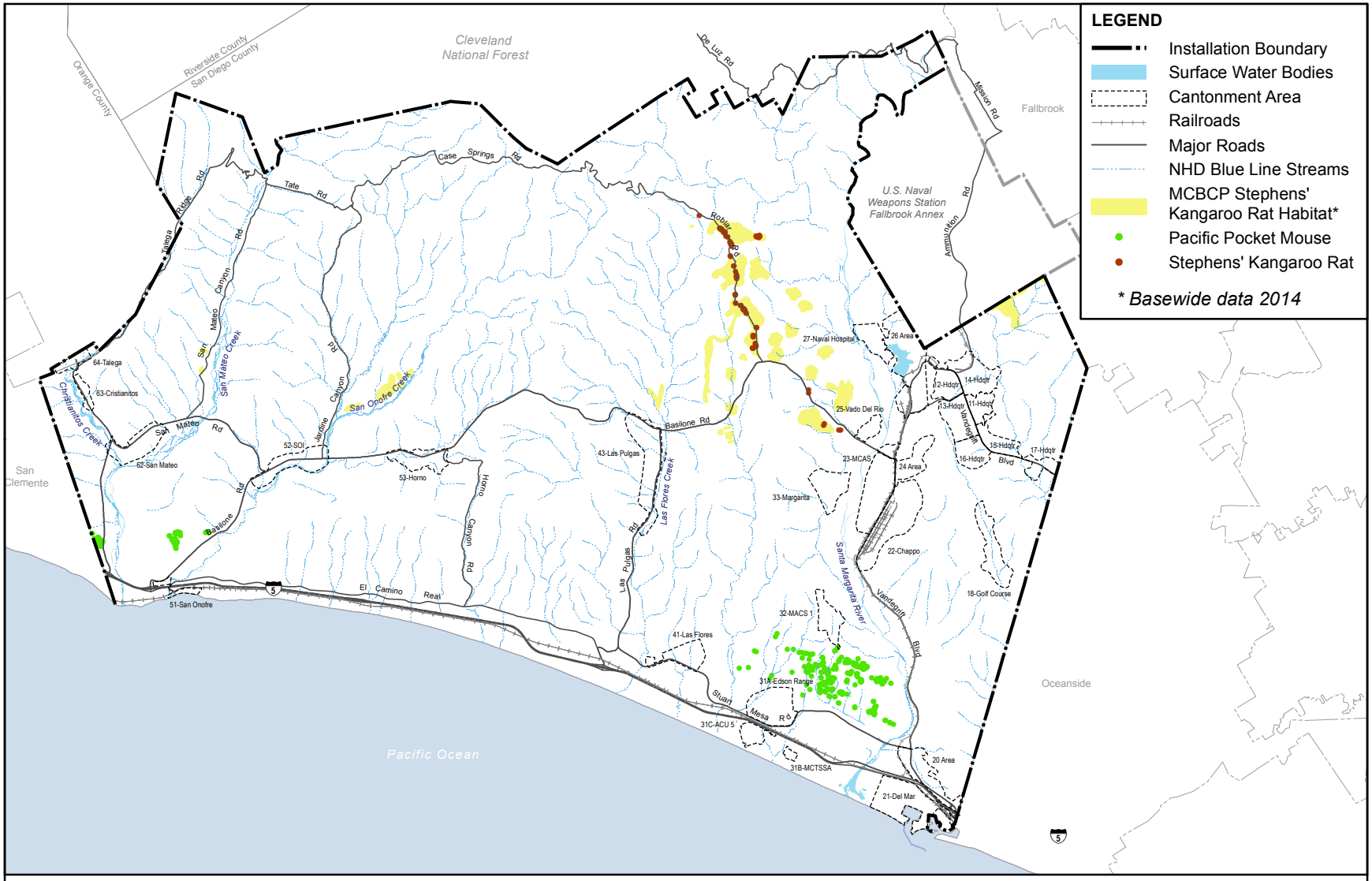


Source: Marine Corps Base Camp Pendleton

3 0 3 Miles

Scale: 1:190,080; 1 inch = 3 Miles

Figure 3-8
Federally Listed Bird Species Occurrences

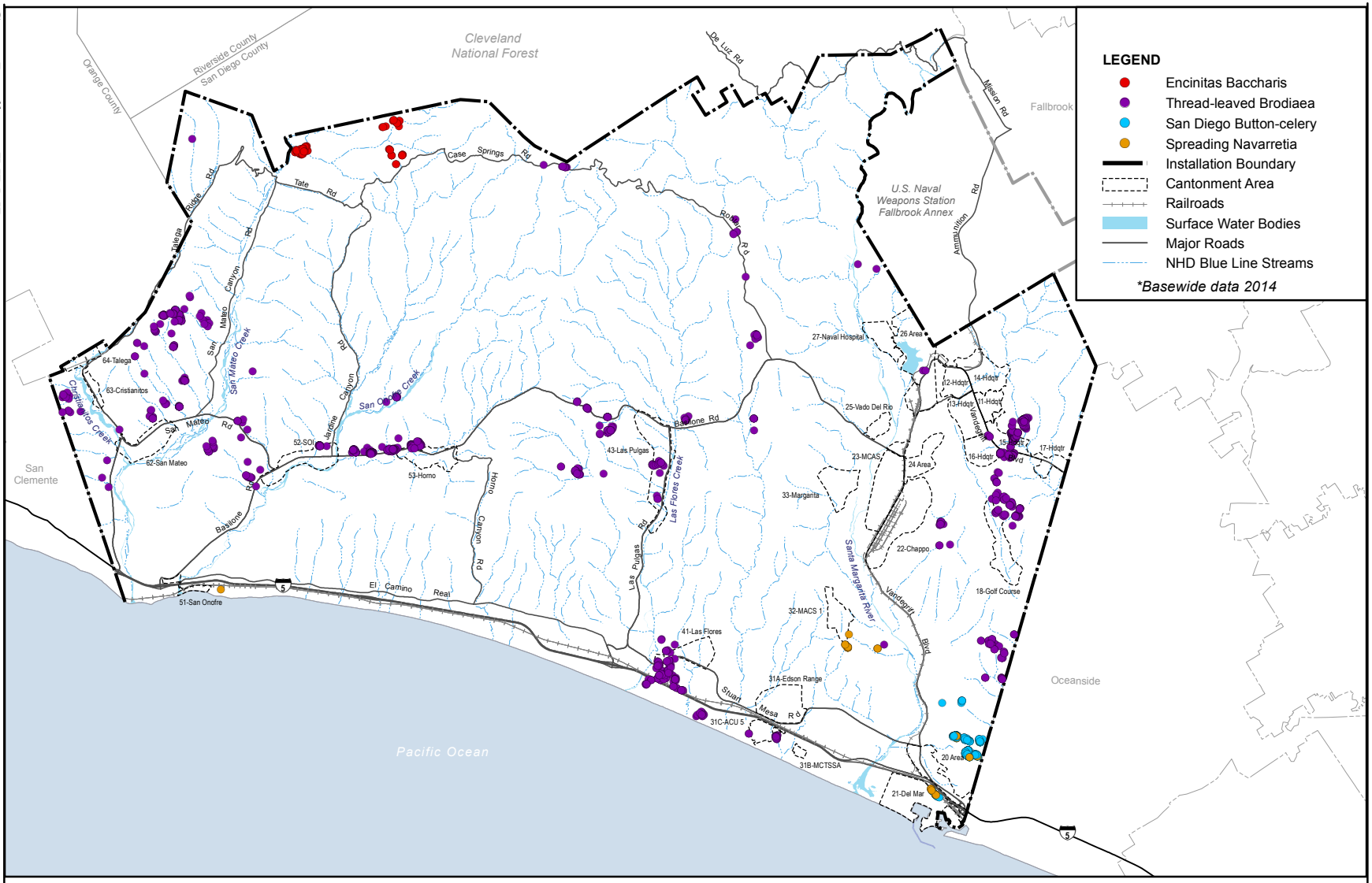


Source: Marine Corps Base Camp Pendleton

3 0 3 Miles

Scale: 1:190,080; 1 inch = 3 Miles

Figure 3-9
Federally Listed
Mammal Species Occurrences



Source: Marine Corps Base Camp Pendleton 2007-2017.

3 0 3 Miles

Scale: 1:190,080; 1 inch = 3 Miles

Figure 3-10
Federally Listed Plant Species Occurrences

Because federally listed threatened or endangered species present a special concern for wildlife management, Camp Pendleton regularly surveys and maps the location and distribution of these species and their related habitats. Information from these surveys is updated periodically and disseminated to Camp Pendleton land and resource managers, land users, and resource agencies to assist in the avoidance of impacts to the species. Surveys for listed wildlife species on-Base are conducted to assist all parties in the avoidance of these species. It is important to note that federally listed species are not usually surveyed, with the exception of Stephens' kangaroo rat, within the Quebec, Whiskey, and Zulu impact areas due to safety concerns.

Management of most federally listed threatened and endangered species on-Base is conducted through the implementation of habitat-based management plans for riparian, estuarine and beach, and upland areas as described above in Section 3.2.1. Species-specific management plans (e.g., for Stephens' kangaroo rat, Pacific pocket mouse [*Perognathus longimembris pacificus*], and others [see rare plant management plans discussed in Chapter 4]) are in progress, and will be amended to this INRMP when complete. These plans are not exclusively habitat based, although habitat management plays an integral role in the successful implementation of these plans and would be an important component of the proposed species management plans. Note, that for a number of the federally listed wildlife species, surveys and management activities vary by season as indicated in Table 3-10.

Table 3-10
Special Management Seasons of Federally Listed
Wildlife Species Found on Camp Pendleton

Species	Status	Habitat	Management Season[1]
Mammals			
Pacific Pocket Mouse	Endangered	Upland-CSS/Grasslands	1 January – 31 December
Stephens' Kangaroo Rat	Endangered	Upland Grasslands	1 January – 31 December
Fish			
Southern California Steelhead	Endangered	Anadromous	1 December – 31 May
Tidewater Goby	Endangered	Estuarine/Lagoon	1 March – 15 September
Amphibians			
Arroyo Toad	Endangered	Riparian	15 March – 30 August
		Upland	16 June – 14 March
Birds			
California Least Tern	Endangered	Beach/Estuary	1 March – 15 September
Western Snowy Plover	Threatened	Beach/Estuary	1 March – 15 September
Light-Footed Ridgway's Rail	Endangered	Estuarine/Marsh	1 March – 15 September
Least Bell's Vireo	Endangered	Riparian	15 March – 31 August
Southwestern Willow Flycatcher	Endangered	Riparian	15 March – 31 August
Yellow-billed Cuckoo, western DPS	Threatened	Riparian	15 May – 30 September
Coastal California Gnatcatcher	Threatened	Upland-CSS	15 February – 30 August

[1]Note: The Special Management Seasons presented in this table may represent periods of restricted Base activity, species breeding season, species management implementation, or a combination of any or all of these. Please contact the Wildlife Management Section for more detailed information at 760-725-9729.

For the purpose of this document, federally listed species are discussed in the following order below: wildlife species then plant species.

3.2.2.1 Federally Listed Wildlife Species

Brief species accounts for the 14 federally listed threatened or endangered wildlife species that are known to occur on Camp Pendleton are provided below. More detailed species accounts are provided in Appendix N. For further species information, please refer to the USFWS' Environmental Conservation Online System available at http://ecos.fws.gov/ecp/.

Riverside Fairy Shrimp (*Streptocephalus woottoni*)

Riverside fairy shrimp are small freshwater shrimp that generally occur in vernal pools and hatch from dormant cysts once hydrated under specific environmental conditions. Fairy shrimp are currently threatened by fragmentation and destruction of vernal pools.

Camp Pendleton Distribution and Management

A survey conducted during the 1997–1998 and 1998–1999 wet seasons identified the coastal mesas on Camp Pendleton as supporting one of the largest known populations of Riverside fairy shrimp, with at least 83 pools occupied (RECON 2001). Inventory surveys conducted in five study areas between 2006 through 2009 detected 53 pools occupied by Riverside fairy shrimp in Cocklebur Mesa, a portion of Edson Range, MASS 3, Oscar Two, and Red Beach. Findings through 2014 indicate a total of 181 pools occupied by Riverside fairy shrimp on Camp Pendleton.

Base Order MCIWEST-MCB CAMPENO 3500.1 CH 1 (Range and Training Area Standard Operating Procedures) and the Environmental Operations Map (EOM) prescribe procedures and general considerations for range and training area users that limit impacts to this species by restricting activities in and adjacent to vernal pools.

San Diego Fairy Shrimp (*Branchinecta sandiegonensis*)

The San Diego fairy shrimp is a small, delicate freshwater shrimp that occurs in vernal pools filled by winter and spring rains that usually begin in November and continue into April or May. San Diego fairy shrimp are threatened by loss and degradation of habitat due to urbanization.

Camp Pendleton Distribution and Management

On-Base, the San Diego fairy shrimp appears locally abundant in natural vernal pools and in man-made pools that have not been disturbed in several seasons (Moeur 1998). San Diego fairy shrimp occur primarily in Victor, Oscar One, and Oscar Two training areas and in the Wire Mountain housing area. Survey efforts conducted during the 1997–1998 and 1998–1999 wet seasons detected a total of 219 pools occupied by San Diego fairy shrimp in 11 study areas: San Mateo, the State Parks Lease Area, Las Pulgas, Tango Training Area, Las Flores, Edson Range, Cocklebur Mesa, Stuart Mesa, Wire Mountain, Basilone, and Lake O'Neill (RECON 2001). Inventory surveys conducted in five study areas between 2007 to 2009 detected 184 pools occupied by San Diego fairy shrimp in Cocklebur Mesa, a portion of Edson Range, MASS 3, Oscar Two, and Red Beach. Findings through 2014 indicate a total of 526 pools occupied by San Diego fairy shrimp on Camp Pendleton.

Southern California Steelhead (*Oncorhynchus mykiss*)

The southern California steelhead is an anadromous sea-run rainbow trout that migrates to the ocean after spending 1 to 4 years in freshwater. Major threats to steelhead are introduction of nonnative species, point and nonpoint source pollution, and loss of watershed habitat from development, blocked access to headwater spawning areas, and/or dewatering of streams by diversions and groundwater pumping. A final recovery plan for southern California steelhead was issued by NOAA Fisheries in January 2012 (NMFS 2012). Recovery planning areas identified in the document include the San Mateo, San Onofre, Santa Margarita, and San Luis Rey watersheds.

Camp Pendleton Distribution and Management

The most recent confirmed observations of steelhead include one individual within San Mateo Creek in 2003; additionally, three were captured in the upper Santa Margarita River in 2009 off-Base. Freshwater fish surveys were conducted in San Mateo Creek in 1995, 1996, and 1997, but failed to detect any steelhead. Likewise, surveys in the Santa Margarita watershed were conducted in 1997, 1998, and 1999 both on- and off-Base resulting in no detection of steelhead. The portions of San Mateo Creek and Santa Margarita River within Base boundaries serve only as a migration corridor (December–March) to spawning habitat off-Base, with limited potential for rearing in the estuaries. Therefore, the persistent presence of steelhead on-Base is not expected.

The Base implements a conservation measure provided in the Riparian BO to examine the Base for habitat qualities necessary to support steelhead runs and determine feasibility of establishing such runs. In addition, Camp Pendleton Base Order MCIWEST-MCB CAMPENO 3500.1 CH 1 (Range and Training Area Standard Operating Procedures) and the EOM prescribe regulations and general precautions for range and training area users that limit impacts to this species by restricting activities in and adjacent to riparian habitat. The Base recently consulted with NOAA Fisheries regarding a water management project that may impact steelhead. The *Final Biological Opinion on the Construction and Operation of the Santa Margarita River Conjunctive Use Project at Marine Corps Base Camp Pendleton* was issued on 28 September 2016, and considered the potential effects to construct and rehabilitate various facilities for the diversion, transport, treatment, storage, and recharge of water from the Santa Margarita River and Fallbrook Creek on the endangered Southern California Coast DPS of steelhead. Conservation management actions were identified in the project description and subsequent BO to be implemented as part of this management plan (NMFS 2016).

Tidewater Goby (*Eucyclogobius newberryi*)

The tidewater goby is a small fish that is a California endemic species and is unique in that it is restricted to coastal brackish water habitats. The major threats affecting the tidewater goby are

loss of estuarine habitat, degraded water quality, and predatory and competitive introduced fish species (USFWS 2005).

Camp Pendleton Distribution and Management

On Camp Pendleton, the extirpation and recolonization of gobies annually fluctuates between lagoons (Swift and Holland 1998). At the time of listing in 1994, the species was thought to be present in only four of the eight drainages on-Base; however, in 2000, the tidewater goby had been detected in all eight lagoons on-Base. From 2002 through 2006, tidewater gobies were consistently detected in all Base drainages entering the Pacific Ocean except French Creek and the Santa Margarita River estuary. Tidewater gobies were, however, observed at French Creek in March 2008. Although they were again absent by August 2008, tidewater gobies were observed in French Creek again in the summer of 2009. It seems possible that gobies have an undetermined upstream refuge at French Creek (USGS 2013).

Tidewater gobies have not been observed in the Santa Margarita River since 2001. The mouth of the river was closed in 2004 and in fall 2010 and open in 2002, 2003, and 2005–2009 (USGS 2013). The lack of a persistent sand bar most likely precludes the long-term persistence of tidewater gobies at this location.

In 2010, the mouth of San Mateo Creek was blasted open by strong rains, which led to tidal flushing, a reduction in many exotics, and a recolonization of tidewater gobies. Tidewater gobies were observed in 2011 and in April 2012 but they were absent in three subsequent 2012 surveys and in 2013 (USGS 2013).

In 2010, an extirpation of tidewater gobies in Aliso Creek was associated with a high-density monoculture of mudsuckers (USGS 2013). Mudsuckers are a potential competitor and predator of tidewater goby and these two species often do not coexist. The absence of mudsuckers at this site in October 2011 may have allowed for recolonization of gobies in 2012.

Tidewater gobies were continually present at Las Flores through 2013, at which time the system converted to supporting only mosquitofish and crayfish (USGS 2013).

Gobies had not been seen in the San Luis Rey since 2002; however, in June 2010, gobies were observed just south of Oceanside Harbor. Though they were found in 2010, tidewater gobies were not observed at this location again in 2011 (USGS 2013).

The San Mateo, San Onofre, and Las Flores Creek populations are considered by USFWS as the largest and most persistent populations of tidewater gobies remaining in the region, and

potentially serve as important source populations for dispersal into suitable waterbodies in the area (e.g., Buena Vista Lagoon and Agua Hedionda Lagoon) (USFWS 2000). However, gobies were not detected in Las Flores Creek in 2014 or 2015 which, if continued, could limit recolonization efforts in the future.

The Base implements programmatic instructions and habitat enhancement measures specified in the Estuarine and Beach Ecosystem Conservation Plan and the Riparian BO for protection and management of tidewater goby. The conservation plan describes estuarine management zones for the specific protection of this species. The Base also conducts monitoring of tidewater goby in accordance with the conservation plan and BO. Although goby monitoring is only required once every 3 years, MCB CamPen has generally been monitoring annually since 2002. In addition, Camp Pendleton Base Order MCIWEST-MCB CAMPENO 3500.1 CH 1 (Range and Training Area Standard Operating Procedures) and the EOM prescribe regulations and general precautions for range and training area users that limit impacts to this species by restricting activities in and adjacent to estuarine habitat.

Arroyo Toad (*Anaxyrus californicus*)

The arroyo toad is a small toad with a light-olive green or gray to tan back with dark spots and warty skin, and is white or buff underneath. They breed in low-flow channels of open streams and often move into adjacent upland habitats for overwintering; however, preliminary results of a study conducted on Camp Pendleton suggest that the majority of arroyo toads may stay in riparian areas during winters, particularly in drought years. The arroyo toad's decline has largely been attributed to extensive habitat loss, human modifications to water flow regimes (e.g., dams), and the introduction of nonnative predators (e.g., bullfrogs).

Camp Pendleton Distribution and Management

On MCB CamPen, arroyo toad occurs in Talega Creek, Cristianitos Creek, San Mateo Creek, San Onofre Creek, De Luz Creek, and Roblar Creek and in the Santa Margarita River. Arroyo toads also occur along the western edge of MCAS CamPen adjacent to the Santa Margarita River. Surface water availability is highly variable along these freshwater streams and yet the overall extent of breeding toads in

wetted areas on-Base remained relatively stable from 2003 through 2012 (77 to 95 percent of wet areas in a given year) with no significant change over this 10-year period. The population in the lower Santa Margarita River drainage is the largest and most stable on-Base; however, from 2014–2016, a negative population trend was observed, probably a response to severe drought.

During 5 years of drought between 2010 and 2016, there was little to no detection of arroyo toad breeding in the northern watersheds on-Base. Toads have been verified to breed up to 6 years of age; therefore, in 2017, the Base partnered with USGS and USFWS to establish a short-term salvage effort for toads occurring in stranded pools to increase probability of breeding success in affected watersheds.

The Base implements programmatic instructions and habitat enhancement measures specified in the Riparian Ecosystem Plan and the Riparian BO for the protection and management of arroyo toad. The Base conducts annual monitoring of arroyo toads in accordance with the conservation plan and BO. The Base is also currently in consultation with USFWS regarding management of water resources, which is taking arroyo toad habitat into consideration for diversion of water at the Lake O'Neill weir and pumping of drinking water. In addition, Camp Pendleton Base Order MCIWEST-MCB CAMPENO 3500.1 CH 1 (Range and Training Area Standard Operating Procedures) and the EOM prescribe regulations and general precautions for range and training area users that limit impacts to this species by restricting activities in and adjacent to riparian arroyo toad habitat during the breeding season. In 2011, the Base initiated an arroyo toad study using telemetry, which will inform dispersal of toads and use of upland habitats; the study will be complete after collecting data in at least one normal or above normal rainfall year.

California Least Tern (*Sternula antillarum browni*)

The California least tern is a small pelagic bird that breeds in beach colonies along the coastline. California populations have diminished from loss of habitat and periodic weather disturbances (e.g., El Niño).

Camp Pendleton Distribution and Management

On Camp Pendleton, California least tern nesting sites are located

on the beaches and salt flats at the mouth of the Santa Margarita River (Blue Beach, previously known as North Beach North and North Beach South), and at the mouths of French and Aliso Creeks (White Beach). Since 2003, nesting sites have also been observed at the mouth of Las Flores Creek (Red Beach), and at the mouth of Cocklebur Creek. Between 2007 and 2015, the tern colony on Camp Pendleton represented a significant portion (approximately 18 percent) of the total tern population breeding in California (Boylan et al. 2015), with the peak occurring in 2010. However, lower numbers in the succeeding years after 2010 do not suggest a decline in the population as numbers seem to fluctuate based on food availability (Sullivan pers. comm. 2015). The Base concluded a 3-year study in 2015 that showed previous fledgling count efforts were unreliable. The results allowed the Base to implement alternative methods that are more accurate.

The Base implements programmatic instructions and habitat enhancement measures specified in the Estuarine and Beach Ecosystem Conservation Plan and the Riparian BO for the protection and management of California least tern. This includes annual habitat enhancement in the fenced tern colonies, and implementation of predator control on nesting beaches. The Base also conducts annual monitoring of California least tern in accordance with the conservation plan and BO. In addition, Camp Pendleton Base Order MCIWEST-MCB CAMPENO 3500.1 CH 1 (Range and Training Area Standard Operating Procedures) and the EOM prescribe regulations and general precautions for range and training area users that limit impacts to this species by restricting activities in and adjacent to suitable habitat and breeding/nesting areas during the breeding season.

Western Snowy Plover (*Charadrius nivosus nivosus*)

The western snowy plover is a small shorebird that forages above the mean high-water line of coastal beaches. Factors contributing to the decline of the western snowy plover are attributed to predation, loss of habitat, and human disturbance.

Camp Pendleton Distribution and Management

On Camp Pendleton, western snowy plover nesting typically occurs in the Santa Margarita River estuary salt flats and along open beaches and dunes from Del Mar Recreation Beach to just north of Aliso

Creek. The breeding population of plovers on Camp Pendleton increased steadily from a total of 36 breeding pairs in 1994 to a high of 94 pairs in 2012; however, nest pair estimation methods have varied over the years. In 2014, there were minimally 69 breeding pairs based on counting the maximum active nests at one time during the season; this methodology provides the most accurate trend data. San Diego County hosted approximately 60 percent of the population, with Camp Pendleton having approximately 18 percent of the entire breeding population. Only eight sites have greater than 200 breeding pairs (Boylan et al. 2014). Continued threats for snowy plover on-Base include nest loss from high tide events, military training at the rack line, and recreation activities.

The Base implements programmatic instructions and habitat enhancement measures specified in the Estuarine and Beach Ecosystem Conservation Plan and the Riparian BO for the protection and management of western snowy plover. The Base also conducts annual monitoring of western snowy plover in accordance with the conservation plan and BO. Western snowy plovers on-Base benefit from habitat enhancement and predator control on installation beaches. In addition, Camp Pendleton Base Order MCIWEST-MCB CAMPENO 3500.1 CH 1 (Range and Training Area Standard Operating Procedures) and the EOM prescribe regulations and general precautions for range and training area users that limit impacts to this species by restricting activities in and adjacent to this species' habitat and breeding/nesting areas during the breeding season.

Light-footed Ridgway's Rail (*Rallus obsoletus levipes*)

The light-footed Ridgway's rail is a secretive, nonmigratory bird that is a resident of salt marshes in coastal wetlands. The decline of the light-footed Ridgway's rail is attributed to loss of habitat in coastal marshes and estuaries, human disturbance, and predation.

Camp Pendleton Distribution and Management

Light-footed Ridgway's rails have been recorded on Camp Pendleton since 1982 when two pairs were detected in the Santa Margarita River estuary; one pair at the Cocklebur estuary, and a single rail in Las Flores Lagoon. Since then, they have been detected in the Santa Margarita River with one or two pairs present from 1982 through 1988, and again from 2002 through 2007 (Zembal et al. 2008). In 2008, one pair and a

single advertising male were detected within the Santa Margarita River estuary (RECON 2009), and two pairs of light-footed Ridgway's rails were detected on the north side of the Santa Margarita River in 2011 (Harris Environmental Group, Inc. 2015). In addition, one adult Ridgway's rail and three chicks were detected in the Santa Margarita River estuary during 2009 predator control activities confirming nesting on-Base. In 2015, Ridgway's rails were detected at two locations on the north and south banks of the Santa Margarita River estuary. Because Ridgway's rails had been detected on the north shore in 2011 and on the south shore in 2013, it is likely that each of these rails nested within the area of detection in 2015 (Harris Environmental Group, Inc. 2015). One rail was detected at San Onofre Creek Estuary in 2013 but has not been detected since.

The Base implements programmatic instructions and habitat enhancement measures specified in the Estuarine and Beach Ecosystem Conservation Plan and the Riparian BO for the protection and management of light-footed Ridgway's rail. The Base also conducts monitoring of light-footed Ridgway's rail on-Base every 2 years. In addition, Camp Pendleton Base Order MCIWEST-MCB CAMPENO 3500.1 CH 1 (Range and Training Area Standard Operating Procedures) and the EOM prescribe regulations and general precautions for range and training area users that limit impacts to this species by restricting activities in and adjacent to riparian habitat and nesting areas during the breeding season.

Least Bell's Vireo (*Vireo bellii pusillus*)

The least Bell's vireo is a small, migratory songbird that primarily inhabits dense, willow-dominated riparian habitats with lush understory vegetation. Historic decline of the least Bell's vireo is mainly attributed to loss of riparian habitat and nest parasitism by the brown-headed cowbird (*Molothrus ater*).

Camp Pendleton Distribution and Management

On MCB CamPen, the least Bell's vireo breeds along rivers, creeks, and tributaries of the Santa Margarita River, Cristianitos Creek, San Mateo Creek, San Onofre Creek, Piedra de Lumbre Creek, Las Flores Creek, Aliso Creek, French Creek, De Luz Creek, Fallbrook Creek, Pueblitos Canyon, Windmill Canyon, and Pilgrim

Creek. This species is present throughout all of riparian habitats on MCAS CamPen. The least Bell's vireo arrives at Camp Pendleton from mid-March to early April and generally leaves for its wintering ground in southern Baja California in late September, although they may begin departing by late July (USFWS 1998). Stragglers have been noted in October and November, and occasionally individuals overwinter in California (USFWS 1998).

The vireo population in 2009 and 2010 was the largest recorded on-Base over a 15-year period (1,013 and 1,068 territories, respectively), but decreased from 2011 (784 territories) to 2012 (636 territories). The least Bell's vireo population reached a maximum of 26 pairs in 2010 on MCAS CamPen. In 2014, the number of documented least Bell's vireo territories (634) on Camp Pendleton decreased by 12 percent from 2013. This follows 1 year of vireo population increase on Camp Pendleton and is not consistent with trends seen elsewhere in San Diego County where vireo populations only decreased slightly or continued to increase for the third year. Vireo populations decreased slightly from 2013 to 2014 on the lower San Luis Rey River (3 percent), increased on the middle San Luis Rey River (53 percent), and increased at MCAS CamPen (13 percent). The population decrease on Camp Pendleton in 2014 is likely a response to wildfires in May 2014 that burned large sections of riparian habitat along the Santa Margarita River and Las Flores Creek. The vireos that were detected before the wildfire within its perimeter either perished or were displaced to other vireo habitat, either elsewhere on Camp Pendleton or surrounding drainages off-Base such as the San Luis Rey River (USGS 2014a).

The Base implements programmatic instructions and habitat enhancement measures specified in the Riparian Ecosystem Plan and the Riparian BO for the protection and management of least Bell's vireo. The Base also conducts annual cowbird trapping, and monitoring of least Bell's vireo in accordance with the conservation plan and BO. Studies on-Base have shown that least Bell's vireos benefit from giant reed removal (USGS 2014a).

To achieve greater mission flexibility in the Santa Margarita River, the plan calls for the maintenance of suitable least Bell's vireo habitat in the Santa Margarita River basin and other major drainages on-Base; enhancement of degraded areas in these drainages; maintenance of the least Bell's vireo population at a minimum of 400 singing males; and promoting expansion of the population above the 1994 level of 22 singing males. In addition, Camp Pendleton Base Order MCIWEST-MCB CAMPENO 3500.1 CH 1 (Range and Training Area Standard Operating Procedures) and the EOM prescribe regulations and general precautions for range and training area users that limit impacts to this species by restricting activities in and adjacent to riparian habitat during the breeding season.

Southwestern Willow Flycatcher (*Empidonax traillii extimus*)

The southwestern willow flycatcher is a small migratory songbird that breeds in relatively dense growths of trees and shrubs in riparian ecosystems and other wetlands, including lakes. Threats contributing to the decline of the southwestern willow flycatcher include loss and degradation of nesting habitat, nest parasitism by cowbirds, and human disturbance.

Camp Pendleton Distribution and Management

On Camp Pendleton, transient willow flycatchers are found on the following rivers, creeks, and tributaries: Santa Margarita River, Newton Canyon, Hidden Canyon, Cristianitos Creek, San Mateo Creek, San Onofre Creek, Piedra de Lumbre Creek, Las Flores Creek, Aliso Creek, French Creek, De Luz Creek, Fallbrook Creek, Roblar Creek, Windmill Canyon, and Pilgrim Creek. Transient willow flycatchers cannot be confirmed as the southern subspecies unless they are heard calling; however, it is assumed that many of the transient are southwestern willow flycatchers; therefore, nonbreeding transitory habitat is considered for impacts during project planning. Southwestern willow flycatcher breeding has been detected in the Santa Margarita River, Lake O'Neill, San Mateo Creek, and the Sierra Training Area ponds. In past years, the breeding population of southwestern willow flycatcher on Camp Pendleton has shown a general decline between 2007 (16 established territories) and 2012 (five established territories). The 10 territories in 2012 consisted of two polygynous pairs (two males and 10 females) limited to the lower Santa Margarita River. Despite the decline, nest success (number of nests fledging at least one young/total number of nests found) of flycatchers in 2008 and 2009 was the highest observed in the past 10 years (USGS 2014b). The number of breeding flycatcher territories on the Santa Margarita River in 2014 (five) decreased relative to 2013 (10). As in previous years, resident flycatchers were largely distributed among historic breeding areas, although the number of territories in all areas differed compared to previous years. Among the occupied areas, one area had an increase, and two areas had a decrease. In 2015, only one breeding male was detected on-Base. In response to potential extirpation of flycatchers from Camp Pendleton, Base biologists established an artificial seep in the Santa Margarita River adjacent to recent breeding territories; one breeding pair was detected in 2016. The multiyear decline on Camp Pendleton is not well understood and is consistent with regional decline of this species in southern California.

The Base is investigating whether removal of settling ponds and/or implementation of water conveyance improvements that reduce seeps are contributing to decline via loss of access to perennial water through the breeding season.

The Base implements programmatic instructions and habitat enhancement measures specified in the Riparian Ecosystem Plan and the Riparian BO for the protection and management of southwestern willow flycatcher, which include 100 percent nest monitoring and banding of chicks. The Base also conducts annual cowbird trapping and removal, and monitoring of flycatcher in accordance with the conservation plan and BO. In addition, Camp Pendleton Base Order MCIWEST-MCB CAMPENO 3500.1 CH 1 (Range and Training Area Standard Operating Procedures) and the EOM prescribe regulations and general precautions for range and training area users that limit impacts to this species by restricting activities in and adjacent to riparian habitat during the breeding season. The Base is currently in consultation with USFWS regarding management of water resources, which is taking southwestern willow flycatcher habitat into consideration for improvement of seeps or other access to perennial water through the breeding season.

Yellow-billed Cuckoo *(Coccyzus americanus)*

The yellow-billed cuckoo is a Neotropical migratory bird that winters in South America and breeds in North America almost exclusively in contiguous low to moderate elevation riparian woodlands within arid to semiarid landscapes. Yellow-billed cuckoos breed in large blocks of riparian woodlands-dominated cottonwoods and willows (Ehrlich et al. 1988). Dense understory cover appears to be an important factor in nest site selection, while cottonwood trees are an important foraging habitat (Laymon et al. 1993).

<u>Camp Pendleton Distribution and Management</u>

The yellow-billed cuckoo is rarely detected on Camp Pendleton;

however, focused surveys have not been conducted. The Santa Margarita River represents the largest block of intact riparian vegetation suitable for yellow-billed cuckoos to breed, although breeding has not been documented to date within Camp Pendleton. However, there is a potential for breeding and use of the Santa Margarita River for dispersal. Additionally, cuckoos may migrate through the Base, along various drainages and creeks. The yellow-billed cuckoo has only been recorded on Camp Pendleton on four occasions since 1980: (1) along the Santa Margarita River at the upper end of Ysidora Basin on 4–5 July 1984 (Unitt 2004); (2) along the Santa Margarita River at the upper end of Ysidora Basin on 7–11 July 2000 (Unitt 2004); (3) a carcass was recovered at the mouth of the Santa Margarita River on 25 June 2005 (Davenport 2012); and (4) yellow-billed cuckoo calls were detected three times during gnatcatcher surveys along the Santa Margarita River at the De Luz Creek confluence on 18 July 2008 (Davenport 2012). Although focused surveys for yellow-billed cuckoo have not been conducted on-Base, there has been no incidental detections of breeding yellow-billed cuckoos during annual monitoring of the least Bell's vireo and southwestern willow flycatcher conducted in Camp Pendleton riparian habitat from 1988 to present. Additional emphasis on identifying and recording yellow-billed cuckoo occurrence in riparian areas was added to the least Bell's vireo annual monitoring effort in 2015 following listing.

No specific management program or activities have been established for the yellow-billed cuckoo due to its rare occurrence on Camp Pendleton. Based on the habitat requirements of the yellow-billed cuckoo, it is likely that this species benefits from management activities and programs provided for the least Bell's vireo and the southwestern willow flycatcher as part of the Riparian Ecosystem Conservation Plan. Management practices, projects, and programs include programmatic instructions that are provided for users and residents of the Base to avoid and minimize impacts from training activity and other Base operations on riparian vegetation and habitat.

Coastal California Gnatcatcher (*Polioptila californica californica*)

The coastal California gnatcatcher is a small and resident bird that is most numerous in low elevation, dense coastal sage scrub habitat in arid washes, on mesas, and on slopes of coastal hills. The main threats to this species include habitat loss and fragmentation, and the synergistic effects of cowbird parasitism and predation.

Camp Pendleton Distribution and Management

On Camp Pendleton, the coastal California gnatcatcher's distribution is primarily within coastal sage scrub habitat, in the less steeply sloped areas of the Base, with concentrations in the northern (State Parks), coastal, and southern (inland) portions of the Base (Griffith Wildlife Biology 2008). The Base has been conducting coastal California gnatcatcher surveys every 3 to 4 years since 1989. This base-wide study found the third highest number of coastal California gnatcatcher locations as defined by territorial males, pairs, and family groups (436 locations). This total was recorded after the largest decrease between studies was recorded during the last base-wide survey. The decrease from the 668 observed in 2006 to 268 documented in 2010 represented the largest decrease recorded for the Base between consecutive surveys; however, the trend data are confounded by the fact that the 2006 surveys were conducted both during the breeding season and the nonbreeding season. Another large decline was recorded between 1998 (604 locations) and 2003 (311 locations). The results of these survey efforts are evidence that this population is subject to rather dramatic fluctuations.

A habitat assessment conducted in 2013 showed that approximately 19,580 acres (7,924 hectares) of suitable gnatcatcher habitat occurs on-Base (Tetra Tech, Inc. 2015). In 2014, there were 436 occupied sites identified, including 122 territorial males, 283 pairs, and 31 family groups. An additional 53 transient individuals were identified as well, but were not recorded as occupied sites that would be considered during project analysis. Within the 73 family group observations, 119 dependent juveniles were observed. Sixty-four of the family groups were observed with dependent juveniles with an average of 1.86 dependent juveniles per family group. Since 2006, several wildfires have altered large expanses of high-quality coastal sage scrub habitat located in areas that typically supported large numbers of gnatcatchers, which may also be a contributing factor. Surveys in 2014 were interrupted mid-season due to large-scale fires on-Base, which may also have disrupted nesting and renesting efforts. Despite the loss of suitable habitat, many areas of vacant unoccupied suitable habitat remain, and further investigation is needed to determine why these areas are not being utilized.

The Base has instituted measures for avoidance and minimization of impacts to the gnatcatcher and its preferred habitat, especially during the breeding season. These measures are specified in Camp Pendleton Base Order MCIWEST-MCB CAMPENO 3500.1 CH 1 (Range and Training Area Standard Operating Procedures) and the EOM, which prescribe regulations and general precautions for range and training area users that limit impacts to natural resources.

Pacific Pocket Mouse (*Perognathus longimembris pacificus*)

The Pacific pocket mouse is a solitary, nocturnal burrowing mouse found in coastal sage scrub, mixed sage scrub, maritime chaparral sagebrush, and the ecotone of coastal sage scrub and nonnative grassland. Threats to Pacific pocket mouse on-Base include habitat loss (development, fire, soil compaction, and associated vegetative loss from heavy use), habitat alteration (overgrowth of nonnative grasses or native shrubs), fragmentation (roads, development), increased predation risks (domestic cats and dogs), and increased competition for seed resources (Argentine ants) (USGS 2014c). Extant populations only occur in four locations, three of which are located on Camp Pendleton.

Camp Pendleton Distribution and Management

Once thought extinct, the critically endangered Pacific pocket mouse has been detected on-Base in the following three areas: the Oscar One and Edson Range training areas (Santa Margarita population), east of the San Onofre housing area (South San Mateo population), and in the northwest corner of the Base between the Base boundary with the City of San Clemente and Cristianitos Road (North San Mateo population).

In 2012, the Base enlisted the USGS to implement the second year of a new monitoring program for the Pacific pocket mouse across all three population sites within the Base to track trends in overall occupancy. The results show that the cover of forbs is the most important predictor of Pacific pocket mouse-occupied habitat across all population sites. In addition, increased forb cover was the most significant predictor of Pacific pocket mouse colonizing previously unoccupied plots from 2012 through 2013 (USGS 2014c). Sandy soils were found not to be a predictor of Pacific pocket mouse-occupied habitat; rather, sandy soils are associated with forb-dominated plant communities and therefore are likely indirectly associated with Pacific pocket mouse occupancy (USGS 2014c). The study also showed a strong negative response of Pacific pocket mouse to high nonnative grass cover (USGS 2014c).

Pacific pocket mouse was regularly documented within open sandy areas of the North San Mateo area from 1995 through 2003. Although numerous and extensive surveys and monitoring efforts have been conducted after this time, no Pacific pocket mouse have been detected at this site since 2003. Due to this, it is currently thought that Pacific pocket mouse has been extirpated from the North San Mateo population area. Theorized impacts to Pacific pocket mouse and habitat at North San Mateo are from recreation, urban edge effects, vegetation succession, and invasion of Argentine ants.

Light military training and movements (as well as biologists) are detrimental to Pacific pocket mouse (USGS 2014c). It is expected that this is much more of a problem for Pacific pocket mouse occupying sandy soils rather than those in the harder clay soils as burrows could be easily crushed.

In 2013, USGS surveyed for Argentine ants across the Pacific pocket mouse survey grids. Argentine ants have been associated with the decline of both small mammal and lizard species (USGS 2014c). They tend to displace native ants and can be relentless predators of native invertebrates and juvenile birds in nests. It is unknown what predatory impact these ants may have on juvenile or adult small mammals, particularly within underground burrows. Because they are not efficient dispersers of seeds, like the harvester ants they displace, their presence can also alter the plant community. Therefore, an Argentine ant invasion could have large direct and indirect effects on Pacific pocket mouse and the ecosystem in which they have evolved (USGS 2014c).

Camp Pendleton Base Order MCIWEST-MCB CAMPENO 3500.1 CH 1 (Range and Training Area Standard Operating Procedures) and the EOM prescribe regulations and general precautions for range and training area users that limit impacts to this species by restricting activities in and adjacent to known occupied habitat. In addition, the terms and conditions of the consultation and BO for the construction, operation, and maintenance of the Crucible Challenge Course in the Oscar One and Edson Range areas of Camp Pendleton, issued on 14 August 1996, provide monitoring and adaptive management for the Pacific pocket mouse population. The Base is also partnering with the San Diego Zoo, Institute for Conservation Research, and USFWS to sponsor a captive breeding program for the eventual establishment of another off-Base population. The Base is also currently conducting a Pacific pocket mouse lighting study to better assess anthropogenic disturbances during the project review process. The Base is in the process of drafting a Pacific Pocket Mouse Management Plan.

Stephens' Kangaroo Rat (*Dipodomys stephensi*)

The Stephens' kangaroo rat is a, nocturnal burrow-dwelling rodent that occurs primarily in annual and perennial grassland habitats, and is commonly found in close association with dirt roads, previously and currently disturbed sites, and/or other areas with a high percentage of bare ground. Threats to the Stephens' kangaroo rat are generally attributed to agricultural and urban development that reduces and fragments available habitat.

In 1996, Tetra Tech, Inc. estimated approximately 684 acres (277 hectares) of occupied Stephens' kangaroo rat habitat on-Base, roughly grouped into three "core population areas" that are referred to as the western, central, and eastern core population areas (USFWS 2011).

The western core population area consisted of occupied habitat located within Ranges 115, 225, 227, 407, 408, and 409, and along Roblar Road. Based on surveys conducted in 1996, the western core population area was estimated to contain approximately 470 acres (190 hectares) of occupied Stephens' kangaroo rat habitat (USFWS 2011). The central core population area consisted of occupied habitat located within AFA 22 in Kilo One, AFA 23 and Combat Town in Kilo Two, and AFA 24 in south India and was estimated to contain approximately 103 acres (42 hectares) (USFWS 2011). The eastern core population area located in the Juliet Area was estimated to contain approximately 110 acres (44 hectares) (USFWS 2011).

In 2005, USGS estimated that 148 acres (60 hectares) of high suitability habitat was occupied by Stephens' kangaroo rat on-Base; in 2006, they estimated 175 acres (71 hectares); in 2007, they estimated 323 acres (131 hectares); and in 2008, they estimated 364 acres (147 hectares). Thus, the greatest amount of occupied Stephens' kangaroo rat habitat estimated by USGS (i.e., 364 acres [147 hectares in 2008]) is only about half of that estimated by Tetra Tech, Inc. in 1996 (USFWS 2011). It is possible that Stephens' kangaroo rat was more widely distributed in 1996 than in 2008, but it is also likely that different methods for calculating occupied habitat have generated different estimates.

Camp Pendleton Distribution and Management

Stephens' kangaroo rat occurs at scattered localities on-Base. Historically, this species has been found in the following areas: Juliet, Kilo One, Kilo Two, Range 407-1, Range 407-2, Range 408-1, and Range 409-1. Stephens' kangaroo rat occupancy was estimated at approximately 462 acres (187 hectares) in 2011–2012 (Brehme et al. 2012).

In 1992, the Base had a project to improve 50 acres (20 hectares) of Range 210E for training troops and firing ordnance. The Base was issued a BO by USFWS on 22 September 1992 (1-6-92-F-48), with the terms and conditions to enhance 24.4 acres (9.9 hectares) of currently unoccupied, but potentially suitable, Stephens' kangaroo rat habitat occurring in the Juliet maneuver area in the northeast section of the Base. This 24.4-acre (9.9-hectare) area has served as a mitigation bank for base-wide impacts to Stephens' kangaroo rat habitat since 1992. Since the establishment of the Juliet bank, numerous projects around the Base impacted Stephens' kangaroo rat habitat, resulting in acreage deductions from the bank. On 28 June 1999, a BO was issued for a project to install and upgrade the power distribution system on-Base. For this project, the Base expanded the Stephens' kangaroo rat management area by 28.7 acres (11.6 hectares). Past and future projects (e.g., Range 409 Improvements) have resulted in, or will result in, deductions from the Juliet bank.

Per the numerous BOs for the management of the Stephens' kangaroo rat bank, the Base is to maintain the management area by prescribed burning. In reviewing the monitoring studies by Stephen Montgomery, PhD, going back to 1998, the habitat became overgrown and mostly consisted of thatch composed of native and nonnative grasses and weeds until the Base started actively managing vegetation in 2007 (Petersen 2015). The Base had been out of compliance on the maintenance of the habitat since approximately 2000. A burn in 1998 kept the habitat clear until the rains arrived in 1999. Then in 2011 and 2012, prescribed burns were implemented to clear the vegetation that had established since 1999. Since then, drought conditions have kept the area clear and no prescribed burns have been necessary.

Since the establishment of the Juliet bank, some habitat enhancement and monitoring efforts have occurred at the site with a recommitment of management efforts occurring since 2009. In April 2011, approximately 300 man-made burrows were created followed by a controlled burn of the entire area in July 2011 (USFWS 2011). A translocation effort was successfully completed in 2011 from 25A combat town to the Juliet site. This translocated population expanded from 21 individuals to more than 90 as of 2015.

The Base conducts base-wide annual monitoring for Stephens' kangaroo rat using a two-phase (habitat assessment and live-trapping) monitoring program. The monitoring protocol was revised

in 2012 to remove low-quality habitat based on the previous year's results. In addition, Camp Pendleton Base Order MCIWEST-MCB CAMPENO 3500.1 CH 1 (Range and Training Area Standard Operating Procedures) and the EOM prescribe regulations and general precautions for range and training area users that limit impacts to this species by limiting activities in and adjacent to Stephens' kangaroo rat occupied habitat. The Base is actively reviewing how it can minimize impacts to this species from its operations and training activities. The Base is anticipated to complete the Final Stephens' Kangaroo Rat Management Plan in 2018 (draft plan is in progress).

3.2.2.2 Federally Listed Plant Species

Brief species accounts for the four federally listed threatened or endangered plant species known to occur on the Base are provided below. No federally listed plant species have been identified aboard the Air Station. More detailed species accounts are provided in Appendix N. For further species information, please refer to the USFWS' Environmental Conservation Online System available at http://ecos.fws.gov/ecp/.

San Diego Button-celery (*Eryngium aristulatum* var. *parishii*)

San Diego button-celery is a perennial or biennial herb arising from a taproot, which occurs in vernal pools. The species is threatened region-wide by urbanization, foot traffic, off-road vehicles, grazing agriculture, and watershed alteration (drainage).

<u>Camp Pendleton Distribution and Management</u>

On Camp Pendleton, San Diego button-celery has been found in 80 vernal pools with 34,793 individuals, composing nearly 1 acre south of the Santa Margarita River basin, inland near the Wire Mountain housing development.

Since this species was listed, the Base has instituted measures for avoidance and minimization of impacts to vernal pools and all vernal pool species, including San Diego button-celery. These measures are specified in Camp Pendleton Base Order MCIWEST-MCB CAMPENO 3500.1 CH 1 (Range and Training Area Standard Operating Procedures) and the EOM, which prescribe regulations and general precautions for range and training area users that limit impacts to this species by restricting activities in and adjacent to vernal pools.

Spreading Navarretia (*Navarretia fossalis*)

Spreading navarretia is a low, annual herb that occurs in vernal pools. Spreading navarretia is threatened by urbanization, foot traffic, off-road vehicles, grazing agriculture, and watershed alteration (drainage).

Camp Pendleton Distribution and Management

On Camp Pendleton, spreading navarretia has been found in 27 vernal pools base-wide with 7,074 individuals, composing 0.13 acre.

Since this species was listed, the Base has instituted measures for avoidance and minimization of impacts to vernal pools and all vernal pool species, including spreading navarretia. These measures are specified in Camp Pendleton Base Order MCIWEST-MCB CAMPENO 3500.1 CH 1 (Range and Training Area Standard Operating Procedures) and the EOM, which prescribe regulations and general precautions for range and training area users that limit impacts to this species by restricting activities in and adjacent to vernal pools.

Thread-leaved Brodiaea (*Brodiaea filifolia*)

Thread-leaved brodiaea is a perennial herb that blooms May through June. It is threatened by urbanization, foot traffic, off-road vehicles, grazing, agriculture, and watershed alteration (drainage).

Camp Pendleton Distribution and Management

On Camp Pendleton, thread-leaved brodiaea has been found in 395 populations with 315,882 individuals at 52 general localities (i.e., occurrences), which total 74.88 acres (30.32 hectares). The occurrences are located in a variety of areas on Camp Pendleton ranging from the southwestern coastal terrace, scattered locations in the northwestern part of the Base, a number of locations in the central more interior portion of the Base, and in the southern portion

of the Base. Other occurrences are within cantonment areas, training and impact areas, and the State Parks-leased land. Within the Base, the Base has conducted surveys over 8,098.35 acres (3,277.29 hectares) of land since 2007 in accordance with the thread-leaved brodiaea survey protocol developed by LMS that requires three separate surveys during the blooming period for thread-leaved brodiaea and 100 percent area coverage.

Since this species was listed, the Base has instituted measures for avoidance and minimization of impacts to rare plant locations, including thread-leaved brodiaea. These measures are specified in Camp Pendleton Base Order MCIWEST-MCB CAMPENO 3500.1 CH 1 (Range and Training Area Standard Operating Procedures) and the EOM, which prescribe regulations and general precautions for range and training area users that limit impacts to this species by restricting activities in and adjacent to rare plants.

Encinitas Baccharis (*Baccharis vanessae*)

Encinitas baccharis is a low-growing perennial shrub that flowers generally in summer and fall. It occurs on coastal sandstones and rocky hillsides, often on unusual soil substrates on locations scattered across San Diego County. The species is threatened by urbanization and hillside agriculture.

Camp Pendleton Distribution and Management

The first specimens found on-Base were discovered when conducting the San Diego Plant Atlas Inventories in the Delta Training Area during September 2013. Prior to conducting the inventories, this species was not known to occur on-Base. As a result of the findings, the Base initiated surveys for Encinitas baccharis in August 2015. Surveys to date have found 217 specimens located in the Delta Training Area in generally undisturbed chaparral habitat, in an area with very rugged terrain adjacent to the Cleveland National Forest San Mateo Canyon Wilderness Area.

3.2.2.3 Species of Special Concern

Wildlife

Camp Pendleton species of special concern include California State Listed Species, CDFW Species of Special Concern, United States Department of Agriculture (USDA) Forest Sensitive Species, as well as other species considered in decline in the region. One California listed endangered animal species (Belding's savannah sparrow [*Passerculus sandwichensis beldingi*]), three California listed animal Species of Special Concern (western pond turtle [*Actinemys marmorata*[; western spadefoot toad [*Spea hammondii*]; and burrowing owl [*Athene cunicularia*]), one animal species that was given emergency, but temporary California endangered status that has since expired (tricolored blackbird [*Agelaius tricolor*]), and one species that is fully protected by CDFW (peregrine falcon [*Falco peregrinus anatum*]) have all occurred on Base as breeders and/or migrants. See Appendix N for detailed species accounts on these six species. A total of 64 other sensitive species, including California listed animal Species of Special Concern and USFS Sensitive Species, are also known to occur and breed on or migrate through Camp Pendleton. See Appendix O for a list of the terrestrial wildlife species of special concern that occur on Camp Pendleton and their sensitivity status.

Essential Fish Habitat

Fish require healthy surroundings to survive and reproduce. Essential Fish Habitat (EFH) is defined as those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity. EFH includes all types of aquatic habitat—wetlands, coral reefs, seagrasses, rivers—where fish spawn, breed, feed, or grow to maturity. NOAA Fisheries works with the regional fishery management councils to identify the essential habitat for every life stage of each federally managed species using the best available scientific information. EFH has been described for approximately 1,000 managed species to date.

Camp Pendleton monitors the EFH along the coastline of the Base through their estuary monitoring and nearshore surveys and inventories.

Plants

Camp Pendleton has a total of 76 sensitive plant species that have been ranked to identify if they may require special surveys and/or management using the California Native Plant Society (CNPS) California Rare Plant Ranking System (formerly known as CNPS lists). The heart of the California Rare Plant Ranks (CRPR) is an assessment of the current conservation status of each of California's rare, threatened, and endangered plants, with an emphasis on plants that are rare

in California. See Appendix O for a list of the California rare, threatened, and endangered plants mapped on-Base along with their CNPS, state and global ranking, and a summary of the number of individuals, populations, and occurrences recorded on-Base. The Base manages sensitive plant species through rare plant inventories and various data collection. Focused surveys and management are conducted for Pendleton button-celery (*Eryngium pendletonense*), Brand's phacelia (*Phacelia stellaris*), and Nuttall's acmispon (*Acmispon prostratus*). All potential habitat for these species has been surveyed.

Pendleton button-celery is unique among the rare and sensitive plant species on-Base, as it is only known to occur on Camp Pendleton (Marsden and Simpson 1999). Pendleton button-celery was first identified on 13 June 1992 and was described as a new species in 1999. Pendleton button-celery was distinguished from the more widespread San Diego button-celery, a federally endangered listed species that also occurs on Camp Pendleton. The Base has conducted inventories in all potential habitat and, through 2015, has identified 1,135 populations in 10 occurrences with 69,237 individual plants, totaling approximately 90.4 acres (36.6 hectares).

Brand's phacelia was removed as a candidate for federal listing by USFWS on 22 November 2013 following development and signature of a Candidate Conservation Agreement (CCA) between the USFWS, Camp Pendleton, Naval Base Coronado, U.S. Customs and Border Protection, and California State Parks (July 2013). Commitment to the conservation actions proposed in the CCA reduces threats to the species, which has since been removed from the USFWS list of candidate species. However, monitoring and management strategies continue to protect this species on Camp Pendleton. Brand's phacelia was first documented on-Base in 1993; at that time, 88 plants were found within a 484-square-foot (45-square-meter) area of the backdune north of the Santa Margarita River outflow. Currently, Brand's phacelia occurs within a roughly 0.33-acre (0.13-hectare) area in the same location and over 3,250 individuals have been documented. This increase in distribution is most likely the result of recent dune restoration efforts and because the range of this species on-Base occurs within an area protected and fenced for the federally and state-listed endangered California least tern. Monitoring the known populations detected nearly a third fewer plants in 2015 (2,532) than in 2014 (3,252) but with the

same number of occurrences and populations. However, although there were fewer individuals, the extent of the area occupied was larger. Annual plants are dependent on yearly weather patterns and the lower numbers were probably due to the severe drought being experienced in the region.

Nuttall's acmispon is a native annual included in the CNPS Inventory of Rare and Endangered Plants on List 1B.1. It primarily occurs in beaches and coastal scrub habitats. At Camp Pendleton, Nuttall's acmispon is known to occur on the coastal area at the southern end of the Base, adjacent to the Del Mar South Jetty and within the Blue Beach Training Area. A total of 15,886 individuals, occupying 12.27 acres (4.97 hectares), have been observed on-Base.

3.2.3 Critical Habitat

Flexibility was incorporated into the ESA through the National Defense Authorization Act of 2004, which exempts military installations from critical habitat designations as long as an INRMP acceptable to the Secretary of the Interior is in place. To qualify for the exemption, INRMPs must provide for the implementation of effective conservation measures that will sustain and advance the recovery of listed species. DoDM 4715.03 summarizes the criteria to determine if an INRMP provides adequate special management or protection to obviate the need for critical habitat designation as follows:

- The INRMP provides a conservation benefit to the listed species. The cumulative benefits of the management activities identified in the INRMP for its duration maintains or provides for an increase in a species' population or the enhancement or restoration of its habitat within the area included in the INRMP (i.e., those areas essential to the conservation of the species). A conservation benefit may result from reducing habitat fragmentation, maintaining or increasing populations, ensuring against catastrophic events, enhancing and restoring habitats, buffering protected areas, or testing and implementing new conservation strategies.
- The INRMP provides certainty that relevant agreed-on actions will be implemented. Persons implementing the INRMP can accomplish its goals and objectives, have adequate funding to implement agreed-on activities, have implementation authority, and have obtained all the necessary authorizations or approvals. The INRMP includes an implementation schedule, including completion dates, for the conservation effort.
- The INRMP provides certainty that the conservation effort will be effective. USFWS considers these criteria when determining the effectiveness of the conservation effort:
    - Biological goals, which are broad guiding principles for the program, and objectives, which are measurable targets for achieving the goals.

- Quantifiable, scientifically valid parameters that demonstrate achieving objectives and standards measuring progress.
- Provisions for monitoring and, where appropriate, adaptive management.
- Provisions for reporting progress on implementation based on compliance with the implementation schedule and effectiveness based on evaluation of quantifiable parameters of the conservation effort.
- A period of time sufficient to implement the actions and achieve the benefits of its goals and objectives.

Camp Pendleton's INRMP meets these three criteria for all federally listed species. Through the National Defense Authorization Act, Camp Pendleton identifies habitat that supports federally and/or state listed species, state species of special concern, or locally rare species as sensitive habitat.

For Criterion 1 (The plan provides a conservation benefit to the species)

While Camp Pendleton developed its management programs and INRMP to focus on ecosystems on the Base, both the Riparian Ecosystem Conservation Plan and the Estuarine and Beach Ecosystem Conservation Plan were developed in coordination with USFWS and finalized with the issuance of BOs under Section 7 of the ESA for covered species. These conservation plans contain species-specific management requirements for individual species as well as the ecosystem that provides management benefit to multiple species using the same ecosystem. These plans are fully incorporated in, and provide the backbone of, Camp Pendleton's INRMP. Specific population minimums have been established for some individual species, including least Bell's vireo and California least tern, while the specific goal for southwestern willow flycatcher is the continued expansion of the population above the 1994 level of 22 singing males. Key aspects of these programs are the removal of exotic flora and fauna throughout the ecosystems on-Base (and in some cases, off-Base) in a systematic manner and the prevention of reinfestation. Additionally, usable habitat is increased by minimizing fragmentation, by the judicious location of any development or habitat-disturbing activities. As previously noted, species-specific management plans have been prepared for Stephens' kangaroo rat (draft plan in progress) and Pacific pocket mouse (draft plan in progress). Other species-specific management plans are proposed and Section 7 consultations and NEPA review for those plans would also be conducted (see Chapter 4).

For Criterion 2 (The plan provides certainty that relevant agreed-on actions will be implemented)

As noted in the USFWS Region 1 Review Procedures, all INRMPs meet this criterion through the statutory requirement of the Sikes Act. Additionally, the DoD and USMC have established, through published orders and regulations, the requirement that INRMPs be developed and implemented. INRMP implementation is tracked and reported to Headquarters, U.S. Marine Corps (HQMC), USFWS, and CDFW annually. Implementation is also evaluated during triennial formal inspections (Marine Corps Environmental Compliance Evaluation [ECE] Program) and annual self-audits conducted by each installation.

Camp Pendleton's INRMP is implemented under the authority of the Base's Commanding General and the Air Station's Commanding Officer. The INRMP has all approvals and concurrences required under the Sikes Act. The Base's Environmental Security Department and the Air Station's Environmental Department have been assigned the responsibility for developing, programming, and implementing INRMP program requirements. These departments have direct control of environmental funding for the Base, as available, and are able to ensure that all environmental requirements are funded and executed. Additionally, because Camp Pendleton's estuarine and beach ecosystems, riparian ecosystems, and species-specific management plans (and their list of actions and management requirements) were included in BOs issued by USFWS, they are legal requirements under the ESA and receive a high priority for funding, which further ensures implementation of planned actions.

For Criterion 3 (The plan provides certainty that the conservation effort will be effective)

Camp Pendleton's management plan has included long-term monitoring of ecosystem health as an essential tool to ensure the sustainable use of the training environment at Camp Pendleton while protecting sensitive resources. As such, the Base has conducted ecological monitoring on specific habitats of interest such as habitat that supports listed species, coastal sage scrub, perennial grasslands, riparian areas, wetlands, vernal pools, oak woodlands, and dunes since the late 1980s and assessments of general ecosystem trends since the 1990s.

From 1991 through 1998, a series of long-term ecological monitoring plots was established and monitored under the Long Term Ecological Trend Monitoring (LTETM) program of the Center for Environmental Management on Military Lands. Although this program was discontinued, these data are still available for baseline comparisons. LMS subsequently developed and implemented ecosystem monitoring protocols for riparian, dune and strand, wetland and estuary, perennial grassland, oak woodlands, and vernal pools.

Specific to riparian systems, Camp Pendleton's management plan has included a habitat value system developed in coordination with USFWS to allow for monitoring the habitat value of riparian systems base-wide. In 2009 and 2013, another program was implemented to monitor the success of riparian natural rehabilitation after treatment for target invasive species. An annual report on all actions proposed in INRMPs (including monitoring actions) is provided to USFWS and CDFW. The results of these monitoring plans are incorporated into the INRMP in tables and narrative, so the results of management programs can be followed and effectiveness noted. The Base's Ecosystem Conservation Plans and INRMP were established to provide long-term management of Base ecosystems and to serve as the backbone of Camp Pendleton's natural resources management program. As part of Camp Pendleton's coordination with USFWS and CDFW (see Section 1.3), the INRMP is reviewed annually (with a more formal/document review every fifth year) along with monitoring plans established in consultation with USFWS. Monitoring and survey activities will continue until after the species covered are delisted or such activities are revised through adaptive management in consultation with USFWS.

Current ecosystem monitoring efforts for key community types on Camp Pendleton are summarized in Sections 4.2.4 and 4.2.7. Currently, LMS is developing health monitoring for coastal sage scrub and chaparral. These existing monitoring efforts will inform continued development and implementation of monitoring protocols.

Designated Critical Habitat

As of 2015, critical habitat has been designated by USFWS for 10 of the 18 federally listed species (Table 3-11) known to occur on Camp Pendleton. However, the Base is exempted from final USFWS critical habitat designation for nine of the 10 species, and critical habitat was never proposed for yellow-billed cuckoo on-Base. The southern California steelhead is under NOAA Fisheries purview; however, the Base was excluded from critical habitat designation by NOAA Fisheries because they concluded that, as implemented, the INRMP provides conservation benefits greater than or equal to what would be expected to result from an ESA Section 7 consultation. NOAA Fisheries also concluded that the Base was to be excluded due to potential impacts on national security.

Table 3-11
Critical Habitat Designation for Listed Species on Camp Pendleton

Species	Designation Status	Federal Register # (Date)	Acres on Camp Pendleton
Plants			
San Diego Button-celery	None	--	--
Spreading Navarretia	Final (Revised)	75 FR 62192-62255 (7 October 2010)	0 (Exempted)
Thread-leaved Brodiaea	Final (Revised)	76 FR 6848-6925 (8 February 2011)	0 (Exempted)
Encinitas Baccharis	None	--	--
Birds			
California Least Tern	None	--	--
Coastal California Gnatcatcher	Final (Revised)	72 FR 72010-72213 (19 December 2007)	0 (Exempted)
Least Bell's Vireo	Final	59 FR 4845-4867 (2 February 1994)	0 (Considered on-Base but determined that existing MOU and provisions of Section 7 provide sufficient protection)
Light-footed Ridgway's Rail	None	--	--
Southwestern Willow Flycatcher	Final (Revised)	78 FR 343-534 (1 January 2013)	0 (Exempted)
Western Snowy Plover	Final (Revised)	77 FR 36727-36869 (19 June 2012)	0 (Designated on-Base in the State Parks leased area but removed after the lease was updated to indicate the park would be managing wildlife under the INRMP)
Yellow-billed Cuckoo	Final	79 FR 71373-71375 (2 December 2014)	0 (None Proposed)
Mammals			
Pacific Pocket Mouse	None	--	--
Stephens' Kangaroo Rat	None	--	--
Fish			
Southern California Steelhead	Final (Revised)	70 FR 52488-52627 (2 September 2005)	0 (Excluded)
Tidewater Goby	Final (Revised)	78 FR 8745-8819 (6 February 2013)	0 (Exempted)
Amphibians			
Arroyo Toad	Final (Revised)	76 FR 7245-7467 (9 February 2011)	0 (Exempted)
Crustaceans			
Riverside Fairy Shrimp	Final (Revised)	77 FR 72069-72140 (4 December 2012)	0 (Exempted)
San Diego Fairy Shrimp	Final (Revised)	72 FR 70647-70714 (12 December 2007)	0 (Exempted)

FR = Federal Register

3.2.4 Invasive/Nonnative Species (Exotics)

Although Camp Pendleton supports many high-quality stands of habitat, invasive and other nonnative species are found throughout the four ecosystems on-Base.

3.2.4.1 Plants

Over 1,800 nonnative plant species have become naturalized in California wildlands since the late 1700s when European settlement began (Cal-IPC 2006). Of the 2,447 vascular plant species documented in San Diego County, 758 (31 percent) are non-native and naturalized (Rebman and Simpson 2014). Of the 1,015 plant species documented (vouchered) on-Base, 308 (30 percent) are nonnative to California. While many of these nonnative plants have caused little impact to the environment, others can be both invasive and damaging to natural ecosystems. Nonnative invasive plants have the potential to cause vast ecological and economic damage, and sometimes pose human health impacts in infested areas. Potential adverse impacts caused by exotic invasive species include:

- A decrease in biodiversity of native communities as a result of competitive exclusion, predation, parasitism, and disease.
- A reduction in habitat quantity and quality for native species (including threatened, endangered, and sensitive species) through the alteration of forage, shelter requirements, and water availability/quality.
- The impairment of ecosystem functions as a result of increased soil erosion, stream sedimentation, clogged waterways, altered nutrient cycling, and increased flooding.
- An increase in the frequency and intensity of wildfires.
- A decrease in the quality or availability of training lands in areas of heavy infestation.
- Human health risks.

Most of the plants that occur on Camp Pendleton are considered native to the region (Table 3-12), but as many as 30 percent are exotic (nonnative), and often are invasive species introduced during the period of European settlement. These nonnative species are believed to have displaced some native plant species in the region. A comprehensive list of the native and nonnative plant species documented on-Base as of 2016 is in Appendix H.

Table 3-12
Number of Native and Nonnative Plant Species at Camp Pendleton, Grouped by Vegetation Type

Growth Form	# Native Species	# Nonnative Species	TOTAL
Forb	443	165	608
Grass	84	67	151
Halfshrub	28	8	36
Shrub	103	24	127
Tree	17	34	51
Vine	2	2	4
Vine/Forb	20	7	27
Vine/Shrub	8	1	9
Tree/Shrub	2	0	2
Total	707	308	1,015

3.2.4.2 Wildlife

Most of the fish and wildlife species on-Base are considered native to the region, but many are also exotic (nonnative). As with exotic plants, some exotic wildlife species are invasive and may be causing the decline or local extirpation of native species as a result of competitive exclusion, habitat alteration, predation, nest parasitism, etc. A comprehensive list of the native and nonnative wildlife species documented on-Base to-date is in Appendix I.

Examples of nonnative wildlife species on-Base include beaver (*Castor canadensis*); brown-headed cowbird; bullfrog (*Rana catesbeiana*); red swamp crayfish (*Procambarus clarkii*); Argentine ants (*Iridiomyrmex humilis*); and several exotic fish species such as mosquitofish (*Gambusia affinis*), carp (*Cyprinus carpio*), black bullhead (*Ameiurus melas*), and green sunfish (*Lepomis cyanellus*). Although there is no official management plan for exotic species removal, the Base conducts annual measures such as aquatic exotic species removal to control and attempt to eradicate exotic species on-Base.

3.2.4.3 Forest Diseases and Pests

Currently, Southern California has three priority nonnative forest pests: goldspotted oak borer (GSOB, *Agrilus auroguttatus*), polyphagous shot hole borer (PSHB, *Euwallacea* sp.), and Kuroshio shot hole borer (KSHB, *Euwallacea* sp.). There are also several native forest pests and diseases that kill trees that are drought stressed, including the 5-spine Ips bark beetle (*Ips paraconfusus*) and the golden oak pit scale (*Asterodiapsis variolosa*).

GSOB is an insect pest that was first detected in San Diego County in 2004 where it has caused extensive mortality in coast live oak, canyon live oak (*Quercus chrysolepis*), and California black oak (*Quercus kelloggii*) (USFS 2010) and is a major potential threat to the oak woodland

community at Camp Pendleton. GSOB primarily attacks red oak species and causes mortality in trees larger than 5 inches (0.13 meter) in diameter. White oak species such as Engelmann oak are less susceptible to attack and, to date, no mortality has been detected in white oaks on-Base (Lawson 2015).

PSHB and KSHB are other closely related insect pests that are a potential threat to various plant communities of Camp Pendleton. These species are associated with an insect-fungus complex that causes fusarium dieback. The fungus destroys the food and water conducting systems of the tree, eventually causing stress and dieback (University of California Riverside 2014). KSHB was identified in San Diego County in 2013 and is a pest of numerous species including coast live oak and native riparian trees such as red willow (*Salix laevigata*), white alder (*Alnus rhombifolia*), and California sycamore (*Platanus racemosa*) (Coleman and Seybold 2014).

Ips bark beetles live in and feed on the phloem in the inner layer of bark on trees and particularly attack pine and spruce. They usually inhabit dead, dying, and stressed trees, including fallen trees, cut logs, and slash. They can be found in trees already damaged by drought, lightning, human activity, or pest infestation. The California 5-spined Ips occurs from southern Oregon to southern California west of the summit of the Cascade Mountains and Sierra Nevada. All species of pines within this range may be attacked (University of Georgia 2015).

The golden oak pit scale is a species of scale that causes pits in bark of oak twigs and sometimes decline and dieback. The pitting effect of the scales is most noticeable on the bark of younger twigs. Surrounding the pit is a doughnut-shaped swelling with the scale in the center. If large numbers of scales are present, the pits coalesce, making the twig surface appear roughened and dimpled (University of California Davis 2013).

3.2.5 Habitat Linkages and Wildlife Corridors

The largely undeveloped, contiguous stretches of habitat on Camp Pendleton function as a wildlife corridor, and one of the last remaining habitat linkages, and the only remaining coastal linkage, between the few remaining open spaces in Los Angeles and Orange Counties to the north, Riverside County to the northeast, and northern San Diego County to the south. Habitat linkages are open space natural areas that provide connectivity among and between habitat patches, and provide locations for native plants and seasonal or year-round habitat for wildlife. Wildlife corridors are narrow connections among and between habitat patches intended to allow for wildlife movement and dispersal. These benefits are an important regional conservation consideration for those species that use the Base for traveling between areas within their home ranges, particularly keystone predators.

While Camp Pendleton may be large enough to serve as a core area and maintain self-sustaining populations of some species for a reasonably long period of time, the long-term sustainability of most species (both within the region and on-Base) will likely be threatened if habitat linkages between the Base and surrounding preserved natural areas are removed by development projects.

Many of the open space areas within and adjacent to Camp Pendleton to the northeast within the Cleveland National Forest are generally large enough to support varied and abundant resident plant and wildlife populations and provide for unrestricted movement between the Base and adjacent open space lands. Also, the large habitat areas on-Base generally allow unrestricted access to the north toward permanently designated open space areas of the Cleveland National Forest, Casper's Wilderness Park, O'Neill Regional Park, Rancho Mission Viejo Land Conservancy, and Thomas F. Riley Wilderness Park.

While there are likely a number of preferred travel routes and landscape features that larger and more mobile wildlife species may use to move within and between permanent open space areas, wildlife "corridors" have not been formally studied and documented within the open space habitat areas on Camp Pendleton nor surrounding the Base, except for the Santa Ana – Palomar Mountain Linkage (see Section 1.8.4). This is essentially because Camp Pendleton and adjacent, permanently designated open space areas (parks and national forests) have generally not been constrained or reduced to the point of artificially creating or necessitating development of wildlife corridors. However, with current and proposed future development planned for many of the areas between the parks, national forests, Camp Pendleton, and other permanently designated open space areas, any remaining habitat linkages could "become" wildlife corridors in the near future.

Wildlife movement on-Base is facilitated because Camp Pendleton contains several watersheds and several small coastal drainages. Although water flows are intermittent across these drainages, they support abundant riparian woodland, scrub, and wetland plant communities within the floodplain areas, and coastal sage, chaparral, or grassland vegetation on canyon slopes and along ridgelines. These areas provide food and cover for many wildlife species on-Base in addition to facilitating wildlife movement base-wide. Potential east-west wildlife movement on Camp Pendleton can occur along the Santa Margarita River and Las Flores, Aliso, and San Onofre Canyons; portions of the San Mateo and San Luis Rey Rivers; and along several small coastal drainages. San Onofre Creek, San Mateo Creek, and the Santa Margarita River offer the best direct connection for wildlife.

Potential north-south wildlife movement occurs on Camp Pendleton through the inland slopes situated along the eastern half of the Base, and those of the coastal belt located just east of the I-5 corridor. Other potential north-south wildlife movement on Camp Pendleton may include the areas along the beaches, coastal benches/bluffs, and foothills that are, for the most part, unconstrained by development and other artificial barriers.

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CHAPTER 4.0
NATURAL RESOURCES MANAGEMENT

This chapter presents the natural resources management programs for Camp Pendleton, including the Base and Air Station. The primary drivers for each program are summarized, as well as other background information applicable to the program (e.g., responsible entities, relevant ecosystems, and program background). Each program presented in this chapter includes one or more elements that address specific management components of the program. Each program and element has a goal, and each element includes one or more objectives intended to meet program and element goals. Goals are visionary, ideal, and general in character, and provide long-term guidance in defining direction and purpose of the program. Objectives provide a more concise statement of what must be achieved to meet program and element goals. Finally, specific actions were developed to support each objective that is identified in this chapter. Actions represent specific efforts (in-process single events or periodic and ongoing) that are implemented or are proposed by the Base and Air Station to support each natural resources management program. In addition to outlining the specific programs, elements, and associated goals and objectives, this chapter summarizes the actions required for the success of each natural resources management program. Refer to Appendix P for a complete list of actions planned for the current INRMP term (i.e., 2018–2023).

4.1 THREATENED, ENDANGERED, AND RARE SPECIES PROGRAM

- PROGRAM GOAL: Manage threatened, endangered, and rare species (e.g., regional species of concern) and their habitats to support sustainable populations while providing maximum training flexibility.

The Threatened, Endangered, and Rare Species Program addresses management of species afforded protections under the ESA (i.e., federally listed species), as well as species of concern. Species of concern are defined broadly to include plant and wildlife species afforded protections under other federal laws (e.g., MBTA, BGEPA); California Endangered Species Act (CESA), considered species of concern by CDFW, USFS; and other species that are regionally rare or of limited distribution (see Chapter 3).

This program is driven primarily by the requirements of MCO P5090.2A CH 3 and DoDM 4715.03. In particular, Chapter 11 of MCO P5090.2A CH 3 states the following:

> "3. Fish and Wildlife Management a. Endangered Species (1) Each installation shall survey and take other appropriate actions to document the presence of candidate species

and endangered or threatened species on the installation, and identify their currently used and periodically-or indirectly-used habitats. Each installation shall assist FWS in determining whether any such habitats may be included or excluded from critical habitat designation. Each installation shall also survey and take other appropriate actions to document the presence of state or territory rare and endangered species."

DoDM 4715.03 further requires INRMPs to incorporate inventory, monitoring, and management of ESA listed species and agreed-upon elements of specific ESA consultations. Camp Pendleton regularly consults with USFWS or NOAA Fisheries to ensure that Marine Corps actions (i.e., proposed species and habitat management actions that are under the purview of the Base's RMB and the Air Station's Environmental Department, or proposed construction projects and related operations and maintenance actions that are under the purview of the Base's PLN and the Air Station's Environmental Department) are not likely to jeopardize the continued existence of any endangered or threatened species, and are within compliance with Sections 7 and 9 of the ESA. Pursuant to Section 7 of the ESA, federal agencies such as the Marine Corps must consult with USFWS or NOAA Fisheries if their action may affect a federally listed endangered or threatened species (50 Code of Federal Regulations [C.F.R.] 402). Such consultations may be formal or informal. When required by Section 7 of the ESA, Camp Pendleton prepares a Biological Assessment (BA) of the effects of a proposed action on listed species. Section 9 of the ESA prohibits the "take" of a threatened or endangered species. Take includes the direct killing, harming, or harassing of a species, or destruction of habitat that may be important for the species' survival or recovery. Additionally, Section 10 permits are required by many of the natural resources monitoring and research efforts.

The Threatened, Endangered, and Rare Species Program is implemented by WMS and LMS, and is applicable to all ecosystems. Beyond management of federally listed species, Camp Pendleton also monitors non-federally listed species of concern under this program to better understand the distribution and abundance of these species.

The program is organized into three elements as discussed in Sections 4.1.1, 4.1.2, and 4.1.3, respectively: (1) ESA Wildlife Management Element, (2) Regional Wildlife Species of Concern Element, and (3) Threatened, Endangered, and Rare Plant Management Element.

4.1.1 ESA Wildlife Management Element

- ELEMENT GOAL: Adaptively manage sustainable populations of federally listed threatened and endangered wildlife species to achieve conservation goals while providing maximum training flexibility.

While Camp Pendleton's natural resources management philosophy is that management should be ecosystem based, special emphasis is provided to manage federally threatened and endangered wildlife species and their habitats to assist in the conservation and recovery of those species. As such, Camp Pendleton maintains habitats sufficient to sustain existing species populations while also allowing for potential population growth. The Marine Corps recognizes the importance of maintaining natural landscapes, wherever possible, as a mission-essential element in training and views effective conservation and management of natural resources to assist in the conservation and recovery of federally threatened and endangered species as compatible with the long-term viability of the military training mission itself. This element provides for management of federally listed wildlife species in all ecosystems. WMS is responsible for implementation of actions associated with management of avian, small mammal, amphibian, and fish species, whereas LMS is responsible for implementation of management actions for the two federally listed endangered wildlife species of fairy shrimp that occur on-Base. The Air Station's Environmental Department is responsible for implementation of actions associated with management of federally listed endangered species that occur on the Air Station. It is Base policy to incorporate MCAS CamPen data into the INRMP and related programming and contracting actions; include MCAS CamPen data in Riparian BO reporting; and provide annual reports to MCAS CamPen documenting actions taken to support MCAS CamPen natural resources.

Camp Pendleton's approach for federally listed species seeks to ensure that (1) a record of all listed species is maintained; (2) species-specific management plans are developed and implemented; and (3) staff are knowledgeable of current and emerging issues related to federally listed species. Objectives for the ESA Wildlife Management Element are described below.

OBJECTIVE 1: Maintain a comprehensive record of data for all listed species on Camp Pendleton to support effective adaptive management decisions and program funding requirements.

Actions to meet this objective consist of listed species monitoring surveys and maintenance of a comprehensive database. For listed avian species, the general goal of the annual monitoring surveys is to document presence/absence, nest locations, nest success, and/or nest fecundity through the use of established protocols. These species include least Bell's vireo, southwestern willow flycatcher, California least tern, and western snowy plover. However, nest monitoring and nest fecundity studies are only conducted for least Bell's vireo in special study areas to test effects of fire or weed removal. Coastal California gnatcatcher monitoring surveys are conducted every 3 to 4 years, during which nest monitoring is conducted on a subset of gnatcatchers to obtain information on breeding trends. Presence/absence data are also recorded for light-footed Ridgway's rail and yellow-billed cuckoo, but nesting data are not recorded. A list of the established species survey protocols that are followed is provided in Appendix Q.

For listed amphibians and small mammals, the general goal is to determine the Proportion of Area Occupied on Camp Pendleton, as defined by USGS protocols developed for Camp Pendleton. These species include arroyo toad, Stephens' kangaroo rat, and Pacific pocket mouse. Annual monitoring of tidewater goby to detect presence/absence and suitability of habitat is also planned.

The LMS strategy for fairy shrimp management has been to determine distribution and abundance of Riverside fairy shrimp and San Diego fairy shrimp base-wide; a challenging task when annual rain patterns were insufficient to determine shrimp to the species level. However, for 15 years, USFWS protocol-level inventories have been conducted to determine species occupancy in the majority of vernal pools and other suitable habitat throughout the Base, and the distribution and abundance of the two listed species have been documented. In addition, all pools known to be occupied by Riverside fairy shrimp and San Diego fairy shrimp have been mapped and entered into the Base GIS environmental data management system. Currently, the Base has documented 3,696 vernal pools, depressions, and road ruts that temporarily pond. Surveys have been conducted on 76 percent of these pools and have found that San Diego fairy shrimp occupy 526 pools and Riverside fairy shrimp occupy 181 pools. The LMS has studied habitat requirements and, together with the distribution and abundance information collected, conservation concepts have been developed in preparation for writing the conservation plans, which are currently being drafted. LMS plans to continue to inventory and monitor Riverside fairy shrimp and San Diego fairy shrimp base-wide, and update GIS records.

The Air Station will continue to monitor the abundance, distribution, and breeding success of arroyo toads, least Bell's vireos, and southwestern willow flycatchers using established protocols, in compliance with the Riparian BO and other applicable biological opinions.

Quino checkerspot butterfly (*Euphydryas editha quino*) is known to occur in the region but has not been identified on Camp Pendleton. This species is included on the list of species USFWS requires consideration for during consultation in this area.

OBJECTIVE 2: Develop and implement management plans for key listed wildlife species and implement adaptive management studies to meet Camp Pendleton's ESA responsibilities to sustain and enhance the conservation potential of listed species while providing maximum training flexibility.

Management of certain federally listed species is guided by the two primary ecosystem-based conservation plans that were discussed in Chapter 3, the Base's Estuarine and Beach Ecosystem Conservation Plan (Appendix K) and the Riparian Ecosystem Conservation Plan (Appendix L).

In addition, two species-specific management plans, the Stephens' Kangaroo Rat Management Plan and the Pacific Pocket Mouse Management Plan, are currently in development and will be appended to the INRMP when complete.

Although the management plans for Stephens' kangaroo rat and Pacific pocket mouse are not exclusively habitat based, habitat management plays an integral role in the successful implementation of these plans and would be an important component of the proposed species management plans. Actions associated with this objective include implementation of these plans and programs, the development and implementation of additional plans, and performing the studies necessary to inform adaptive management strategies. Actions to meet this objective for different groups of taxa are summarized below. Refer to Appendix P for the complete list of actions planned to meet this objective.

Avifauna

- Annual maintenance and improvement of listed shorebird (i.e., California least tern and western snowy plover) nesting habitat will be conducted prior to 15 March each year, including installation of a protective perimeter fence. The fence will be maintained 15 March through 15 September. California least tern habitat use studies were completed in 2014 and results will be applied during habitat enhancement in future years. Additionally, least tern fledgling success studies concluded in 2018 will be analyzed for efficacy and applicability to provide more accurate fledgling counts. Western snowy plover fledgling detection studies will be conducted 2018–2022. Lastly, predation and competition threats to the survival and recovery of listed shorebirds will be assessed annually, and strategies will be developed and implemented to reduce and effectively manage the populations of potential predators in the vicinity. For example, since 2013, WMS has participated in a raptor relocation study to reduce predation on California least terns. WMS will complete this study to determine if this is sustainable methodology for predator control.
- Limiting habitat factors for southwestern willow flycatcher on Camp Pendleton will be investigated and subsequent management actions will be proposed to sustain a viable population.
- Post-fire recovery studies will be conducted in coastal sage scrub to determine length of time and plant biodiversity required for coastal California gnatcatcher to resume breeding, and to determine winter dispersal/habitat use adjacent to burned areas. These studies will be conducted annually for at least 5 years until the results are sufficient to inform future management strategies. Also, the need for a coastal California gnatcatcher management plan will be assessed.

Small Mammals

- Annual habitat enhancement will be performed at the Juliet Stephens' kangaroo rat Mitigation Area, including implementation of prescribed burn plans by LMS in conjunction with the CPFD. The dispersal and survivorship rates of Stephens' kangaroo rats translocated to the Juliet Mitigation Area will be recorded annually. Stephens' kangaroo rat occupancy will be maintained on Camp Pendleton on at least 1,552 acres (628 hectares) of habitat. Pacific pocket mouse micro-habitat requirements will be assessed and used to better inform future restoration and habitat enhancement. Lastly, consultation and NEPA review for the final Stephens' Kangaroo Rat Management Plan (draft plan in progress) and the final Pacific Pocket Mouse Management Plan (draft plan in progress) will be initiated by 2018.

Amphibians

- To maintain a stable population of arroyo toad on Camp Pendleton, WMS will conduct an analysis of 5-year trend data to develop subsequent adaptive management strategies. The Air Station conducts monitoring of arroyo toads and provides their results to the Base. Additionally, by 2018 WMS will complete an arroyo toad mitigation and management study in support of reducing training restrictions. Lastly, WMS will monitor developing life stages of arroyo toad in the Santa Margarita River annually to determine impacts of Base water management activities.

Fish

- Feasibility for the translocation of tidewater goby individuals to suitable habitat off Camp Pendleton will be identified. Additionally, potential for southern California steelhead to occur within San Mateo Creek and Santa Margarita Rivers will be considered when planning and conducting management activities under the Riparian BO. The survey methodology for southern California steelhead will be completed by 2018 and implemented annually thereafter.

Invertebrates

LMS has been working collaboratively with USFWS regarding the development of a Conservation Plan for vernal pool habitat occupied by Riverside fairy shrimp and San Diego fairy shrimp. The plan will be based on differing levels of conservation, depending upon distribution and abundance on-Base paired with the knowledge of suitable habitat requirements. This will include three levels of conservation: maximum, status quo, and limited conservation.

- Maximum conservation will continue to preserve and manage core fairy shrimp populations (identified in collaboration with USFWS) and their habitats and reduce threats to their long-term viability at target vernal pool complexes. All new construction projects will be prohibited in these areas and, as funding becomes available, degraded pools will be restored to high-quality pools. The target areas for maximum conservation are Cocklebur Mesa, San Onofre Mesa, Wire Mountain, White Beach, VP Group 68, and the area between Stuart Mesa Road and I-5 in Oscar 2.

- Status quo conservation will consist of conserving and managing secondary fairy shrimp populations by actively complying with MCIWEST-MCB CAMPENO 3500.1 CH 1 and the EOM that prohibit off-road vehicle travel in areas with vernal pools. Dirt roads and unauthorized training for which no NEPA analysis was conducted will be off-limits. LMS will determine a baseline level of dirt roads using 1998 aerial photographs. All dirt roads created since 1998 where no NEPA analysis was conducted will be removed. Pools impacted by unauthorized training activities will also be restored. The target areas for status quo conservation are Coastal Training Areas (west of I-5) that are not part of core areas listed above, Oscar 1, and all other isolated occupied vernal pools outside of dirt roads.

- Limited conservation will entail the establishment of areas with minimal training restrictions, other than to prohibit filling or intentional destruction of existing off-road pools. In coordination with USFWS, LMS will develop and conduct fairy shrimp viability monitoring and studies (at both the pool and population level) in a manner that does not impede training. Population/pool thresholds will be established that, if reached, would require reversion to Status Quo Conservation. The target areas for limited conservation are Tango, Oscar Two inland from Stuart Mesa Road (excluding Pool Group 68), and previously established roads (per 1998 baseline).

Management areas will be developed during plan development for each conservation level and concurrence from the Environmental Security Department, G-3/5, and USFWS obtained prior to implementation. Once concurrence is obtained, the Fairy Shrimp Conservation Plan will be planned, funded, and implemented. Effectiveness of the plan will be assessed based on the results of monitoring and studies required under that plan, and revised as necessary.

Multi-Species

Other monitoring and management activities to be conducted that will benefit multiple species include:

- Informational Carsonite markers will be installed in sensitive habitat. Additionally, unauthorized recreational usage of training beaches will be minimized by posting signage, taking enforcement actions, and reporting trespass issues on an as-needed basis.
- Creek crossings, stream water quality, and storm frequency and volume will be monitored to assess immediate and long-term impacts to listed species so that the degradation of listed species habitat does not occur.
- The Riparian Ecosystem Conservation Plan and Estuarine and Beach Conservation Plan will be amended to incorporate newly listed species and/or new occurrences of listed species.

OBJECTIVE 3: Maintain awareness of current and emerging issues related to federally listed wildlife species and other species of concern with potential implications to Camp Pendleton.

Camp Pendleton maintains awareness of, and reviews and comments on, Federal Register notices regarding proposed listings, critical habitat, recovery plans, and candidate species status. As these issues are identified, WMS and LMS review existing abundance and distribution data, conservation plans, management programs, and programmatic instructions for applicability and support provided to those species and issues. Camp Pendleton also participates in regional working groups to increase knowledge of federally listed species status and management issues for species known to occur on-Base.

4.1.2 Regional Wildlife Species of Concern Element

- ELEMENT GOAL: Monitor non-federally listed wildlife species of concern to better understand the distribution and abundance of regionally sensitive species.

MCO P5090.2A CH 3 and DoDM 4715.03 provide key guidance on the management of non-federally listed species. MCO P5090.2A CH 3 directs the installations to conduct surveys to document the presence of state endangered and rare species and, to the maximum extent practicable and where it does not conflict with the installation mission, to survey and take other appropriate measures to identify, monitor, and manage other species at risk. DoDM 4715.03 requires the identification of state-listed species and other sensitive species, stressing that INRMPs address regional conservation issues and priorities, including regional species of concern.

Monitoring of non-federally listed wildlife species is driven primarily by other federal laws and MOUs with agencies or interest groups. Drivers related to non-federally listed species include the MOU between DoD and the Pollinator Partnership, MOU between DoD and Bat

Conservation International, and the Strategic Plan for Amphibian and Reptile Conservation and Management on DoD Lands (see Appendix B for copies of these MOUs and plans).

To comply with these drivers, WMS and LMS monitor non-federally listed species of concern to better understand the distribution and abundance of these species. Monitoring on species-specific levels is used to gather data to provide additional indices of ecosystem health and inform potential future listings decisions. Monitoring of non-federally listed species of concern may also occur as part of listed species monitoring and management (see Section 4.1.1). Monitoring of non-federally listed species of concern is conducted across all ecosystems (including vernal pools by LMS). The following objective provides for the monitoring of non-federally listed species of concern.

OBJECTIVE 1: Monitor wildlife species of concern by conducting inventory surveys and studies on a regular basis to comply with military order to participate in and contribute to regional conservation efforts.

As funding allows, WMS performs inventory surveys for regional species of concern including pollinators, bats, and raptors and amphibians. Generally, at least 2 years of data are collected for each species of concern selected for inventory. The WMS will also evaluate management techniques to promote conservation of pollinating species of bird and insect and their habitats per the 2015 MOU between DoD and the Pollinator Partnership and for the monarch butterfly (*Danaus plexippus plexippus*) specifically, which is under review for federal listing (USFWS 2015). WMS will determine the need for wintering habitat studies. As feasible, WMS will also monitor grunion activity on installation beaches and provide data for inclusion in Statewide assessments.

WMS also seeks to engage with regional partners (including researchers) to support limited research. WMS and LMS will provide access to Camp Pendleton, when compatible with military training, safety, and natural resources management goals, for qualified research projects that are regional in nature. Such projects often support one or more of the natural resources management program goals and objectives, as well as contribute to Camp Pendleton's overarching natural resources management goal of encouraging regional plans and incentives that address conservation of native biodiversity, ecosystem sustainability, and watershed management issues. Currently, the Base is sponsoring USGS to conduct a coastal California gnatcatcher post-fire census, badger occurrence, and climate change stream data loggers; Point Blue Conservation Science for least tern food provisioning study and mark/recapture study; an annual raptor banding; a mountain lion dispersal study; and an arroyo toad dispersal study with Ranch Mission Viejo, among other studies.

As appropriate, the Air Station will also conduct general or focused wildlife inventory surveys to evaluate natural resources on the installation, with a particular focus on regional species of concern including pollinators, bats, and amphibians.

Lastly, WMS will evaluate the potential to support or contribute manpower to surveys of non-federally listed species of concern at locations off Camp Pendleton for the benefit of studying regional abundance and distribution of certain species.

4.1.3 Threatened, Endangered, and Rare Plant Management Element

- ELEMENT GOAL: Manage for the continued sustainability of federally listed and select rare plants while reducing encumbrances to training lands.

Camp Pendleton supports a diverse biota that includes numerous species of rare plants including one federally listed endangered species—San Diego button-celery, and three federally listed threatened species—thread-leaved brodiaea, spreading navarretia, and Encinitas baccharis. One species, Brand's phacelia, was a federal candidate species and was near listing when LMS, in conjunction with other federal and state partners, wrote a combined CCA to successfully preclude the listing. San Diego button-celery and thread-leaved brodiaea are also listed as endangered under CESA. Two other rare species that are not listed under the ESA or CESA that occur on Camp Pendleton and are managed by LMS are Pendleton button-celery and Nuttall's acmispon, the latter being ranked as 1B.1 by CNPS (CNPS 2015). No federally listed or state-listed plant species are currently known to occur on the Air Station (APEX and AECOM 2009). It is critical for Camp Pendleton to engage in the identification; determine distribution and abundance; monitor phenology; and conserve federal candidate, state listed, and 1B.1 ranked species with extremely small, isolated populations, such as these, to help prevent future listing under the ESA.

Rare plant management is conducted by LMS across all ecosystems and has included conducting inventories, habitat analysis, phenology data collection, and monitoring to document species distribution and abundance; collecting voucher specimens for all plants (and bryophytes) occurring on Camp Pendleton; developing Conservation Plans that include avoiding and minimizing threats; habitat enhancement; and monitoring these populations. A list of the established rare plant survey protocols that are followed is provided in Appendix Q.

LMS has standardized inventory protocols to provide for complete 100 percent inventories during peak detectability season in habitats for their species of interest. The protocols are then formatted in a geodatabase so inventory personnel collect data in a standardized format that can be uploaded to GIS. Mapping methods have been standardized when a group of plants deemed a

"population" is at either 23 feet (7 meters) or 13 feet (4 meters). LMS also tracks "occurrences" defined as populations within 0.25 mile (0.4 kilometer) from each other (method also used by USFWS) (Appendix Q).

Monitoring and mapping data are migrated into a geodatabase and used for determining habitat requirements such as slope, aspect, soil type, and vegetation type. This further informs LMS of potential habitats and where to focus inventories. While determining distribution and abundance on-Base, phenology data are gathered to understand if the plants are actively being pollinated, creating viable fruits and seed, and if there are differing age classes and recruitment, which indicates that the plant populations are currently sustainable. In addition, all other CNPS plants occurrences and populations are collected. Species locations are updated as available for publishing on the MCB CamPen EOM for reference by trainers and other range and training area users. Impacts to populations and their locations from routine training activities are currently controlled through the development of programmatic instructions, which are published in the Base Training Regulations that focus on avoidance and minimization of impacts.

Objectives for each of the federally listed plant species and select regional species of concern are summarized below per plant species of concern. It should be noted that these species also benefit from other LMS base-wide ecosystem management practices such as invasive, nonnative vegetation control and erosion control (see Section 4.2).

OBJECTIVE 1: Implement management to maintain and enhance the three largest occurrences of thread-leaved brodiaea (82 percent) and remove the remaining occurrences (49) from training restrictions by 2018.

To meet this objective, LMS is currently developing a thread-leaved brodiaea management plan in cooperation with USFWS and the San Diego Management and Monitoring Program. All information gained from monitoring, studies, and management activities will be provided to USFWS to be incorporated into their formal 5-year review for this species. With the enhancement of the three largest (80 percent) of the thread-leaved brodiaea populations on Camp Pendleton, the remaining 49 occurrences are expected to be released from training restrictions. The thread-leaved brodiaea management plan will be updated every 10 years, if required.

OBJECTIVE 2: Manage populations of San Diego button-celery to be self-sustaining.

In cooperation with USFWS, LMS is developing a San Diego button-celery section for the developing Rare Plant Management Plan to determine if occupied vernal pools need thatch and invasive grass management to improve the plants habitat. Occupied vernal pools will be monitored following rainfall seasons with average or above average rainfall. The majority of

pools are protected by fences and the remaining pools will be marked with Carsonite markers to avoid impacts. Upon completion, the Rare Plant Management Plan, including the San Diego button-celery measures identified therein, will be implemented and will be updated every 10 years. All information gained from monitoring and management activities will be provided to USFWS to be incorporated into their formal 5-year review for this species.

OBJECTIVE 3: Manage populations of spreading navarretia to be self-sustaining.

In cooperation with USFWS, LMS is developing a spreading navarretia section for the Rare Plant Management Plan to improve the plant's habitat and to manage populations to be self-sustaining. The 27 known occupied vernal pools will be monitored following rainfall seasons with average or above average rainfall. The majority of pools are protected by fences and the remaining pools will be marked with Carsonite markers to avoid impacts. Upon completion, the spreading navarretia measures identified in the Rare Plant Management Plan will be implemented and updated every 10 years. All information gained from monitoring and management activities will be provided to USFWS to be incorporated into their formal 5-year review for this species.

OBJECTIVE 4: Inventory all potential habitat and collect ecological and natural history data for Encinitas baccharis.

To meet this objective, LMS is conducting inventory surveys for Encinitas baccharis in all potential habitat for this species to determine its distribution and abundance on-Base. All information gained from inventorying and phenology data collection will be provided to USFWS to be incorporated into their formal 5-year review for this species. LMS will develop a management strategy after all potential habitat is inventoried along with collecting in-depth phenology and habitat data within the next 5 years.

OBJECTIVE 5: Continue to conserve populations of Brand's phacelia by implementing the CCA.

A CCA was developed for Brand's phacelia in 2013 with USFWS, Naval Base Coronado, California State Parks, and U.S. Customs and Border Protection. The purpose of the agreement is to ensure the long-term conservation of Brand's phacelia through implementation of conservation actions and the minimization of threats to its persistence to preclude federally listing the plant. The participants in the CCA anticipate that successful and continued implementation of conservation actions will be sufficient to improve the status of this species thereby precluding the need to list it within the foreseeable future as threatened or endangered under the ESA.

To meet this objective, LMS is inventorying the lower Santa Margarita River for new populations, monitoring all known populations, and collecting data on the species phenology for the duration of the CCA (2018). Habitat enhancement has and will be conducted in occupied habitat. LMS coordinates twice a year with other CCA members to write a combined yearly report documenting progress made implementing the plan. The CCA will be updated every 5 years.

OBJECTIVE 6: Manage populations of Pendleton button-celery to be self-sustaining so the species does not require federal listing.

LMS has inventoried all potential habitat and determined distribution and abundance, and has collected in-depth phenology and density information. In FY 2016, LMS conducted the last phenology and habitat data collection for inclusion in the management plan. In cooperation with USFWS, LMS is developing a Pendleton button-celery section for the Rare Plant Management Plan and will update that section of the plan every 10 years, if needed. All information gained from monitoring and management activities will be provided to USFWS to preclude federal listing under the ESA.

OBJECTIVE 7: Manage populations of Nuttall's acmispon to be self-sustaining so the species does not require federal listing.

LMS inventoried all potential habitat in 2016 to determine distribution, abundance, and phenology of Nuttall's acmispon. In cooperation with USFWS and the San Diego Monitoring and Management Program, LMS is in the process of developing a Nuttall's acmispon section for the Rare Plant Management Plan and will update that section of the plan every 10 years, if needed. All information gained from monitoring and management activities will be provided to USFWS to avoid federal listing under the ESA.

OBJECTIVE 8: Continue baseline floral inventory to determine plant species diversity on Camp Pendleton.

To meet this objective, LMS will continue to conduct yearly floral inventories using the San Diego Plant Atlas methods through 2021 with the San Diego Natural History Museum. In addition, during all specific plant inventories all rare plants found are also recorded. Other actions being undertaken as time permits are to determine presence of other San Diego County federally listed or candidate plants that are not known to occur on Camp Pendleton. As appropriate, the Air Station will also periodically conduct floral inventories to inform resource management on that installation.

OBJECTIVE 9: Revisit historic rare plant observations.

To meet this objective, LMS is conducting visits through 2022 to historic rare plant locations to confirm that the populations or individuals observed are still present.

OBJECTIVE 10: Maintain awareness of current and emerging issues related to federally listed plant species and other species of concern with potential implications to Camp Pendleton.

To meet this objective, LMS regularly reviews the Federal Register for updates that may be applicable to the management of listed species within the Base, and participates in regional working groups to increase knowledge of federally listed species status and management issues.

4.2 SUSTAINABLE ECOSYSTEM MANAGEMENT PROGRAM

- PROGRAM GOAL: Manage Camp Pendleton lands to support present and future training requirements while conserving and enhancing ecosystem integrity.

The Sustainable Ecosystem Management Program provides for landscape sustainability of all ecosystems through activities that restore and maintain ecosystems, actions that measure impacts and effects of actions and activities to ecosystems, identification of changes to ecosystems from natural and nonnatural sources, and establishment of actions to monitor ecosystems, and ensure ecosystem processes are conserved. DoD has recognized the value of ecosystem management and has established principles and guidelines for natural resources managers on military installations. Ecosystem management requires a shift from the management of single species or habitats to the management of multiple species and their habitats. Regulatory requirements have historically fostered a greater emphasis on a species-by-species management approach.

Camp Pendleton has endeavored to reflect the principles of ecosystem management (e.g., the Riparian Ecosystem Conservation Plan and Estuarine and Beach Ecosystem Conservation Plan), and its future vision of its natural resources management is to further develop, promote, and refine its ecosystem-based management program. The aim of this approach is to promote the conservation of native species and habitats, provide for the sustainability and biological diversity of terrestrial and aquatic ecosystems, maintain soil resources and their processes, monitor and maintain ecosystem processes, and facilitate maximum support of the military training mission and infrastructure, while simultaneously ensuring compliance with applicable laws and regulations.

An important component of ecosystem management is adaptive management. Since knowledge of ecological systems and processes is inherently limited (due in part to changing conditions), learning how to manage better is continuous. Flexibility and adaptation in the face of uncertainty are critical (Leslie et al. 1996). At the heart of adaptive management is the need to approach all management decisions as experiments to be tested (Leslie et al. 1996). Hypothesis testing, assessments of the efficacy of management techniques, and incorporation of knowledge gained over time are key to successful adaptive management.

The Sustainable Ecosystem Management Program is implemented by LMS and WMS and is organized into 11 elements: (1) Wildlife Observation Database Element; (2) Exotic Wildlife Control Element; (3) Ecosystem Mapping Element; (4) Ecosystem Monitoring Element; (5) Wetland and Estuary Management Element; (6) Vernal Pool Management Element; (7) Nonnative and Invasive Species Management Element; (8) Erosion Control Element; (9) Wildland Fire Management Element; (10) Climate Change Element; and (11) Training Element. These elements and their associated goals and objectives are discussed further in the following subsections.

4.2.1 Wildlife Observation Database Element

- ELEMENT GOAL: Maintain a database of incidental wildlife observations reported on Camp Pendleton.

The establishment and maintenance of a natural resources inventory is an essential component of conservation and adaptive management (DoD 1996). While not collected during standardized survey efforts, incidental observations of wildlife species (including listed and nonlisted species) can provide useful supplemental data to inform conservation and adaptive management. The following objective is provided to ensure incidental wildlife observations are documented and properly memorialized.

OBJECTIVE 1: Document incidental wildlife observations made on Camp Pendleton as they are reported.

As noted in Section 2.4.2.1, the Air Station's Environmental Department identifies, collects, and stores the remains of bird strikes under the BASH Program. On the Base, WMS gathers and records observations of wildlife species that are opportunistically observed by range and training area users, contracted biologists, and Environmental Security Department staff. Many of these observations are collected incidentally when conducting focused surveys for a protected species associated with military construction projects or annual monitoring. Observations are vetted for authenticity before entering them into the database, considering factors such as experience of

observer, distance to animal, and historic occurrence. The database is not meant to be an exhaustive record of species occurring on-Base but rather an archive of incidental observations that could be used to validate presence of species for a specific time period. It is important to note that *absence* of a species cannot be determined using the Wildlife Observations Database records.

4.2.2 Exotic Wildlife Control Element

- ELEMENT GOAL: Conduct removal of target exotic wildlife species.

Exotic animals may pose a threat to native species and communities on Camp Pendleton (e.g., competitively excluding native species, altering the habitat in a manner that favors other exotics, predation, nest parasitism, etc.). The introduction and spread of invasive nonnative animals has been particularly prevalent in riparian and aquatic habitats on Camp Pendleton (USDA 1999). These infestations often coincide with habitat disturbance, making it difficult to separate the influence of one from the other. For example, introduced fish and amphibians tend to thrive in highly modified habitats, confounding habitat degradation with the exotic predators as the primary source of native amphibian declines. However, observations of successful breeding activity by native amphibians in extremely modified breeding sites that were free of exotics support the interpretation that the exotic species themselves are an important problem (USDA 1999). These observations have helped lead Camp Pendleton's ecosystem management to maintain an aggressive program element for the control and removal of invasive exotics.

The *Exotic Aquatic Species on MCB Camp Pendleton, California; Control and Management* (Holland and Swift 2000) study states that a watershed approach will be most effective due to the prolific reproductive ability of most exotics. In 2004, ECORP Consulting, Inc. conducted an analysis of various removal methods as recommended by Holland and Swift (2000), which led to a focused, site- and gear-specific study designed for a 5-year, nonnative aquatic species removal program in the Santa Margarita River within the boundaries of the Base. In 2009, the program was further adapted to target the removal of bullfrogs (*Lithobates catesbeianus*) within the Santa Margarita River. Based on the success of this program and the widespread problem in the other HUs, the Base expanded its nonnative aquatic species removal program into three of its major HAs in 2010: San Mateo Canyon HA (which contains San Mateo Creek and its tributaries); San Onofre HA (which contains San Onofre Creek and its tributaries); and the Ysidora HA (which contains the lower portion of the Santa Margarita River and its tributaries). ECORP was contracted by the Base to continue the implementation of this program and, in 2012, this program was expanded to include the upper portion of the Santa Margarita River shared with Naval Weapons Station Seal Beach Detachment Fallbrook.

WMS is responsible for exotic wildlife species control efforts, which primarily take place in the Wetland, Aquatic, and Marine Ecosystem. The following objective is provided to obtain control of exotic wildlife species.

OBJECTIVE 1: Obtain reasonable control (distribution and abundance) of exotic wildlife species to benefit listed and nonlisted species through annual removal efforts.

As required by the Riparian BO and other consultations, exotic aquatic species control and removal have been and are primarily conducted in the Santa Margarita, San Onofre, and San Mateo watersheds. Exotic species control is conducted in the San Mateo watershed as part of the ongoing steelhead monitoring, and also as part of the Santa Fe Pacific Pipeline mitigation. In addition, exotic species control was done as part of the tidewater goby reintroduction carried out as mitigation for the North County Transit District Emergency Repairs of San Mateo Bridge. Species removed from San Mateo Creek have included mosquitofish, crayfish, black bullhead, and bullfrog tadpoles and egg masses. As necessary, the Air Station's Environmental Department will conduct bullfrog removal or coordinate with WMS to allow access for bullfrog removal on MCAS CamPen.

In addition, the Camp Pendleton cowbird control program was initiated in 1983. Its purpose is to benefit the federally endangered least Bell's vireo, southwestern willow flycatcher, and other host species by removing brown-headed cowbirds from riparian nesting habitat.

4.2.3 Ecosystem Mapping Element

- ELEMENT GOAL: Map Camp Pendleton vegetation every 5 years using the National Vegetation Classification Standard (NVCS).

Performing consistent vegetation mapping is one component of determining sustainability of lands to support military training and prevent invaluable training acres from becoming degraded. Vegetation mapping is fundamental to the understanding of species distribution and managing ecosystem health and, as such, land managers, planners, and decision makers require a consistent and repeatable hierarchical system to organize distinct plant assemblages.

Several base-wide or area-specific mapping projects have been conducted at Camp Pendleton since the mid-1980s. However, because of the various mapping scales, levels of detail, map unit size, and classification systems used during each mapping event, and subsequent changes in vegetation cover in riparian areas as required by the Riparian BO, and in other areas of interest, much of the existing mapping should not be used for detailed ecosystem health monitoring.

To accurately assess changes in vegetation over time, a repeatable mapping methodology, using the NVCS, is being conducted (NVCS 2015). This system is a widely accepted, scalable, scientific methodology that is currently used by the National Park Service (NPS) Vegetation Inventory Program and other federal agencies to accurately map large land holdings. The system is hierarchical, with upper levels based on physiognomy and lower levels based on floristics, and it is inclusive of both cultural and natural vegetation types. Specific advantages of the NVCS are that it is (1) repeatable; (2) broadly accepted; (3) based on sound science; (4) based on standard field and data analysis methods; (5) ecologically meaningful; and (6) able to be cross-walked to other classification systems.

An important use of updated vegetation mapping is documenting specific changes in plant community distribution, particularly in sensitive habitats such as coastal sage scrub, estuaries, and chaparral. Conducting a spatial change analysis between previous and current sites will identify impacts or a change in habitat types.

A riparian habitat monitoring program was developed in the Riparian BO for riparian areas of the Base. It uses geographical areas of plant communities that are weighted by points. The Base's Riparian Ecosystem Conservation Plan (Appendix L) defines monitoring requirements for the riparian areas as required under the Riparian BO. The plan identifies the major riparian habitats and assigns values to habitat types based on their suitability for currently listed threatened and endangered species. An ecosystem health value of the riparian areas was derived from the acreage of each habitat type weighted by its habitat value. The plan's assumption was that removal of exotic species would increase habitat value for least Bell's vireo, southwestern willow flycatcher, and arroyo toad populations. Issues with ensuring the same amount of acreage were included in the assessment and adherence to the classification system resulted in invalid ecosystem health values (EHV) and prompted LMS to supplement the BO requirement with the Base's current riparian habitat monitoring system described in Section 4.2.4.1.

The following objective is implemented by LMS and provides that vegetation communities in all ecosystems are systematically mapped across Camp Pendleton.

OBJECTIVE 1: Map Camp Pendleton vegetation using the NVCS every 5 years.

To meet this objective, high-quality aerial imagery will be taken during the appropriate season to achieve an accurate representation of current vegetation cover. Vegetation mapping of Camp Pendleton will be conducted using a methodology conforming to the most current guidance and standards outlined by the NPS Vegetation Inventory Program and the NVCS. The classification system is being cross-walked to previous mapping efforts. Initial photo-interpretation and field verification started in 2014, will be conducted to 2019, and subsequently updated in 5-year

intervals. An 80 percent mapping accuracy will be required for baseline and future vegetation mapping projects. Disturbances such as road density, development, altered hydrology, and other anthropogenic alterations will be recorded for each map unit (polygon). Vegetation will be mapped to the alliance level, except where the association level is necessary to capture nonnative species or to meet requirements of the Riparian BO or other agreements. However, for general planner use within GIS only, the primary vegetation community will be used (e.g., coastal sage scrub) to reduce misapplication. Vegetation mapping efforts will include MCAS CamPen as well as the Base.

4.2.4 Ecosystem Monitoring Element

- ELEMENT GOAL: Monitor ecosystem health per vegetation community to maintain landscape sustainability using adaptive management.

Long-term monitoring of ecosystem health is essential to ensuring the sustainable use of the training environment at Camp Pendleton while protecting sensitive resources. As such, the Base has conducted ecological monitoring on specific habitats of interest such as habitat that supports listed species, coastal sage scrub, perennial grasslands, riparian areas, wetlands, vernal pools, oak woodlands, and dunes since the late 1980s and assessments of general ecosystem trends since the 1990s, including the LTETM program discussed in Section 3.2.3.

LMS has developed and implemented ecosystem monitoring protocols for various habitat types on-Base as described in the following sections. LMS is responsible for developing and overseeing ecosystem monitoring across Camp Pendleton. The following objective is implemented by LMS and provides that vegetation communities in all ecosystems are systematically monitored across Camp Pendleton.

OBJECTIVE 1: Develop new and implement existing monitoring protocols for each vegetation community by 2018.

To meet this objective, LMS has developed and implemented vegetation monitoring programs for riparian, dune and strand, wetland and estuary, perennial grassland, oak woodlands, and vernal pools (see Section 4.2.7 Vernal Pool Management Element for details about monitoring programs for this vegetation community). Currently, LMS is developing health monitoring for coastal sage scrub and chaparral.

Current ecosystem monitoring efforts for key community types on Camp Pendleton are summarized in the following subsections. These existing monitoring efforts will inform

continued development and implementation of monitoring protocols. LMS is currently updating their vernal pool monitoring methods for completion by 2018 (see Section 4.2.7 for details).

4.2.4.1 Riparian Habitat

In addition to BO-required geographically mapping-based change analysis and point system for riparian areas as discussed in Section 4.2.3, the Riparian BO requires further analysis to assess the effectiveness of exotic vegetation removal and habitat function and value. In support of this requirement, the Base developed a Riparian Habitat Monitoring Program (Riparian HMP) using a combination of California Rapid Assessment Methodology (CRAM) (California Wetlands Monitoring Workgroup 2013) assessment areas, line-intercept transects, and frequency quadrats.

The program was implemented in 2009 and 2013 to monitor the success of riparian natural rehabilitation after treating three target invasive species, giant reed, tamarisk, and perennial pepperweed (*Lepidium latifolium*), along the Santa Margarita River, Las Flores Creek, and San Mateo Creek. This program was developed to bypass the shortfalls to habitat monitoring using a weighted score for geographical extent of undefined riparian vegetation communities. This system collects data on proxies of ecosystem health and includes Primary and Secondary Success Standards. To be considered successful, Primary Success Standards must be met; however, the Secondary Success Standards are more informational and currently do not have to be met. The intent is to measure parameters of mature riparian habitats and set those parameters as a goal to reach.

Results of the 2013 monitoring effort indicate that success standards for post exotic species removal are being met on over 1,800 acres (728 hectares) in the three study areas and are not being met on approximately 520 acres (210 hectares) where recent initial arundo treatment had taken place and needed more time to naturally regenerate after treatment. Primary success standards are that vegetative cover must be 50 percent or greater total native cover and less than 1 percent cover of the three main exotic species. Secondary success standards are that the CRAM score be within 10 CRAM points of the mature control site and native herb cover be 50 percent or greater. Once an area meets these criteria, it no longer needs to be monitored under this program. However, the Conjunctive Use Project is interested in continuing this monitoring program to detect changes to riparian habitat during water use changes.

The CRAM component of the riparian monitoring program is a cost-effective, scientifically defensible method for monitoring the conditions of wetlands and riparian habitats that was developed specifically for the wetland types of California. This method yields an overall score of 30–100, with 30 being the poorest condition and 100 being optimal condition, for each assessed area based on the component scores for a set of four attributes (landscape context, hydrology, physical structure, and biotic structure) and their metrics. The method also provides guidelines to

identifying stressors and can be used to assess the performance of mitigation and restoration projects.

A major riparian habitat restoration and stormwater improvement project was completed at MCAS CamPen in 2008. Additionally, invasive species, including giant reed, tamarisk, and perennial pepperweed, have been removed from a previously disturbed riparian woodland area. These projects resulted in the creation or improvement of approximately 50 acres (20 hectares) of riparian habitat. Weed control and monitoring are conducted annually in support of the Riparian BO (MCAS CamPen 2013).

4.2.4.2 Dune and Strand Habitat

The Riparian BO requires dune vegetation monitoring on a 5-year basis to assess the effectiveness of the Base Estuarine and Beach Conservation Plan (Appendix K), the conditions of which have been met and are being updated in a new plan.

Dune and strand vegetation mapping was performed from 1993 through 1996 (BioSystems Analysis, Inc. 1994) and follow-up monitoring was conducted in 1995 (Garcia and Associates, Inc. 1996) and 2007 (RECON 2008). Noted changes in community types included a decrease in the invasive iceplant (*Carpobrotus edulis*) community, which decreased 97 percent as a result of control efforts, and corresponding increases in dune scrub vegetation, dune/marsh interface, and sea bluff coastal scrub (RECON 2008).

Additional monitoring has also been conducted as part of the LMS invasive plant program and the phacelia monitoring program and, in 2015, more intensive mapping was conducted in the back dune portions of the dune and strand community. During this inventory, the dominant plant species were recorded, which are the most abundant species in the community and contribute more to the character of the community than the other nondominant species present.

LMS is seeking to redefine the dune and strand monitoring with USFWS to increase monitoring in other base dunes and strand.

4.2.4.3 Estuaries

LMS has also adopted CRAM for estuary health monitoring. CRAM assessments were conducted for estuaries, cismontane alkali salt marsh, and freshwater marshes at Camp Pendleton in 2016 and will be conducted every 3 years. This feeds into the general Wetland Management Program of no net loss, and of size and functions and values discussed in Section 4.2.6. In addition, as with dune and strand habitat, invasive plant species have been targeted for removal by LMS, and levels of iceplant, arundo, tamarisk, and perennial pepperweed have been reduced

to less than 1 percent cover. A new project was conducted to map a population of a nonnative genotype of common reed (*Phragmites australis*). The extent of the population was mapped and monitored following the 2015–2016 season.

4.2.4.4 Coastal Sage Scrub

Coastal sage scrub, which is predominant at low elevations and on moderate to gentle slopes where most training activities occur, is a key habitat for species of concern including coastal California gnatcatcher, Pacific pocket mouse, and thread-leaved brodiaea. The habitat can be difficult to restore once a type conversion occurs, and following repeated disturbance, it often converts to annual grassland or a sparse shrubland with poor native composition. Among the major vegetation types at Camp Pendleton, coastal sage scrub is recognized as the most dynamic and sensitive. Fire management through reduced ignitions, weed management, and active restoration through stewardship projects are conducted in this community type.

Coastal sage scrub is typically managed by reducing wildfire in the system and post wildfire management. LMS is currently working with USFWS and other regional partners to develop and implement a coastal sage scrub health monitoring protocol to assess the health of these habitats.

4.2.4.5 Perennial Grasslands

The native perennial grasslands on Camp Pendleton are generally found at lower elevations and may harbor vernal pool ecosystems. These grasslands are being degraded over time due to invasion and competition from nonnative grasses and forbs. Prescribed burning is the primary management tools for maintaining native grasslands.

The extent and composition of grasslands were inventoried in 1989 and monitored in 1991 and LMS followed up with monitoring in 2009 (Soil Ecology and Restoration Group 2010). Survey locations were selected to represent the variation of grassland environment on the Base. Grassland monitoring occurred on 26 transects that ranged from 1,063 feet (324 meters) to 3,937 feet (1,200 meters) and averaged about 2,674 feet (815 meters) in length. Along each transect, quadrats were positioned every 26.2 feet (8 meters) for vegetation monitoring (Soil Ecology and Restoration Group 2010). Results of a vegetation change analysis did not indicate a difference between 1989, 1991, and 2008. The error of the analysis was extremely high, at 82.3 percent. It was determined that a sample size of 164 transects would be required to reduce the error to less than 20 percent. Because the error of this analysis is extremely high, this analysis should be considered inconclusive. A visual comparison of the transect photographs between 2009 and past years indicates there has been significant change at least at some of the grasslands due to

nonnative grass and forb invasion. The next round of monitoring within Base lands will require an adequate sample size to reduce error to 10 percent or less.

4.2.4.6 Oak Woodlands

Oak woodlands are a highly diverse and valuable ecological community, as well as an important asset for military training on Camp Pendleton. This is due to the tactical value and aerial concealment offered by the trees, as well as shade and shelter from weather. Oak woodlands occupy a small acreage on the landscape, but have a disproportionately high ecological value.

A monitoring program, begun on the Base in 1987, has studied establishment and survival rates and the effects of fire on oak woodland communities over a 24-year study period. The study consists of a set of burn plots and a set of stand structure plots, which have been monitored three times between 1987 and 2011 (Table 4-1).

Table 4-1
Oak Woodland Study Timetable

Year	Plots Surveyed	
	Burn Plots	Stand Structure Plots
1987	X	
1988		X
1995	X	
1997		X
2011	X	X

The 2011 study shows that oak woodlands have been increasing in density over the 24-year study period. Most oak woodlands on-Base occur in two elevational bands—from approximately 410 to 738 feet (125 to 225 meters) and from approximately 1,969 to 2,625 feet (600 to 800 meters). The high elevation woodlands generally have more seedlings and saplings, lower mortality rates, and better post-fire recovery; have the largest oak trees; and are better habitat for coast live oak. The lower elevation woodlands have fewer seedlings and saplings, lower sapling growth rates, higher mortality rates, and poor post-fire recovery, and are better habitat for Engelmann oak.

The high fire frequency on Camp Pendleton has not impeded oak woodland expansion and this habitat type, for the most part, is in generally good condition. However, recruitment of large

sapling and adult size classes may not be sufficient at low elevations to compensate for mortality associated with the most severe wildfires. The most significant fire effects are likely to come from intermediate-length fire intervals (approximately 5 to 7 years), which are long enough to allow understory fuel loads to accumulate to a level that allows relatively high fire intensities, but short enough that individual oak trees are not able to recover from the previous fire (Lawson 2015).

4.2.5 Forest Pest and Disease Management Element

- ELEMENT GOAL: Prevent pests and disease from damaging the function and biodiversity of forested ecosystems on Camp Pendleton.

MCO P5090.2A CH 3 requires that installations with forest resources fully cooperate in the planning, coordination, and execution of field operations to prevent and suppress forest damage and insect disease outbreaks.

LMS developed and currently implements a GSOB monitoring protocol. No GSOB have been found on-Base. New information is emerging on the other pests and LMS is expanding the program to cover monitoring and treatment of infected trees. The PSHB and KSHB are currently found in San Diego County and impact riparian forests. Therefore, this program is currently being expanded on-Base. Air Station riparian communities will be incorporated into efforts to detect and control PSHB and KSHB in the future.

OBJECTIVE 1: Develop, implement, and collaborate on monitoring programs for forest pests and disease.

LMS will coordinate with organizations on and near Camp Pendleton that have responsibility for tree health and maintenance in the region on these and other emerging forest pest issues and will update the GSOB monitoring protocol to include other native and nonnative forest pests and diseases. LMS will also educate Marines, dependents, and civilians about monitoring programs and actions such as prohibiting the movement of firewood on- or off-Base, which will help limit the spread of tree pests and disease on Camp Pendleton.

OBJECTIVE 2: Time the treatment of infected trees to limit the spread of pests and disease, e.g., prior to beetle flight seasons.

Once detected, rapid response measures, including taking immediate steps to cut, chip, and tarp infested trees and monitor adjacent trees, are required to prevent the spread of forest pests. To be prepared and able to quickly implement necessary control strategies, LMS will renew, as

appropriate, and ensure that there is an active decision memorandum Categorical Exclusion to support the emergency removal and treatment of infected trees and wood.

Preventing an infestation of forest pests requires an update to the existing GSOB early detection and rapid response (EDRR) plan that integrates a number of strategies, including education and outreach, monitoring, and developing and implementing new Base policies. The EDRR plan for GSOP, KSHB and PSHB has four components:

- Prevention
- Detection
- Rapid Response
- Eradication

Prevention measures actively being conducted include monitoring and managing potential pathways for beetles to be introduced to Camp Pendleton. Included measures are to:

- Develop and give presentations to Marine Corps Community Services (MCCS), Game Wardens, and Base firefighters.
- Develop and provide brochures to educate MCCS patrons, campers, and hunters.
- Develop education campaign for off-Base neighbors.

Detection measures consist of conducting the following action annually:

- Review potential sources of GSOB and PSHB, KSHB, and other pest introduction.
- Check GSOB, PSHB, and other pest distribution off-Base.
- Monitor plots visually for signs of GSOB, KSHB, and PSHB.
- Use appropriate trap types to monitor for adult beetles. Current trap types used are green 12-funnel Lindgren traps for GSOB and black 12-funnel Lindgren traps with Quercivorol scent lures for PSHB and KSHB.

Rapid response measures include taking immediate steps to remove, cut, chip, and tarp infested trees and monitor adjacent trees.

If infestation occurs, eradication steps are to:

- Remove and chip trees to prevent adult beetles from emerging and dispersing.

- Tarp chipped wood and leave in place for 2 years.

4.2.6 Wetland, Aquatic, and Marine Ecosystem Management Element

- ELEMENT GOAL: Conserve and enhance the natural and beneficial uses of regulated wetlands and ledger/manage no net loss of size, function, and value of wetlands.

Wetlands are highly productive and complex ecosystems that provide a variety of services such as flood control, pollution abatement, prevention of saltwater intrusion, and fish and wildlife habitat. Wetland management is a challenge nationally where more than 50 percent of wetlands have been lost, and particularly in California where more than 90 percent of wetlands have been converted to agriculture, developed, or drained for other land use (USGS 1996). Wetlands on Camp Pendleton include lakes, ponds, rivers, creeks, estuaries, and vernal pools (see Section 3.2.1). Approximately 0.1 acre (0.04 hectare) of jurisdictional wetlands has been identified at the Air Station.

Drivers for this element are the CWA, EO 11990 – Protection of Wetlands, MCO P5090.2A CH 3, and DoDI 4715.03 guide wetlands protection on the installations. MCO P5090.2A CH 3 and DoDI 4715.03 require the Marine Corps to comply with the national policy of no net loss of wetlands and avoidance of loss of size, function, or ecological value of wetlands. Further, these guidances require that the Marine Corps preserve and enhance the natural and beneficial values of wetlands while conducting its activities. EO 11990 addresses federal agency actions required to identify and protect wetlands, minimize the risk of wetlands destruction or modification, and preserve and enhance the natural and beneficial values of wetlands. This EO further requires federal agencies to avoid any new development in wetlands unless there is no practicable alternative. Wetlands contribute to the biodiversity on-Base and are valuable as habitat for listed and other species and as habitat for game species that are part of the Base's hunting program. Wetlands also provide important military training conditions, and provide functions that benefit the region's water quality.

Management actions at Camp Pendleton are taken to ensure that all facilities and operational actions avoid, to the maximum degree feasible, wetlands destruction or degradation regardless of wetland size or legal necessity for a permit. These actions include (1) developing and publishing avoidance and minimization measures in the Base Training Regulations and other Base Orders; and (2) providing oversight or conducting wetland repair/restoration for impacts. Current wetland restoration activities include the restoration of an alkali marsh at Ysidora flats at Camp Pendleton. LMS has also provided on-site wetland mitigation through the development of a freshwater mitigation site at Pilgrim Creek.

LMS serves as the overall coordinator for management activities that affect wetlands at the Base, and the Environmental Department at the Air Station is responsible for jurisdictional waters at the Air Station. The following objectives are implemented to provide for no net loss of size (Objective 1), function (Objective 2), and value of wetlands on Camp Pendleton.

OBJECTIVE 1: Assess the distribution and extent of wetlands using the NVCS by 2018 and update every 5 years.

To meet this objective, LMS is conducting wetlands mapping using the standard NVCS on Camp Pendleton. This will allow and ensure that change analysis can be consistently and reliably performed and the goal of no net loss be assessed every 5 years. A GIS database will be updated along with the standardized classification and mapping to ensure the ability to accurately report and show where wetlands are located and what changes are taking place, and to help determine if the changes are the results of natural or anthropomorphic actions.

OBJECTIVE 2: Assess the baseline ecological function of wetlands and estuaries using CRAM and monitor every 3 years.

To assess the conditions of the wetlands, LMS conducted CRAM on each wetland type starting in spring of 2016 to determine functions and values. CRAM will be used to evaluate their general condition, establish baseline conditions, identify stressors, and compare their condition to the statewide average. This rapid assessment methodology will be used to evaluate the general condition of wetlands on a 3-year cycle. LMS will maintain a no net loss ledger to document the current status of each wetland type.

OBJECTIVE 3: Assess the ecological function of estuaries annually using the EPA's *Rapid Bioassessment Protocols for Use in Streams and Wadeable Rivers: Preiphyton, Benthic Macroinvertebrates and Fish.*

To meet this objective, WMS will measure trends in water chemistry and monitor benthic habitat to detect ecological integrity and fluctuations in biotic composition for individual coastal lagoon and estuarine habitats using the EPA's *Rapid Bioassessment Protocols for Use in Streams and Wadeable Rivers: Preiphyton, Benthic Macroinvertebrates and Fish* (EPA 2015). This lagoon and estuarine habitat monitoring will be conducted once quarterly to obtain a seasonal annual assessment of ecological functions and values in these habitats.

4.2.7 Vernal Pool Management Element

- ELEMENT GOAL: Conserve and enhance the natural and beneficial uses of regulated vernal pools and ledger/manage no net loss of size, function, and value of regulated pools.

A vernal pool is a type of isolated ephemeral wetland that is differentiated from other forms of isolated ephemeral wetlands by its assemblage of specific floral species. Depressional wetlands other than vernal pools can be seasonal or perennial, but their flora and fauna are mostly not characteristic of vernal pools, and they lack the impervious substrate that controls vernal pool hydrology. Specialized plant and animal species adapted to this seasonal wet and dry cycle thrive in many vernal pools on-Base, including the four federally listed as threatened or endangered species: Riverside fairy shrimp, San Diego fairy shrimp, spreading navarretia, and San Diego button-celery. As a special aquatic system, vernal pools contribute to the biodiversity on-Base and provide valuable habitat and food sources (e.g., invertebrates and cysts) for ducks and migratory birds.

Military operations, such as artillery, mortar, air delivered explosives, and vehicles may create depressions that support species normally associated with vernal pools. Similar to other wetlands, LMS has a several-pronged approach for meeting the element goal of "no net loss" of size, functions, and values of regulated pools. First, LMS will determine which pools are regulated by developing a landscape model to determine regulatory status. Once determined, LMS will determine the number of vernal pools and track any losses. Acreage of vernal pools will not be used as size is dependent on rainfall, not on an actual measurable variable. Next, these pools will be measured to determine functions and values. Currently, LMS is testing two models for this; one is the Base Class System developed in the 1990s; the second is a State of California method, Vernal Pool CRAM. Once a health monitoring system is developed, the Base can determine how degraded regulated pools are (or are not) and improve their functions, if needed.

LMS is investigating the difference and similarities of this system of vernal pool monitoring vs. the CRAM vernal pool modules to determine which method will be used for monitoring vernal pool health. LMS will provide a crosswalk system so historic data are not lost.

To meet the conservation and enhancement goals of vernal pool management, LMS will develop and implement a Vernal Pool Management Plan, as discussed below. Other LMS actions that benefit vernal pools include the implementation of conservation prescribed burns designed to improve the ecosystem function of vernal pools and their inhabitants, which will be discussed in Section 4.2.10.

OBJECTIVE 1: Develop a Vernal Pool Management Plan to guide goals.

The overall goal is to have a no net loss of size (by number of pools), functions, and values of regulated vernal pools. The first step is to develop a large-scale method of determining the regulatory status of vernal pools base-wide. Management of these regulated vernal pools will be addressed in a Vernal Pool Management Plan that is being developed in coordination with USFWS. The second piece is to determine the functions and values (health), and LMS is comparing and contrasting the current vernal pool assessment method and the Vernal Pool CRAM system. Once the health (Function and Value) are determined, LMS will restore pools by improving their measurable function and values.

LMS is currently updating their assessment of vernal pool health by monitoring regulated vernal pools to determine function and value, and conducting a comparative analysis between this method and the Base's previous classification system.

OBJECTIVE 2: Implement the final Vernal Pool Management Plan actions starting in 2019.

Once Objectives 1 and 2 are met (determining baseline function and value), LMS will also populate the no net loss ledger with the number and function and values (health score) of each regulated vernal pool. The next step is to improve function and values of regulated vernal pools.

4.2.8 Nonnative and Invasive Species Management Element

- ELEMENT GOAL: Minimize the introduction of exotic plant species; detect and rapidly respond to control in a cost-effective and environmentally sound manner; monitor invasive plant species populations, restore invaded ecosystems, and promote public education.

One of the most severe environmental problems facing Camp Pendleton's natural areas is the spread of nonnative invasive plants into native habitats. Of the 1,015 plant species documented on-Base, 308 (30 percent) are nonnative to California. A fraction of these nonnative species are considered a threat to Camp Pendleton's native habitats and are actively managed under the Nonnative and Invasive Plant Management Program Element in accordance with EO 13751.

The purpose of invasive plant management is to develop and implement a strategy for the control of such plants on Camp Pendleton. "Control" is considered, as appropriate:

- The eradication, suppression, reduction, or management of invasive species populations.

- The prevention of invasive species introductions and their spread from previously infested areas.
- The reduction of potential adverse effects of invasive species through techniques such as the restoration of native species.

Subject to the availability of funds and staff, invasive plant management activities include (1) prevention of the introduction of invasive species; (2) detection and rapid response to and control of new invasive species in a cost-effective and environmentally sound manner; (3) monitoring and tracking invasive species populations accurately and reliably; (4) conducting research on invasive species and developing technologies to prevent introduction and providing for environmentally sound control of invasive species; and (5) promoting education and awareness of invasive species.

Additional efforts include on-Base and off-Base education through interdepartmental meetings, posters, handouts, display boards, and participation in off-Base weed management meetings/forums and groups (e.g., California Invasive Weed Symposium and California Invasive Plant Council [Cal-IPC]). Additionally, the Base's BEAP includes, as part of the Basewide Master Plant List, a list of prohibited plants to ensure invasive exotics are not introduced to Camp Pendleton during landscaping activities. The Air Station also has obligations in terms of weed removal and is operating under a weed management plan. The Air Station's BEAP also includes a list of plants prohibited from use in landscaping.

LMS is responsible for monitoring and treating the introduction and spread of invasive plant species within the Base. Of the known invasive plant species from Camp Pendleton, approximately 48 are targeted for eradication, 148 are targeted for management, and 32 are surveillance species, which are nearby but not on the Base. There is zero tolerance for all of these species in restoration sites. The remaining invasive species are considered naturalized and are not managed. Appendix R identifies the nonnative species and their designated control levels.

The following objectives are provided to prevent the proliferation of exotic plant species on Camp Pendleton.

OBJECTIVE 1: Write the Nonnative, Invasive Species (NIS) Management Plan.

To meet this objective, LMS is collecting baseline information for the NIS Management Plan, including nonnative and invasive species inventories and location and size of populations on-Base. Appendix R identifies the nonnative species that have been identified on-Base to date and their designated control levels.

OBJECTIVE 2: Continue to implement invasive plant Early Detection Rapid Response Program to prevent the spread of new populations of highly invasive exotic plants on Camp Pendleton to prevent long-term costs associated with controlling larger infestations.

Initiated in 2004, the EDRR program is essential to preventing new infestations of invasive plants from establishing on Camp Pendleton. If overlooked, new infestations have the potential of becoming larger infestations that may prove more costly for LMS to remove in the future.

The primary component of the EDRR program is an annual program that incorporates roadside, firebreak, and boundary invasive plant mapping and monitoring of all highly traveled roads with a rapid response treatment element that targets all identified invasive plant species. After target species are positively identified as an undesirable exotic plant, contract personnel are directed to treat the infestation usually within 2 weeks of discovery.

OBJECTIVE 3: Reduce cover of artichoke thistle, yellow star thistle, giant reed, chrysanthemum, fountain grass, and pampas grass to <1 percent cover; manage the spread of fennel into sensitive habitats by 2020.

Artichoke thistle (*Cynara cardunculus*), yellow star thistle (*Centaurea solstitialis*), giant reed, chrysanthemum (*Chrysanthemum coronarium*), fountain grass (*Pennisetum setaceum*), and pampas grass (*Cortaderia jubata*) are listed as high priority because of their negative ecological impact, invasive potential, and wide distribution on Camp Pendleton and in southern California.

One of the first exotic plant species treated on Camp Pendleton was artichoke thistle. A large, spiny perennial thistle that can grow to 8.2 feet (2.5 meters) in height, artichoke thistle is particularly invasive in Camp Pendleton's grasslands and in some cases can impede military training. A base-wide control program for artichoke thistle was initiated in 1984, and, dependent on funding, currently occurs on an annual basis. Contract personnel typically survey large areas of Camp Pendleton that have known populations of artichoke thistle and treat any remaining individuals with spot herbicide treatments. As of 2013, the species is considered under control throughout most areas of Camp Pendleton, with the exception of several impact areas designated as off-limits and the State Parks lease area where artichoke thistle continues to be a problem. Treatment costs are expected to decline; however, this species will likely require annual monitoring and treatment in the foreseeable future.

One of the most widespread invasive exotic plants on Camp Pendleton is fennel (*Foeniculum vulgare*). A perennial species with high seed production, fennel is particularly invasive within Camp Pendleton's grasslands and habitat transition zones. Due to the extent of the infestation, management must be directed toward sites that have or are within sensitive resources

(i.e., federally protected species and sensitive habitats) and where control will be most effective. Historically, dense areas with 70 to 90 percent cover of fennel were mowed and treated with herbicide resulting in only trace cover of this invasive species. Over time, the program has changed and now focuses on treating areas with 1 to 5 percent fennel cover to prevent the return of more dense infestations. Prescribed burns have been planned (currently under NEPA review) as a method of initial treatment for this invasive plant. Herbicide will then be applied to attain fennel cover of trace or less than 1 percent. Treated sites will be evaluated for perennial grassland restoration.

In certain cases, the spread of exotic invasive plants can be exacerbated following wildland fire in shrublands. In 2004, post-fire weed control efforts were initiated on 160 acres (65 hectares) following the Chappo Fire (22 Area). To prevent the spread of fennel and other target exotics into coastal sage scrub habitat, post-fire weed control efforts took place on 200 acres (81 hectares) following the Horno Fire of 2007. Depending on funding and fire severity, post-fire invasive plant treatments will be ongoing.

OBJECTIVE 4: Reduce cover of riparian type-converting invasive plants, including salt cedar and perennial pepperweed, to <1 percent cover and eliminate giant reed by 2020.

The Riparian Invasive Weed Control Program focuses on control and/or eradication of invasive species listed in Appendix R within riparian habitats on-Base. Since 1995, the Base has allocated approximately $10 million toward riparian invasive plant removal efforts in 1,300 acres (526 hectares), the majority going toward removing large infestations of giant reed and salt cedar mostly from the Santa Margarita River corridor.

The final stretch of river infested with giant reed and salt cedar was treated from 2010 through 2011 and is now on a yearly maintenance schedule. Some areas that are not passively restoring to riparian habitat are actively being restored in the Habitat Restoration Program Element.

Following initial treatments, most sites require at least 4 years of intensive treatments to achieve target control goals. Thereafter, a yearly maintenance contract is in place to ensure no new infestations occur. Maintenance treatments are primarily accomplished through an annual riparian weed maintenance program in the Santa Margarita River corridor yearly and other riparian areas on a rotating schedule. The program targets mainly high-priority exotic species like giant reed, tamarisk, and perennial pepperweed and serves as a monitoring program for any newly discovered riparian weeds.

Management of these invasive exotics in riparian habitats is the primary method of compensation that the Base employs to mitigate for permanent impacts to riparian habitats identified in the

Riparian Ecosystem Conservation Plan. The Riparian HMP has showed giant reed, tamarisk, and perennial pepperweed have been treated to less than 1 percent cover.

OBJECTIVE 5: Manage invasive exotic plants in coastal dune, strand habitats, and bluffs, and restore with native dune and bluff plants.

Because of the extent of sensitive natural resources within Camp Pendleton's coastal dune habitats (i.e., California least tern and western snowy plover nesting sites, and rare plant populations), the Coastal Dune/Beach Weed Control Program was created per a requirement in the Riparian BO to control and/or eradicate exotic plant species and their thatch that are detrimental to those habitats. Conditions of the initial Dune Study and Management Plan (The Nature Conservancy 1994a, 1994b) have been met and future invasive plant control will be addressed in a base-wide invasive plant monitoring plan being developed under Objective 1. The program currently includes initial treatments within areas that have never been treated and maintenance treatments within previously treated sites.

Intensive initial treatments, which began in 2004, typically occur within 40- to 50-acre (16- to 20-hectare) sites for a period of 3 years. The sites are then moved into a weed management maintenance yearly treatment schedule. Treatments target exotic invasive plants that are particularly damaging to coastal dune habitats, including devil's thorn (*Emex spinosa*), which is targeted for eradication and iceplant or hottentot-fig, New Zealand spinach (*Tetragonia tetragonioides*), European sea rocket (*Cakile maritima*, nonnative), wild radish (*Raphanus sativus*), and perennial pepperweed, which are targeted for reduction to less than 1 percent of cover. An annual maintenance program was initiated in 2011 to re-treat sites that have already undergone initial treatments. LMS also creates and/or enhances dune and strand habitat by sand replenishment and following with native dune plantings.

OBJECTIVE 6: Support regional invasive plant information sharing.

Participation in information-sharing events off-Base can help to educate staff on current problems and solutions. Therefore, Camp Pendleton participates in the San Diego Weed Management Area steering committee.

4.2.9 Erosion Control Element

- ELEMENT GOAL: Conserve soil resources that support the training landscapes and their ecosystems.

Erosion and sedimentation are naturally occurring processes caused by the actions of wind, water, and gravity, which can also be accelerated due to anthropogenic disturbances. Training and construction activities near surface waters, in particular, have the potential to cause water pollution or stream degradation, if the proper erosion and sediment control measures are not implemented. In particular, valuable training lands are lost when gullies form and need to be treated.

Soil erosion can also limit the training capacity of Camp Pendleton by reducing access in training areas, creating unsafe conditions for users, or threatening infrastructure stability. It is Marine Corps policy to prevent soil erosion and to restore eroded sites where possible in accordance with MCO 5090.2A CH 3:

> The Marine Corps will manage its land to control and prevent soil erosion and to preserve natural resources by conducting surveys and implementing soil conservation measures. Altered or degraded landscapes and associated habitats are to be restored and rehabilitated whenever practicable.

Because of the high percentage of accelerated erosion resulting from excessive fire frequency on Camp Pendleton, fire mapping is essential in documenting the fire data over time and to more efficiently plan erosion control projects. Additionally, surveys are conducted following wildfires (e.g., along steep slopes) to determine where and when to apply erosion control efforts.

Wildland fire contributes to erosion as the vegetative cover stabilizing soil is temporarily removed from the surface. In scrublands with too frequent fires, sites may lose their resiliency to fire's cumulative effects, namely loss of topsoil, soil moisture, rooting crowns, and seed bank storage, thus promoting the competitive advantage of plants adapted to short fire cycles. This may result in long-term conversion of native shrub communities to annual grassland communities.

Field inventories and the database have identified and helped to prioritize locations where existing and potential erosion problems exist. At present, erosion and sediment control activities are focused on specific sites based on criteria such as proximity to training, transit routes, and waters of the U.S. Other factors that are considered include:

- Safety, such as for emergency or military vehicle access on secondary roads;
- Potential impacts on high-value facilities or crucial training areas;
- Likelihood of sediment entering a jurisdictional wetland, or impacting an identified species or significant cultural resources;

- Volume of potential soil loss; and
- Cost-effectiveness of the control measure.

Part of the Erosion Control Element emphasizes avoiding the creation of erosion problems through review of project plans, mainly projects that concentrate water flow. This review determines if a project has the potential to create erosion problems during or after the project, and provides direction to help prevent erosion problems (e.g., best management practices during construction and recommended design changes to prevent post-project erosion).

Camp Pendleton has expended substantial time, effort, and funds in an attempt to adequately address erosion issues. The restoration projects undertaken by LMS directly benefit natural resources through (1) military training by returning training lands to usable conditions and reducing safety hazards; (2) potential expansion of habitats for natives species; and (3) exotic plant reduction and control. LMS will achieve the following objective to continue to address erosion issues to support ecosystem integrity and the training mission.

OBJECTIVE 1: Maximize the capability of the landscape to support military training and sensitive habitats.

This objective will be met by conducting strategic erosion control projects that have been prioritized by range and training area users and LMS.

4.2.10 Wildland Fire Management Element

- ELEMENT GOAL: Manage fire potential to minimize coastal sage scrub type conversion and minimize adverse impacts to highly valued natural and cultural resources and assets.

MCO P5090.2A CH 3 drives wildland fire management authority for the LMS Wildland Fire Program with responsibilities including, but not limited to, resource advising, firebreak planning, developing and updating prescribed burn plans, generating the science–based and MCO compliant National Fire Danger Rating (NFDR) system, fire ecology, and post wildland fire monitoring and restoration management. MCO P5090.2A CH 3 explains that DoD will use the National Wildfire Coordinating Group's standards, such as the NFDR system. The overriding goal of Wildland Fire Management on Camp Pendleton is to maintain natural ecosystem functioning while maximizing military training opportunities. The CPFD is in charge of Operations of Wildland Fire Suppression and Prescribed Burn logistics and completion.

To meet the element goal, LMS first targeted creating a science-based NFDR that is MCO compliant. To do this, remote automated weather stations were placed in differing firesheds on-Base. At each of the six sites, monthly live and dead fuel moistures are measured. These data with additional monitoring determine an accurate and local daily NFDR. The CPFD and G-3/5 then determine what training is allowed and where depending on their needs. The next step to meet the objective is to manage fuels so when an ignition occurs it has limited fuels to carry the fire into unburned training areas. This is being conducted through the approvals in the Wildfire Protection Plan Environmental Assessment as it manages fuels through prescribed burning, mowing, and a series of firebreaks and fuel breaks, and will provide 10 years' worth of NEPA coverage for the project. Prescribed burning mainly occurs in grasslands, both nonnative annual and perennial. These areas will be monitored; the areas that are annual grasslands will slowly be converted to native perennial grasslands to improve migratory bird habitat, when possible.

Prescribed burns are also used as a conservation tool. LMS conducts conservation burns that (1) control invasive plant species removal and (2) enhance listed species habitat, specifically Pacific pocket mouse, Stephens' kangaroo rat, and fairy shrimp habitat. In vernal pool mesas, fire is proposed to be used to improve the ecosystem functioning of native perennial grassland by removing annual grasses and their thatch. In the understory of coastal sage scrub habitat, prescribed burns can be used to reduce fine fuels (invasive nonnative grasses) to reduce wildfires and restore coastal sage scrub. Prescribed fire is also being planned as a means of reducing fennel and artichoke thistle. Specific instances are the two conservation prescribed burn areas, Cocklebur and Vernal Pool View Point, for which NEPA analysis is being conducted.

Post-wildfire suppression (rehabilitation) actions may include, but are not limited to, erosion control, restoring temporary firebreaks created while suppressing the fire, exotic vegetation control, erosion control, habitat restoration, and increased protection of the site with Carsonite markers. Post-suppression fire management actions generally occur where a fire has burned occupied federally listed threatened or endangered species habitat and other sensitive areas. These activities are implemented to reduce potential long-term negative effects of fire and are intended to reduce the effects of direct and indirect suppression actions.

Post-fire activities (e.g., reseeding) occur under limited conditions, as determined by LMS. For example, seeding takes place only at sites where erosion or loss of vegetation cover is caused by human activities or where exotic/weedy vegetation existed before. Examples of post-fire reseeding with native seed stock include locations known as Chappo, Gavilan, Ammunition, and Basilone Complex wildfires. These areas were hand seeded and/or aerial seeded with a mix of native shrubs, grasses, and forbs. Most recently, the Basilone Complex fire in 2014 burned through southwestern willow flycatcher nesting area in the lower Santa Margarita River. LMS is actively restoring this site.

The following objectives are provided to manage wildland fire in a manner that promotes ecosystem health and maintains training needs. The Wildland Fire Management Element is implemented by LMS.

OBJECTIVE 1: Develop National Wildland Fire Management Compliant Fire Danger Rating System.

To meet this objective, RAWS were installed in six areas on-Base and are now maintained quarterly on the coast, inland valley, and mountains. Weekly live and dead fuel moisture readings are also taken at these sites. The data collected from these projects are being used to generate a science-based NFDR system. An NFDR calculator was developed to consume all forms of data required to determine the daily NFDR. The NFDR system consists of a color-coded notification system that indicates the fire danger level on Camp Pendleton. NFDRs are established daily from a combination of weather data, fuel moisture, and fuel load. LMS uses the Weather Information Monitoring System internet platform to develop the daily NFDR and send to the CPFD. The CPFD then includes firefighting resource availability (ratings may be further adjusted within a given locality for the added protection of the natural resources present). The CPFD then provides this information to the Range Operations Department, which then adjusts base activities as needed to meet their needs.

OBJECTIVE 2: Support fuels management to enhance grassland ecosystem health and prevent coastal sage scrub habitat type conversion to a disturbed state.

LMS will prioritize fuel treatments adjacent to coastal sage scrub to reduce wildfires in these areas and reduce type conversions. Juxtaposition of firebreaks and fuelbreaks will be adjusted to reduce wildfire and wildfire frequency in coastal sage scrub thus reducing type conversion to a weedy state. Grasslands typically improve with prescribed burning and will be monitored to track their health. Nonnative grasslands will be slowly restored to native perennial grasslands using targeted seeding.

LMS will map all prescribed burns and wildfires each year to track the frequency in coastal sage scrub and perennial grasslands and determine if management actions are necessary to improve the health of sites after fires.

OBJECTIVE 3: Conduct conservation prescribed burns to improve wildlife and other habitat in accordance with species and ecosystem management goals.

Species management goals of WMS and LMS identify the need for prescribed burns in several ecosystems mainly to reduce nonnative grass and thatch cover. The CPFD will conduct prescribed burns as needed, depending on guidance given from LMS that is based on existing

habitat conditions for the Stephens' kangaroo rat, Pacific pocket mouse, thread-leaved brodiaea, and San Diego and Riverside fairy shrimp. Prescribed burns will also be conducted in vernal pool mesas at Cocklebur, White Beach, and Oscar 2 to improve the vernal pool mesa habitat as outlined by the prescribed burn plans as well as several prescribed burns to reduce fennel and Russian thistle.

4.2.11 Climate Change Element

- ELEMENT GOAL: Provide Marine Corps decision makers with tools to understand future climate change-induced impact to natural resources.

Climate change is any significant change in measures of climate (such as temperature and precipitation) lasting for an extended period (decades or longer). The magnitude and rate of future climate change will depend on factors such as the rate of increase of greenhouse gases in the atmosphere; how strongly climate features like temperature, precipitation, and sea levels respond to atmospheric greenhouse gas concentrations; and other natural influences on climate from sources such as volcanic activity, changes in the sun's intensity, and changes in ocean circulation patterns (EPA 2016).

DoD recognizes that climate change will play a significant role in its ability to fulfill its mission in the future as climate change will affect both built and natural infrastructure, which impact readiness and environmental stewardship responsibilities at installations across the nation. As part of its annual Strategic Sustainability Performance Plan (SSPP), DoD has released its Climate Change Adaptation Roadmap (CCAR) detailing its plan for managing the effects of climate change on its operations and infrastructure in the short and long term (DoD 2012). The CCAR identifies several potential high-level climate change impacts to the DoD mission and operations including rising temperatures; changes in precipitation patterns; increases in storm frequency and intensity; rising sea levels and associated storm surge; and changes in ocean temperature, circulation, salinity, and acidity. However, more comprehensive and region/installation-specific vulnerability assessments are needed to determine what adaptive responses are the most appropriate at individual installations.

The following objectives were developed to provide decision makers on Camp Pendleton with data to understand climate change-induced impacts to natural resources. Actions associated with these objectives are implemented by LMS and WMS, and apply to all ecosystems.

OBJECTIVE 1: Prepare Vulnerability Assessments for species and habitats.

Climate change vulnerability assessments are a means of preparing for and coping with the effects of climate change (Glick et al. 2011). A vulnerability assessment is a key element in

identifying which species or systems are likely to be most strongly affected by projected changes in climate and provides a framework for understanding why particular species or systems are likely to be vulnerable, often depending on factors such as exposure, sensitivity, and adaptive capacity. Vulnerability assessments of natural systems are conducted at the biological levels of species, habitats, and ecosystems, and should consider the current context of existing stresses such as habitat fragmentation and invasive species in addition to climate projections (Glick et al. 2011). Such an assessment informs conservation planning by identifying climate-related threats and resulting stresses, which then become part of the decision-making process undertaken to identify and prioritize conservation strategies.

LMS will prepare a Vulnerability Assessment for each habitat type (e.g., vernal pools) on Camp Pendleton and one ecosystem Vulnerability Assessment by 2020.

OBJECTIVE 2: Collect climate informed data.

To meet this objective and gather data related to the climate, information should be gathered from several sources. As outlined in Section 4.2.10 for Wildland Fire Management, RAWS will be maintained every year to monitor the weather and fuel moisture. Wildfire mapping will also continue yearly.

LMS has conducted yearly monitoring of insect functional guilds (e.g., decomposers, pollinators, herbivores, predators) per plant community to maintain awareness of any changes as a result of climate change. During insect monitoring on the Base, climate data will also be collected to inform the analysis of the potential impacts of climate change on species. Similarly, during wildlife monitoring efforts on-Base, WMS will collect appropriate climate data to support future analysis of climate change impacts to wildlife species.

4.2.12 Habitat Restoration Element

- ELEMENT GOAL: Implement habitat restoration to support sustainable landscapes.

Many of the BOs issued to Camp Pendleton include mitigation/compensation requirements for impacts to federally listed wildlife species. LMS is responsible for implementation of on-Base project-related restoration mitigation projects funded by LMS. The following objective is provided to ensure habitat restoration requirements of BOs are met.

OBJECTIVE 1: Support completion of restoration projects required by BOs, sustainable habitat goals, and disturbed areas, as needed.

LMS routinely restores lands required as mitigation or to ensure sustainable landscapes. Currently, LMS is implementing three restoration projects prescribed by existing BOs to compensate for impacts to occupied listed species habitat: one for the Sierra IV buffer project, P-1117 vernal pool restoration, and P-1086 Pacific pocket mouse habitat restoration. In addition to conducting restoration as a mitigation requirement, LMS also conducts habitat restoration as part of its land stewardship activities, e.g., LMS is restoring the Ysidora flats alkaline salt marsh to ensure the future sustainability of this habitat in this area. Similarly, LMS is planning and is in the NEPA phase to start restoration of the San Onofre Mesa vernal pool habitat (basins and surrounding uplands) in 2018, and to restore the Cocklebur Vernal Pool Mesa after the Conservation Burn is conducted in 2019. See Section 4.8.1 for habitat restoration information related to repair and restoration of impacts associated with unplanned and/or unauthorized events (i.e., environmental incidents).

4.3 MIGRATORY BIRD AND RAPTOR MANAGEMENT PROGRAM

- PROGRAM GOAL: Provide that populations of migratory birds and raptors are conserved in compliance with legal drivers while ensuring maximum flexibility to the Marine Corps military training mission.

Camp Pendleton's varied habitat assemblage supports a rich diversity of resident and migrant bird species. To date, 362 bird species have been recorded on Camp Pendleton, including resident breeders, migrants, and vagrants (i.e., birds wandering from their normal home range). Because birds are specialized, differ in environmental requirements and tolerances, and are easily monitored, they can provide insight into ecosystem integrity.

Several policies guide the migratory bird conservation on Camp Pendleton. The primary consideration with regard to the conservation and management of migratory birds is compliance with the MBTA and BGEPA. Guidance for compliance with these federal laws is provided under EO 13186 and the resulting MOU with USFWS and the Final Rule for the Take of Migratory Birds by the Armed Forces.

The Migratory Bird and Raptor Management Program is implemented by WMS, and to a lesser degree by GWS. The program is applicable to all ecosystems and is organized into two elements: (1) Migratory Bird and Raptor Conservation Element and (2) Bird/Wildlife Air Strike Hazard Element. These elements and their associated goals and objectives are discussed further in the following subsections.

4.3.1 Migratory Bird and Raptor Conservation Element

- ELEMENT GOAL: Promote the conservation of migratory birds and raptors through MBTA compliance, population monitoring, and habitat management.

Camp Pendleton's approach for conserving migratory birds and raptors seeks to ensure (1) compliance with the Base's policies, programs, and procedures with the MBTA and (2) monitoring and management of species' populations. The MBTA prohibits the taking, killing, or possessing of migratory bird populations unless permitted by regulations promulgated by the Secretary of the Interior. EO 13186 directs that federal agencies take responsibility for the protection of migratory birds. Pursuant to this EO, the DoD entered into an MOU with USFWS on 31 July 2006. The MOU is a 5-year agreement that must be reviewed and renewed by the participating parties every 5 years. It was most recently renewed in 2014. This MOU is designed to promote the conservation of migratory birds by ensuring DoD operations (with the exception of military readiness activities) are consistent with the MBTA and avoid the take of migratory bird populations. Military readiness activities are defined as all training and operations of the Armed Forces that relate to combat, including but not limited to, the adequate and realistic testing of military equipment, vehicles, weapons, and sensors for proper operation and suitability for combat use. The MOU does not authorize "take" of migratory birds but outlines the responsibilities of DoD personnel during installation activities that pertain to natural resources management, installation support functions, operation of industrial activities, construction of facilities, and hazardous waste cleanup. The MOU requires that management activities, such as prescribed fire, fuels management, and invasive species control, consider the impacts of such efforts on migratory bird populations and that monitoring be used to assess these impacts. The MOU requires that such planning efforts for such activities consider the impacts on migratory bird populations.

Responsibilities identified in the MOU specific to DoD include:

- Incorporating conservation measures addressed in Regional or State Bird Conservation Plans in INRMPs;
- When consistent with safety and security, allowing USFWS and other partners reasonable access to military lands for conducting surveys;
- Engaging in early planning and scoping with USFWS prior to starting any activity likely to affect populations of migratory birds to proactively address migratory bird conservation and initiate appropriate actions to avoid or minimize the take of migratory bird populations; and

- Managing military lands and nonmilitary readiness activities in a manner that supports migratory bird conservation.

The MOU does not address incidental take resulting from military readiness activities or active DoD airfield operations. Military readiness activities are covered by 50 C.F.R. 21.15 (Authorization of take incidental to military readiness activities). This final rule authorizes the Armed Forces to take migratory birds as an incidental result of military readiness activities. Conditions of this authorization are the obligation of DoD installations to confer and cooperate when military readiness activities may have a significant adverse effect on migratory bird populations. To avoid reaching the threshold that could revoke this authorization, DoD should engage in early planning and scoping, involve USFWS in planning, develop a list of conservation measures for migratory birds, and include comprehensive migratory bird management objectives in planning documents. To operators in the field, this provision provides significant benefit as training activities were previously subject to potential litigation and injunction. Camp Pendleton will, through this INRMP and NEPA review processes, continue to identify measures to avoid and minimize—to the extent practicable—adverse impacts to migratory birds that may be attributable to military readiness activities.

Objectives for the Migratory Bird and Raptor Conservation Element are described below.

OBJECTIVE 1: Monitor the compliance of Camp Pendleton policies, programs, and procedures with the MBTA, and develop measures to avoid and minimize impacts to bird populations, as well as conservation measures.

There is no authorization for the intentional or unintentional take of migratory birds during actions that are not considered military readiness activities. Thus, projects that are not actual military readiness activities must be reviewed for potential impacts to migratory bird populations through the NEPA process.

Per the 2014 MOU between USFWS and DoD, prior to implementing any activity that has, or is likely to have, a measureable negative effect on migratory bird populations:

a) Identify the migratory bird species likely to occur in the area of the proposed action, and determine if any species of concern could be affected by the activity;

b) Assess and document, through the project planning process (e.g., NEPA), the potential effects of the proposed action on species of concern. Use best available demographic, population, or habitat-association data in the assessment of effects upon species of concern; and

c) Engage in early planning and scoping with USFWS to proactively address migratory bird conservation, and to initiate appropriate actions to avoid or minimize the exposure of birds and their habitats to avian stressors that may result in the take of migratory birds.

As needed, WMS will monitor and interpret any new policies related to migratory birds and will coordinate with the Western Area Counsel Office (WACO) for consistency. WMS will also coordinate with PLN to incorporate applicable measures into environmental review documents.

OBJECTIVE 2: Identify activities on Camp Pendleton having population-level effects on migratory bird populations through annual and as-needed monitoring.

To determine whether activities on Camp Pendleton are having an impact (positive or negative) on migratory bird populations, WMS performs or participates in monitoring efforts to obtain data on the status of migratory birds. Examples of regular monitoring efforts implemented on Camp Pendleton include:

- Annual neotropical migratory bird studies for listed species and species of concern,
- Christmas bird counts,
- Annual surveys to map great blue heron (*Ardea herodias*) nesting colonies, and
- Monitoring Avian Productivity and Survivorship stations,
- Breeding Bird Surveys.

WMS will also evaluate landscape attributes as needed to ensure patch sizes and connectivity of habitat support sustainable populations of migratory birds.

OBJECTIVE 3: Monitor and manage raptor populations on Camp Pendleton to support healthy populations, comply with federal laws (BGEPA and MBTA), and support the military mission.

Raptor monitoring and management are conducted to support species diversity, comply with the MBTA and BGEPA, and support the military mission and other species management programs on Camp Pendleton. To meet the objective, WMS will conduct surveys every 5 years to track population changes. Other monitoring and management programs that will be implemented to satisfy the objective include the following:

- By 2018, WMS will update the existing Avian Protection Plan. This includes coordination with the Facilities Maintenance Department to identify utilities that are hazardous to large birds (e.g., power lines, wind turbines, communication towers, etc.) and recommend modifications to reduce impacts.

- With regard to bald and golden eagles, WMS will coordinate with USFWS to design measures in line with current policies to mitigate impacts in by 2019.

OBJECTIVE 4: Manage and maintain permits for authorized removal of birds and bird nests.

Removal of bird nests on-Base or on the Air Station may be necessary to support the training mission or to minimize impacts during maintenance and construction activities. For the natural resources staff to remove bird nests and still comply with the MBTA, a Migratory Bird Depredation Permit must be maintained and renewed (as needed). Additionally, permits required for removing predatory raptors must be maintained. WMS, GWS, and the Air Station are responsible for implementing this objective.

OBJECTIVE 5: Restore annual nonnative grasslands to perennial grass and forb lands in prescribed burn areas to promote nesting and foraging areas for grassland migratory bird populations where possible.

In 2016, LMS started a monitoring program to determine which historic prescribed burn areas managed for fuels reduction are annual grasslands, perennial grasslands, or perennial grasslands invaded by nonnative grasses. The goal is to restore annual grasslands to native perennial grasslands only if there is no conflict with fuel management objectives. These areas are not prescribe-burned every year; therefore, establishing native bunchgrasses for the benefit of grassland migratory birds should not conflict with fuel reduction treatments that are meant to reduce wildfires in nonprescribed burn areas.

4.3.2 Bird/Wildlife Aircraft Strike Hazard Element

- ELEMENT GOAL: Support reduction of BASH risk though avian-specific reporting, monitoring, and habitat management.

The BASH Prevention Program (Station Order 5100.7) was created aboard the Air Station to ensure an integrated bird control and hazard abatement policy. It was designed to minimize aircraft exposure to potentially hazardous bird and animal strikes. The BASH program is governed by BAHWG and is chaired by the Air Station's Director of Safety and Standardization with the Environmental Department playing a critical role on the working group.

The Air Station is currently in consultation with USFWS regarding the compliance of its Clear Zone with DoD and DoN Airfield Safety and Planning Criteria related to obstructions to flight whereby extensive habitat modifications could occur, and hopes to have the Finding of No Significant Impact (FONSI) by the end of 2017. Any USACE consultations and required permits

would be obtained prior to project initiation. Pending issuance of the FONSI, this INRMP will be adjusted through the annual review process (e.g., text as well as goals/objectives/actions matrix) to address the removal of the Air Station's riparian habitat and transitioning all areas into grassland habitat with no open sources of water in compliance with safety requirements. The Air Station's Environmental Department is responsible for implementing the objectives outlined below. This element is applicable to the Terrestrial Upland Ecosystem.

OBJECTIVE 1: Conduct monitoring, inspection, reporting, and wildlife conflict management to support the BASH program.

The Air Station conducts surveys in areas of operation, including hangars, and implements measures to exclude nesting/roosting/perching activities. Examples of the exclusion methods include installation of anti-perch devices, ensuring hangars are secured, maintenance of vegetation around the air strip, removal and control of bird and other wildlife attractants, and removal of inactive nests when required and in accordance with applicable permits. Should an air strike occur within Air Station air space, a report will be submitted immediately and the bird remains salvaged for diagnostic purposes.

4.4 MARINE AND FISH MANAGEMENT PROGRAM

- PROGRAM GOAL: Manage sustainable populations of native marine and freshwater species to meet the conservation objectives of applicable regulations and provide maximum flexibility for the military training mission.

The Marine and Fish Management Program intends to develop and implement proactive marine and fish management plans that support populations of threatened, endangered, and native species so that all applicable conservation measures are met to provide maximum flexibility for military training requirements. The program also intends to continue utilization of the best technology and research methodology to characterize aquatic habitat and species interactions in support of enhanced flexibility for military training requirements. Lastly, the program intends to develop exceptional recreational sport-fishing conditions for service members and their families stationed aboard Camp Pendleton.

WMS is responsible for coordinating marine fauna issues for Camp Pendleton, and the management of freshwater fish on-Base. The Base is responsible to ensure that any of its actions or activities that may impact resources offshore are conducted in accordance with regulations and laws governing those resources and the MCO. Camp Pendleton takes this responsibility seriously since a large portion of the military training mission requires use of seaspace and the airspace over it. Management of aquatic fauna on-Base balances the needs of the training

mission with the support of recreational game programs, as well as with the protection of federally listed threatened and endangered species, and other natural resources as required by law. In addition to the CWA and other laws that govern the minimization of pollution into U.S. waterways, aquatic resources on-Base and offshore are subject to natural resources management laws, including the Magnuson-Stevens Act, MMPA, and ESA (see Section 4.4.1 regarding the management of federally listed threatened or endangered marine or anadromous species). Camp Pendleton also has a recreational fishing program that is subject to additional applicable federal and state regulations (Section 4.6.1).

The Marine and Fish Management Program is organized into two elements: (1) Magnuson-Stevens Act and MMPA Compliance and (2) Marine and Freshwater Monitoring Element. These elements and their associated goals and objectives are discussed further in the following subsections.

4.4.1 Magnuson-Stevens Act and MMPA Compliance Element

- ELEMENT GOAL: Support compliance with the Magnuson-Stevens Act and MMPA.

Magnuson-Stevens Act

The Magnuson-Stevens Fishery Conservation and Management Act is a national program for the conservation and management of the fishery resources of the United States. Its purpose is to prevent overfishing, rebuild overfished stocks, ensure conservation, facilitate long-term protection of EFHs, and to realize the full potential of U.S. fishery resources. All of Camp Pendleton's nearshore resources, including the Santa Margarita estuary and Del Mar Boat Basin on-Base, are designated as EFH under the Magnuson-Stevens Fishery Conservation and Management Act. EFH at Camp Pendleton may include streams, estuaries, and offshore subtidal habitats that may be important for marine and anadromous fish species. Eelgrass is also designated as an EFH pursuant to the Act.

Regulation of these resources falls under the Pacific Groundfish Management Area or the Pacific Coastal Pelagic Fishery Management Area.

The Coastal Pelagic Species Fishery Management Plan includes 81 species potentially found offshore of Camp Pendleton, and the Pacific Coastal Pelagic Fishery Management Area is specifically designed to protect lower trophic species (e.g., anchovies, sardines, mackerel, and market squid), all of which are known to occur offshore of Camp Pendleton (NMFS 1991).

Eelgrass occurs in Camp Pendleton nearshore environment and in the Del Mar Boat Basin. The Southern California Eelgrass Mitigation Policy was developed, in collaboration by NOAA Fisheries, USFWS, and CDFW, to standardize and maintain a consistent policy regarding mitigating adverse impacts to eelgrass resources. Eelgrass vegetated areas are recognized as important ecological communities in shallow bays and estuaries because of their multiple biological and physical values. Eelgrass habitat functions as an important structural environment for resident bay and estuarine species, offering both predation refuge and a food source. Eelgrass functions as a nursery area for many commercially and recreational important finfish and shellfish species, including those that are resident within bays and estuaries, as well as oceanic species that enter estuaries to breed or spawn. Eelgrass also provides a unique habitat that supports a high diversity of noncommercially important species whose ecological roles are less understood (NMFS 1991).

Marine Mammal Protection Act

The 1972 MMPA established a federal responsibility to protect and manage marine mammals (see Appendix B). The MMPA prohibits, with certain exceptions, the take of marine mammals in U.S. waters and by U.S. citizens in international waters; and the importation of marine mammals and marine mammal products into the United States. Take of a marine mammal is defined to include harassment, hunting, capturing or killing, or the attempt of such actions.

Marine mammals are generally not known to use beach or estuarine habitats along Camp Pendleton's coast except when stranded. However, the presence of cetaceans and pinnipeds is fairly common offshore. Approximately 30 known species of cetaceans are found off the coast of southern California. However, abundance and diversity of cetaceans along the south coast can vary depending on continental slope, upwelling, and mixing of four different water masses on a seasonal and interannual basis (Leatherwood et al. 1987; Carretta et al. 2006). Cetacean species include toothed whales or odontocetes, such as sperm whales, beaked whales, dolphins, and porpoises. Baleen whales or mysticetes include six rorqual species, the northern right whale (*Eubalaena glacialis*), and the California gray whale (*Eschrichtius robustus*). Off Camp Pendleton's coast, six species of cetaceans occur in moderate to high numbers, either regularly or seasonally. These include the California gray whale, short-beaked common dolphin (*Delphinus delphis*), long-beaked common dolphin (*Delphinus capensis*), the coastal and offshore stocks of the bottlenose dolphin (*Tursiops truncatus*), Risso's dolphin (*Grampus griseus*), and Dall's porpoise (*Phocoenoides dalli*). Of the pinnipeds that regularly occur off the coast of southern California, only the Pacific harbor seal (*Phoca vitulina richardii*) and California sea lion (*Zalophus californianus*) are likely to occur off Camp Pendleton, though in small numbers.

As marine mammals do not breed, colonize, or haul out on Camp Pendleton beaches, management for marine mammals primarily consists of contacting USFWS and/or NOAA Fisheries, as appropriate, should marine mammals or their products (carcasses or body parts) be found stranded or washed ashore on Camp Pendleton's beaches, and coordinating with USFWS and NOAA Fisheries (as part of the NEPA process) to ensure that projects and activities that occur along the shore or offshore do not adversely affect marine mammals.

The following objective is intended to ensure compliance with the Magnuson-Stevens Act and MMPA.

OBJECTIVE 1: Facilitate compliance with the Magnuson-Stevens Act and MMPA through review of policies and development of response protocols.

WMS reviews existing and new policies on an as-needed basis to ensure that all activities on the Base are in compliance with the Magnuson-Stevens Act and MMPA. Before the end of 2018, WMS will finalize protocols for responding to stranded marine mammals. Ongoing coordination with NOAA Fisheries and USFWS will be conducted concurrently with the implementation of the established stranded marine mammal protocols and enforcement actions. WMS will also coordinate with GWS to obtain and manage records of stranded marine mammals.

4.4.2 Marine and Freshwater Monitoring Element

- ELEMENT GOAL: Conduct monitoring of marine and freshwater habitats.

Marine and estuarine ecosystems include abundant biodiversity of species and microhabitats. Reduction of species' complexity in these ecosystems could indicate natural or nonnatural impacts and should be investigated by Base biologists. Periodic monitoring of the nearshore environment and routine monitoring of the estuaries are needed to determine whether species complexity or habitat alteration has occurred. The following objective ensures monitoring of marine and freshwater habitats on Camp Pendleton.

OBJECTIVE 1: Monitor marine and freshwater environments and species to document diversity of native aquatic species through periodic inventory and habitat assessments.

WMS will periodically (minimally every 10 years) inventory the condition of the nearshore environment and diversity of native marine species. WMS will annually monitor the lagoons and estuaries within Camp Pendleton to determine whether habitat is functional for persistence or existence (Santa Margarita River estuary) of tidewater goby as noted in Section 4.1.1 (see Objective 1). Monitoring efforts include invertebrate and vertebrate sampling, as well as physical

and chemical water sampling. Species diversity and habitat constituents will be assessed on a relative scale to previous results, and future management actions addressed as needed based on most recent findings.

Freshwater fish species are sampled incidentally to conducting aquatic exotic species removal in the San Mateo, San Onofre, Las Flores, and Santa Margarita watersheds. WMS will also sample fish biodiversity during steelhead surveys as described in Section 4.1.1 (see Objective 2).

4.5 GAME MANAGEMENT PROGRAM

- PROGRAM GOAL: Manage sustainable game populations to support a recreational hunting program that is consistent with the military mission and other species management programs.

In support of the recreational hunting program on Camp Pendleton (see Section 4.6.2), GWS manages game species on-Base in cooperation with CDFW and follows California law and the annual framework established by CDFW. Section 640, Title 14, California Code of Regulations (Management of Fish and Wildlife on Military Lands) and Sections 3450 through 3453 of California Fish and Game Code allow for sufficient flexibility in administering hunting and fishing programs, to avoid conflicts with military training and maintain sustainable game species populations. Staffing of GWS was converted from military to civilian billets in 2004 and 2005. This conversion included changing some of the billets to biological technicians and another billet to a biologist. In recent years, GWS has increased their involvement in the review of harvest data, review of authorized harvest limits, and identification of population enhancement measures. Additionally, in 2004, a sportsman club was established. This organization is expected to provide user input into the Game Management Program and volunteer labor for projects in support of the program.

Wildlife game species at Camp Pendleton include California quail (*Callipepla californica*), mountain quail (*Oreortyx pictus*), mourning dove (*Zenaida macrour*a), band-tailed pigeon (*Columba fasciata*), desert cottontail (*Sylvilagus audubonii*), brush rabbit (*Sylvilagus bachmani*), southern mule deer (*Odocoileus hemionus fuliginatus*), and many waterfowl species. Sustainability in game management should favor using methods that do not require regular inputs of labor or materials to maintain continued benefits for wildlife and a harvestable surplus of game animals indefinitely. Management practices benefiting game species on Camp Pendleton include providing additional water sources, prescribed burns, restoring plant communities, and population monitoring for game species.

The Game Management Program is organized into two elements: (1) Game Species Element and (2) Bison Management Element. These elements and their associated goals and objectives are discussed further in the following subsections.

4.5.1 Game Species Element

- ELEMENT GOAL: Monitor and manage game species to support recreational hunting.

GWS is responsible for managing wildlife game species (deer, small game, and waterfowl) in a scientifically sound manner to provide a high-quality hunting experience for those permitted to hunt on Camp Pendleton. The following objectives are intended to ensure that GWS monitors and manages game species in support of the recreational hunting program.

OBJECTIVE 1: Implement management strategies to sustain mule deer populations as determined by current deer harvest and survey data.

Hunting and active management of the southern mule deer population at Camp Pendleton have been ongoing since at least 1955. Fairly extensive game data records, in annual hunting reports dating back to 1955, are available for deer hunting effort and harvest. Starting in 1987, in an effort to expand data input and reinforce game management plans, deer hunting reports began including deer age, weight, and sex. GWS staff collect hunter harvest information including harvest date, number of animals, species, sex, and age of game animals harvested. Additionally, lower incisors are collected from each harvested deer and used for age estimation. In many years since 1990, the Base has conducted helicopter surveys to estimate deer population size. Aerial deer surveys conform to CDFW methods and the Base shares results with CDFW. Information is also collected from deer roadkills. The current objective intends to continue the management of the species through annual surveys, analysis of data from aerial surveys and vehicle strikes, and managing hunter efforts through lottery check-in times, and times allowed for field changes and walk-in hunters.

OBJECTIVE 2: Collect game species data that are useful in evaluating appropriate hunting bag limits, monitor for over-harvest, and identify health/disease conditions.

Since 1955, game wardens and wildlife staff have collected and evaluated game species data to provide quality hunting and fishing programs. Data are collected for small game (since at least 1970) and waterfowl (since at least 1985). GWS staff tally the number of doves, rabbits, pigeons, squirrels, and ducks harvested. They also measure hunter effort for small game and waterfowl hunters and record sex data for quail and waterfowl. Other monitoring methods have included performing quail cow-call counts and estimating juvenile and adult ratios for quail and doves.

Data such as these are used by GWS to examine trends and hunting pressure, and determine if there is sufficient game to support future hunter effort and provide a quality hunting experience.

OBJECTIVE 3: Implement game management strategies that support a recreational hunting program and are consistent with the military mission.

Game management is reviewed by GWS annually to provide a quality, sustainable hunting experience for military and DoD patrons. Harvest bag limits, dates of seasons, and areas available for hunting are adjusted based on the results of these reviews, data collected from harvested animals, and from customer comments. Reviews will also identify any required changes to existing hunting programs and any enhancements required to improve species populations or the quality of the program. Specific training/hunting area use is authorized each hunting day dependent upon training use, hunter numbers, effort, and safety with sufficient manpower to run programs.

4.5.2 Bison Management Element

- ELEMENT GOAL: Manage bison population.

Most of California is not part of the bison's original range. The San Diego Natural History Museum, however, has 11 fossil records of an extinct species of bison that lived in the area about 100,000 years ago. The climate was likely much wetter and had more grasslands during that period (Lee 2008). In 1973, plains bison (*Bison bison bison*) were reintroduced onto Camp Pendleton as a gift from the San Diego Zoo because they did not have enough room to keep the animals (Lee 2008). Between 1973 and 1979 as part of this program, 14 bison were presented to Camp Pendleton. From 1979 to 2015, the bison herd grew from 14 to approximately 150 individuals, according to the 2015 helicopter population survey (Yoder pers. comm. 2015).

Currently, Camp Pendleton's bison herd is not intensively managed and is one of only two bison conservation herds in California; the other herd is on Santa Catalina Island. The following objective is intended to ensure GWS manages the bison population on Camp Pendleton.

OBJECTIVE 1: Manage the bison population to minimize mission conflicts and impacts to habitat and safety.

GWS finalized the Bison Management Plan in 2015 (Appendix J). Recommendations in the plan being considered include proactive strategies to minimize conflicts between training activities and bison, including immediate reporting of bison presence on or near active training grounds, near military personnel or infrastructure, or other potential bison-related emergencies.

4.6 OUTDOOR RECREATION PROGRAM

- PROGRAM GOAL: Provide natural resources-related recreational opportunities to installation personnel, their dependents, and the general public to the maximum extent practicable when compatible with the military mission, security, and natural resources sustainability.

The Base's Outdoor Recreation Program seeks to promote safe and legal outdoor recreation such as hunting, fishing, camping, and other recreational uses to ensure that service members and their families will have ready access to enjoy federally managed natural resources now, and well into the future. The Outdoor Recreation Program includes fishing and hunting programs, which are guided by the *Cooperative Plan for the Conservation and Management of Fish and Wildlife Resources Aboard Camp Pendleton*, signed by the DoI, DoD, and California Department of Fish and Game (now CDFW) in August 1963. Hunting and fishing programs are managed in cooperation with CDFW and are in compliance with California law and the annual framework established by CDFW. Section 640, Title 14, California Code of Regulations (Management of Fish and Wildlife on Military Lands) and Sections 3450 through 3453 of the California Fish and Game Code allow sufficient flexibility in administering hunting and fishing programs to avoid conflicts with military training.

As noted in Section 2.4.2.1, the Air Station's land is not made available for uses such as recreation or hunting (for either military or civilian personnel) as these activities would be inappropriate for reasons of security and would not be consistent with the safety of the public or Air Station personnel.

The Outdoor Recreation Program is implemented by GWS and WMS across all ecosystems. The program is organized into three elements: (1) Fishing Element; (2) Hunting Element; and (3) Recreation and Camping Element. These elements and their associated goals and objectives are discussed further in the following subsections.

4.6.1 Fishing Element

- ELEMENT GOAL: Manage mission-compatible and ecologically sustainable fishing opportunities that enhance quality of life for active and retired military personnel, DoD civilian personnel, their dependents, and the sponsored public.

Although no native freshwater game fish species are permissible to catch on Camp Pendleton, a few ponds and lakes have been historically managed for exotic game fish as part of a recreational fisheries program. These lakes include Case Spring Ponds, Lake O'Neill, and Pulgas Lake.

Inland freshwater fishing is not authorized in rivers or creeks, with the exception of the diversion ditches into and out of Lake O'Neill. Inland fishing may be authorized at Horseshoe Lake, Whitman Pond, Pilgrim Creek Pond, Broodmare Ponds, Wildcat Ponds, Windmill Lake, and Las Flores Slough (from I-5 bridge west to the ocean). Fishing is permitted at Pulgas Lake for catch and release only.

The following objectives provide management of a mission-compatible and ecologically sustainable fishing program.

OBJECTIVE 1: Manage fisheries to provide a high-quality recreational fishing program and experience consistent with the military mission and other species management programs.

To provide recreational fishing on-Base, Lake O'Neill is stocked annually (or as conditions allow) with exotic game fish, including largemouth bass (*Micropterus salmoides*), bluegill (*Lepomis macrochirus*), black crappie (*Pomoxis nigromaculatus*), channel catfish (*Ictalurus punctatus*), rainbow trout (*Salmo gairdnerii*), and red-eared sunfish (*Lepomis microlophus*). In addition to nonnative fish salvaged as part of the exotic aquatic animal control program (Section 4.2.2), hatchery fish are placed in Lake O'Neill, when funding is available. Stocking of Lake O'Neill is coordinated with a WMS fishery biologist, and GWS occasionally collects fish counts and data from anglers to inform stocking efforts.

To limit the inadvertent escape of the stocked exotic game fish species, GWS has installed and maintains screens on the outflow at Lake O'Neill. Requiring anglers' strict adherence to California State and Base fishing regulations that prohibit the transport of live fish from the water where taken further reduces the risk of direct or indirect adverse effects to protected species. In addition, the WMS's exotic wildlife species control efforts (Section 4.2.2) help support protected species through the ongoing removal of exotic aquatic species. Any proposed recreational fishing activities that may impact federally listed species will be evaluated through the NEPA process prior to implementation.

Floating Solar Bee™ pond circulators are also installed in Lake O'Neill to redistribute water from the bottom to the top of the lake. The mixing action accelerates the biological and photosynthetic processes and aids in stabilizing oxygen and temperature levels of the lake thereby creating an environment to sustain fish for sport fishing. Before the introduction of the Solar Bee™ units, the lake was susceptible to blue-green algae. Oxygen and temperature measurements are collected and evaluated to ensure the equipment is operating correctly and algae blooms and summer fish kills are minimized.

OBJECTIVE 2: Provide an accessible, sustainable outdoor fishing experience for military and civilian patrons within the constraints of the military mission and capability of the resources.

GWS is responsible for the sale and tracking of recreational fishing permits. GWS staff monitor permit prices relative to other installations to ensure prices are reasonable. GWS staff check permitted users in and out of fishing areas to ensure compliance with the rules and regulations of Camp Pendleton's fishing program. Anglers are required to follow published federal, state, and Base fishing regulations and must acknowledge receipt and understanding of the regulations by initialing a release statement when purchasing a Base permit.

4.6.2 Hunting Element

- ELEMENT GOAL: Manage quality, mission-compatible and ecologically sustainable hunting opportunities that enhance quality of life for active and retired military personnel, DoD civilian personnel, and their dependents.

Recreational hunting is permitted year-round and includes seasons for small/upland game, deer, and waterfowl hunting (Table 4-2). Hunting is allowed within training areas when not in use for military training. Hunting is not permitted in dud-producing impact areas, most cantonment areas, areas closed for conservation (e.g., recently burned), and areas with sensitive vegetation and habitat. However, it is allowed within some non-dud-producing impact areas if no training is occurring. Hunting may also be allowed before or after working hours (0900–1700), and all day on holidays and weekends as authorized, in areas not in-use for military training. Hunting hours are extended during the primary hunting seasons from September through January to accommodate additional hunter interest.

Table 4-2
Listed Game and Hunting Seasons on Camp Pendleton

Species[1]	Hunting Season[2]	Limit[3]
Mourning Dove	1 September to mid-September, and early-November to mid-December	10 per day; 10 in possession
California Quail and Mountain Quail	Mid-October to late-January	10 per day; 10 in possession
Band-tailed Pigeon	Mid-December to late-December	2 per day; 2 in possession
Crow	December to late March	24 per day, 24 in possession
Waterfowl	Mid-October to late-January	Varies by species
Deer (archery)[4]	September to early-December	1 per season per hunter
Deer (rifle)[4]	Mid-October to early-December	1 per season per hunter
Ground Squirrel	Year-round	None
Brush Rabbit and Cottontail Rabbit	1 July to late-January	5 per day; 5 in possession
Coyote	Year-round	None

[1] Species may be added to or removed from this list, depending upon resource needs and as long as state and federal hunting regulations are met.
[2] Actual dates of hunting periods vary. GWS publishes specific dates annually.
[3] Limits may be reduced dependent upon resource management decisions.
[4] Not more than one deer can be taken per hunter per year.

Hunting is available to active duty military, retired service members, DoD employees, dependents, and some immediate family members. In addition to holding a valid California hunting license, and state required stamps and tags, hunters must also hold a valid hunting permit that may be purchased from the game warden office. Hunters may use firearms, crossbows, or bow-and-arrows, in accordance with all applicable state and Base regulations. While not a common activity, Camp Pendleton allows hunters to field-train hunting dogs with game birds during daylight hours between 1 July and 31 March. All hunters planning to train hunting dogs on Camp Pendleton must have a CDFW hunting license and Base hunting permit from GWS. Hunters must ensure that birds are not harmed or killed while field-training dogs.

The following objective ensures that sustainable hunting opportunities are provided to active-military personnel, DoD, retired service members, and dependents.

OBJECTIVE 1: Provide a quality, sustainable outdoor hunting experience for those permitted to hunt on-Base within the constraints of the military mission, and capability of the resources.

GWS is responsible for managing Camp Pendleton's hunting program. Hunters are required to check-in and check-out in person daily when hunting is authorized. This allows GWS to minimize overuse, maximize hunter enjoyment, and see each animal taken. Detailed data on the species harvested (number, sex, age, and condition of animals), hunter success, and other parameters are also obtained. The number of hunters allowed in each hunting area is determined by several factors: the size of the area, vegetation, fire frequency, road access, game species population levels, manpower availability, cumulative harvest for the current season, safety, and hunter satisfaction. Limiting the number of hunters in each area allows Camp Pendleton to spread hunter impacts and avoid too much pressure on any single area. Consequently, this restriction helps to provide a safe, quality hunting experience while better managing game populations.

4.6.3 Recreation and Camping Element

- ELEMENT GOAL: Manage a quality, mission-compatible, and sustainable recreation camping opportunity that enhances quality of life for active and retired military, DoD civilians, their dependents, and the sponsored public.

Camp Pendleton provides developed site camping opportunities to active duty and retired military, their dependents, DoD personnel, and guests. Cottages and campsites with electrical hookups and picnic cabanas are available at the Del Mar and San Onofre Beaches. Recreational camping and picnic cabanas are also available at Lake O'Neill. Lake O'Neill campgrounds offer tent camping and developed campsites with water, electricity, and sewer hookups. The Lake O'Neill Peninsula is available for large group activities like promotions, retirements, and wedding receptions. This area has picnic cabanas, BBQ grills, a stage, electrical power, and athletic facilities. Bumper boats, paddleboats, and rowboats are also available to rent.

Camping in self-contained vehicles is permitted at the dirt overview area at Cocklebur Beach and on Red Beach, as training and security issues allow. Camping at Cocklebur Beach is permitted only during 15 September through 1 March, the nonbreeding season of the California least tern (federally endangered) and the western snowy plover (federally threatened). Camping at Cocklebur Beach is for the DoD community only and no general public civilian campers are allowed. Anyone obtaining a camping permit can camp at Red Beach when it is available; however, camping may be temporarily suspended or redirected in years when listed shorebirds nest on Red Beach. Camping permits are required for both beach locations and, additionally, are restricted during training operations. Camping, as well as other recreational activities, are also allowed at the Las Flores Ranch House designated camping area by all camping permit holders or Las Flores recreational permit holders, when it is available. There is no recreational swimming or water access allowed at either Cocklebur Beach or Red Beach. Fishermen may enter the ocean water up to their waist to cast fishing lines, but must fish at least 300 feet (91.4 meters) from posted nesting areas.

GWS camping on Camp Pendleton is undeveloped, with no toilets or water provided. Campers are required to have a complete, self-contained camper, trailer, or 5th-wheel or motor home and to obtain an annual camping permit, and must coordinate campsite use with GWS to verify site availability. Up to 1,000 permits (an internal restriction) can be issued annually on a first-come, first-served basis. In addition, group camping permits may be available in the future. Seniors (>65 years old) and patrons with a California vehicle disability placard can receive a discount on camping fees.

Depending upon the location, campgrounds on Camp Pendleton are supervised by MCCS staff, GWS, and/or beach lifeguards. Campers on Camp Pendleton are required to follow Base Regulations. A permit and check-in with GWS is required before entering camping/training areas and occupying any nondeveloped campsite. All vehicles (to include recreational vehicles and camping trailers) on Camp Pendleton must meet all California Vehicle Code sections (street legal), and be properly registered and insured. Game wardens also reinforce patron awareness of,

and compliance with, Base Order P11320.13D Fire Protection Regulations and Instructions (MCB CamPen 2000) regarding contained campfires, use of stoves, tents, etc.

The following objective ensures that camping opportunities are provided to enhance quality of life for active military, DoD, retired service members, dependents, and the sponsored public.

OBJECTIVE 1: Provide a quality, sustainable outdoor camping experience within the constraints of the military mission and capability of the resources.

GWS is responsible for evaluating the camping program annually. GWS seeks to maintain the number of camping customers and permits sold to provide a consistent annual funding source. GWS strives to provide multiple camping options on weekends and holidays, and ensure dispersed camping offers a safe, quiet, and enjoyable experience.

4.7 HUMAN-WILDLIFE CONFLICT MANAGEMENT PROGRAM

- PROGRAM GOAL: Manage Camp Pendleton wildlife conflict response and resolution.

Camp Pendleton's boundaries interface with both urban and natural environments. Conflicts routinely arise with animals that occasionally pose a health or safety hazard to Camp Pendleton residents. Further, federally listed threatened and endangered species and other native wildlife can become prey for domestic animals (e.g., cats), including pets and feral animals. Wildlife problems previously identified at Camp Pendleton include snakes, coyotes, and nesting birds in housing and cantonment areas, bats roosting in buildings, gulls and crows at the landfill, and birds nesting in military equipment. Wildlife management services have included the removal of beavers from the Santa Margarita River; the removal of coyotes and turkey vultures from housing areas that were classified as a threat to human health or safety by CDFW; and the removal of opossums, raccoons, and skunks that have become problem animals. The following objective ensures that wildlife conflicts are resolved to minimize risks to human health and safety.

OBJECTIVE 1: Manage wildlife conflict responses as related to human health and safety, military operations, quality of life, cantonment areas, and other species management programs.

GWS, WMS, and the Air Station all coordinate to respond to human-wildlife conflict hazards. Routine, ongoing wildlife conflict management efforts are focused on domestic, exotic, and native species that can be a nuisance, pose a threat to human health and safety, or are causing property damage. Wildlife conflict management efforts in housing and cantonment areas are focused on providing information to residents, units, and commands on how to avoid creating

conditions that will attract wildlife and potentially create a conflict. All wildlife damage management and control measures on Camp Pendleton are conducted in a humane and judicious manner. Wildlife control activities are compliant with existing federal regulations regarding these species (permit issues are discussed further in Section 4.8.2).

4.8 INCIDENT MANAGEMENT PROGRAM

- PROGRAM GOAL: Support conservation compliance and oversight for the installation mission and activities.

The Incident Management Program provides for compliance with applicable laws while allowing flexibility for Camp Pendleton's mission and training activities. Under this program, natural resources staff respond to incidents involving regulated natural resources (e.g., federally listed species) and provide for the rehabilitation of habitat impacts resulting from training activities. The program is implemented by GWS, LMS, and WMS, and across all ecosystems. WMS and LMS identify federally threatened and endangered species incidents and report them through the Environmental Incident Reporting System (EIRS). The Incident Management Program is organized into two elements: (1) Incident Management Element, and (2) Wildlife Permits Element. These elements and their associated goals and objectives are discussed further in the following subsections.

4.8.1 Incident Management Element

- ELEMENT GOAL: Manage the timely redress of unauthorized impacts to regulated resources.

This element provides for repair and restoration of impacts associated with unplanned and/or unauthorized events (i.e., environmental incidents). Examples of environmental incidents include accidental sewage spills, activities not conducted in compliance with Range Regulations, and documented occurrences of unauthorized take. When an environmental incident occurs, the incident is documented and tracked in the EIRS database. LMS is responsible for restoration of impacts associated with environmental incidents. The following objectives are provided to ensure environmental incidents involving listed species are remediated in a timely manner.

OBJECTIVE 1: In a timely manner, investigate, report, and address solutions for environmental incidents pertaining to regulated resources as needed using the EIRS.

Whenever environmental incidents have the potential to affect listed or other sensitive species, GWS, LMS, and WMS inform managers and other Environmental Security Department staff of the identified potential impact so the necessary protections can be employed.

OBJECTIVE 2: Mitigate unauthorized impacts to regulated resources on an as-needed basis.

Restoration projects that are currently planned or are being implemented by LMS to address unauthorized impacts to listed species are listed in Table 4-3. In addition to the restoration projects summarized in Table 4-3, LMS will also conduct new restoration projects if additional incidents occur.

Table 4-3
Current and Planned Restoration Projects (through 2023)

Project Name	Habitat(s)
Vernal Pool Group 68	Vernal pool mesa
P-1086 Pacific Pocket Mouse	Perennial grassland
Horse Pasture Fennel Control	Perennial grassland
51 Area Unauthorized Firebreaks	Coastal sage scrub
25 Area Erosion	Coastal sage scrub
41 Area Vernal Pool	Vernal pool mesa

4.8.2 Wildlife Permits Element

- ELEMENT GOAL: Manage permits that allow for minimizing conflicts with human health and Camp Pendleton's mission.

Permits are required to allow natural resources staff to handle or remove wildlife presenting risks to human health and Camp Pendleton's training mission. GWS and the Air Station are responsible for responding to wildlife conflicts on the Base and the Air Station, respectively. GWS is responsible for ensuring permits that cover the entire Base are in place to allow lawful handling and removal of wildlife. The following objective is provided to ensure wildlife salvaging permits are obtained and maintained to protect human health and support training.

OBJECTIVE 1: Manage wildlife permits to minimize human-health and training conflicts.

GWS is responsible for obtaining and renewing wildlife permits to allow for management of wildlife conflicts on Camp Pendleton. The need for permits is evaluated on an annual basis; once permits are in place, GWS and the Air Station provide data related to wildlife conflicts to applicable state and federal agencies. Current permits maintained by Camp Pendleton GWS, its purpose, and the responsible agency are identified in Table 4-4.

Table 4-4
Wildlife Permits

Agency	Specific Permit	Details	Expiration
USFWS	MBTA Depredation Permit	Vulture/Raven removal	Annual
USFWS	MBTA Special Purpose	Birds, nests, and eggs	3 yrs/report annual
USFWS	MBTA Special Collection	Birds	3 yrs/report annual
CDFW	Scientific Collectors Permit	Spotlighting deer (SONGS)	Annual
CDFW	Survival Training Permit	Take animals during training	Annually, as needed
CDFW	Beaver Depredation Permit	Remove beaver	On demand
CDFW	Dead Specimen Permit	Salvage and keep dead wildlife	Annual
CDFW	Scientific Collectors Permit	Capture, mark, and hold snake	3 yrs/report annual

4.9 NATURAL RESOURCES AWARENESS AND EDUCATION PROGRAM

- PROGRAM GOAL: Raise awareness of Camp Pendleton's natural resources management program successes and contribution to conservation of the resources entrusted to USMC stewardship.

While the management and protection of natural resources within Camp Pendleton's boundaries are important (and contribute to regional conservation efforts), long-term sustainability of ecosystems processes requires a regional perspective and coordination of efforts to achieve common goals. Through the Natural Resources Awareness and Education Program, natural resources staff are responsible for coordination and outreach efforts that serve to enhance awareness of management programs, federally listed and other regulated species, and steps being taking to balance training with resource protection on Camp Pendleton. Educating other units, residents, visitors, and the general public about Camp Pendleton's unique natural resources, stewardship initiatives, and contributions to regional conservation goals helps to demonstrate the Marine Corps' commitment to environmental protection and preservation of its natural resources.

The Natural Resources Awareness and Education Program is implemented by LMS, WMS, and GWS and is applicable to all ecosystems. The Base and Air Station's Comprehensive Environmental Training and Education Program (CETEP) is also applicable to all ecosystems. These programs are generally organized into three elements: (1) Data Sharing Element; (2) Internal Education Element; and (3) External Education Element. These elements and their associated goals and objectives are discussed in the following subsections.

4.9.1 Data Sharing Element

- ELEMENT GOAL: Share ecological data with stakeholders and interested parties to promote regional conservation of sensitive natural resources.

A form of regional involvement that supports natural resources awareness is the generation and sharing of useful ecological data. Much of the knowledge gained from data derived on Camp Pendleton can be directly applicable to issues of regional concern and has a clear benefit to local and regional management and planning efforts. The following objective is provided to ensure ecological data are shared with stakeholders and other interested parties for the benefit of regional conservation of sensitive natural resources.

OBJECTIVE 1: Facilitate the public availability of ecological data collected on Camp Pendleton to support regional conservation and research efforts.

Camp Pendleton routinely makes available data and copies of completed reports and surveys conducted on the installations. LMS and WMS provide reports to interested parties as a result of regional workshop goals and provides monitoring reports to USFWS annually, which are kept in their library and available to the public in that manner. USGS monitoring on-Base is available to the public through the USGS website. In addition, natural resources staff are partnering with several groups to improve regional sharing of ecological data. In particular, natural resources staff partner with USGS, State Parks, Western Ecological Research Center, San Diego Natural History Museum, and nongovernment organizations to collectively serve as participants in regional working groups for Pacific pocket mouse, riparian birds, coastal California gnatcatcher, and burrowing owl.

4.9.2 Internal Education Element

- ELEMENT GOAL: Inform military staff about natural resources and the programs to manage these resources, maintain natural resources staff technical expertise related to ecosystem management, and provide Conservation Law Enforcement Officers (CLEOs) with training opportunities to meet their mandated training requirements.

The primary mission of the Base and Air Station is to train Marines. Camp Pendleton is home to the largest stretch of undeveloped coastline in southern California, and the coastal and foothill terrain provides opportunities for a wide variety of military training; however, federal environmental laws and regulations dictate how training and day-to-day operations can be implemented on military installations. In an effort to ensure that training is accomplished in compliance with federal laws protecting sensitive natural resources, natural resources staff

coordinate with other branches and units to educate them on natural resources, applicable laws and regulations, and programs implemented on-Base. Training is also critical for LMS and WMS technical staff to maintain proficiency in their areas of expertise, and provide technical currency and updated knowledge in natural resources subject matter and management issues.

The following objectives provide for the training of military staff about natural resources on Camp Pendleton, and for the ongoing training needs for the natural resources technical experts within LMS and WMS.

OBJECTIVE 1: Provide training opportunities and information to other units and staff on a periodic basis to enhance their understanding of wildlife and land management programs being conducted on Camp Pendleton and ensure compliance with GWS, LMS, WMS, and Air Station programs.

WMS, LMS, and GWS coordinate with other branches and units on-Base through as-needed informal meetings, staff support, and project coordination. The Air Station's Environmental Department leads their CETEP and provides guidance and services to ensure environmental compliance and resources stewardship in support of the Air Station's mission. Section Heads and staff serve as Subject Matter Experts in their respective fields and are responsible for interpretation and dissemination of natural resources laws and policy.

WMS participates in the annual Reserve Support Unit (RSU) conference. RSU consists of military reservists that engage in annual training exercises on-Base to maintain readiness. WMS provides a 30-minute brief at this conference to ensure reservists are informed of RMB conservation issues.

In addition, WMS conducts annual briefs to military units that frequently train on installation beaches to ensure compliance with the Estuarine and Beach Ecosystem Conservation Plan and CAMPENO 3500.1 CH 1. Seasonal restrictions in the Santa Margarita Endangered Species Management Zone, estuarine management zones, and all posting of nesting sites apply to all military units training on beaches to protect the federally listed California least tern, western snowy plover, light-footed Ridgway's rail, and tidewater goby. Restrictions limit activity type and number of military personnel permitted within 16 feet (5 meters) and 984 feet (300 meters) of management zones and posted nesting areas, depending on activity. Beach briefs are provided by WMS at the beginning of the breeding season and emphasize the need to comply with restrictions in order to maintain flexibility of training for future units.

OBJECTIVE 2: Provide mandated and focused training for all CLEOs.

GWS coordinates or provides the training for all CLEOs on-Base, which includes Federal Law Enforcement Training Center (FLETC) Land Management Police Training (LMPT) and firearms training, and oversees that all required special certifications (e.g., hunter education instructor, defensive tactics instructor, firearms instructor) are current for personnel.

OBJECTIVE 3: Support current trainings for WMS and LMS staff on technical issues related to wildlife and plant species, ecosystem habitat management, and biodiversity.

To meet this objective, WMS and LMS staff should attend regional and range-wide workshops, symposiums, meetings, etc. to maintain and share knowledge of wildlife and land management techniques and issues (e.g., annual Western Snowy Plover Regional Unit 6 Working Group Meeting). Trainings are selected from a variety of sources and can include formal classes from universities and colleges, formal training from other federal agencies (e.g., USFWS National Conservation Training Center), attendance at conferences held by DoD and other professional organizations (e.g., National Military Fish and Wildlife Association), and participation in annual/periodic regional species meetings and conferences. As time allows, WMS and LMS staff will obtain field training with contractors sufficient to apply for and hold their own ESA Section 10(a)(1)(A) recovery permits.

4.9.3 External Education Element

- ELEMENT GOAL: Promote public awareness of Camp Pendleton's natural resources management program and USMC stewardship.

As stewards of significant open space in coastal southern California, it is important for Camp Pendleton to ensure the general public is well informed of the Marine Corps' commitment to environmental protection and preservation of its natural resources. Communicating the contributions to the sustainability of local natural resources benefits both the sensitive resources in the region and public perception of the Marine Corps' efforts to conserve these resources. The External Education Element targets education of nonmilitary groups, such as neighboring communities, conservation organizations, and academic institutions. The following objectives are provided to raise awareness of Camp Pendleton's natural resources management programs to nonmilitary groups.

OBJECTIVE 1: Maintain public awareness of Camp Pendleton's effort to manage natural resources and INRMP programs through public outreach.

To maintain public awareness of natural resources management programs, staff are responsible for developing briefs, papers, posters, and articles for presentation at appropriate venues. In addition, staff are available for interviews with local newspapers via Camp Pendleton Public Affair Office with management approval. Staff also participate in, support, and/or host events for many educational days throughout the year. Current and potential activities that provide education may include:

- Earth Day
- National Public Lands Day
- Annual Camp Pendleton Beach Clean-up
- National Audubon Bird Festival Tour
- Cal-Poly Pomona Herpetological Class Tour
- Endangered Species Day

Staff also participate with local high schools in a School-to-Career program, orienting students monthly during winter months to the environmental compliance and natural resources management professions, education requirements, and expertise being exercised on Camp Pendleton.

WMS will also be installing a blue whale bone display at the Del Mar Recreation Beach, and installing more outreach signs at the Del Mar Beach main lifeguard tower. WMS will also install educational signs at the Game Warden Office at the entrance of the maintained nature trail.

OBJECTIVE 2: Elevate public awareness and elicit understanding of and support for listed species conservation objectives.

On the Base, WMS and LMS are responsible for installing signs and kiosks that inform users of sensitive habitats and listed species. On the Air Station, where such signage is needed, it is installed by Air Station Environmental Department personnel. These signs or kiosks provide an opportunity to communicate natural resources information and Marine Corps policies to users and visitors of Camp Pendleton. The signs are intended to show users how successful the Marine Corps has been at accomplishing their training mission while significantly protecting natural resources. The Marine Corps is proud of the work done to protect threatened and endangered species on this topnotch training facility, and feels it is important for users to learn about how interesting Camp Pendleton is and how unique. Interpretive signs have been installed in a few locations on Camp Pendleton, and the goal is to continue to develop signs where needed for the

enjoyment of all users for now and in the future. LMS is also conducting outreach on-Base by conducting briefs on fairy shrimp to groups using the Oscar II, Fire Base Gloria, Cal Site 23, and DZ Tank Park areas.

WMS is focusing public outreach in the Endangered Species Management Zone. Specifically, brochures are prepared for MCCS to facilitate education of beach users on endangered species issues in the Endangered Species Management Zone.

OBJECTIVE 3: Provide and support public awareness of natural resources sustainability as appropriate.

Public access is restricted on Camp Pendleton for the safety of visitors, security, and Antiterrorism and Force Protection requirements of Camp Pendleton, and provide for the safety of personnel and mission-essential property and resources. That said, public access is available and Camp Pendleton maintains awareness of public access policies through social media (e.g., Facebook). When requested, customers are provided recreational regulations to further educate them on public access opportunities on-Base.

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CHAPTER 5.0
INRMP IMPLEMENTATION

5.1 IMPLEMENTATION

The Sikes Act requires that INRMPs be implemented and the status of implementation reported to Congress; therefore, the INRMP must reflect an annual strategy that addresses legal, regulatory, and DoD and USMC directive or policy requirements. This INRMP will be considered implemented when Camp Pendleton:

- Actively requests, receives, and uses funds for Common Output Levels of Service (COLS) 3 compliance projects and activities;
- Ensures that sufficient numbers of professionally trained natural resources management personnel are available to perform the tasks required by the INRMP;
- Coordinates annually with all cooperating offices; and
- Documents specific INRMP action accomplishments undertaken each year.

5.2 FUNDING

5.2.1 Funding Mechanisms

This INRMP identifies a number of actions to meet the natural resource objectives of Camp Pendleton (Appendix P). These actions include compliance requirements that must be performed to maintain compliance with laws and regulations, EOs, Memoranda of Agreement (MOAs), and MOUs, as well as conservation actions that are necessary to ensure effective stewardship of public land entrusted to the USMC. Although funding priority is generally given to compliance-driven actions, noncompliance actions will be carried out as funding and personnel become available. Proactive noncompliance management that focuses on efforts to prevent the listing of species at risk, which, if listed under the ESA, could adversely impact military readiness, is considered a priority funding by Camp Pendleton. Actions that rely on volunteer labor and enjoy the support of the military community, or have available alternate funding sources are also likely to be implemented.

Operations and Maintenance, Marine Corps (O&M, MC) environmental funds are the primary source of resources to support recurring and non-recurring natural resources projects. Other environmental funding may be provided from the Naval Working Capital Fund (NWCF);

Military Construction; Procurement, Marine Corps; Hunting and Fishing Access Fees; Qualified Recycling Program revenues; and the Defense Logistics Agency Energy funds. Responsibilities, requesting, and reporting requirements for each of these funds are identified in MCO P5090.2A CH 3. Camp Pendleton no longer holds any agricultural outleases and does not have a commercial forestry program; however, limited reimbursable funds from Fish and Wildlife Access Fees may be available for stewardship activities. Revenue collected from access fees may be used for the protection, conservation, and management of installation wildlife habitats and the hunting, fishing, and trapping programs.

Other special DoD initiatives to fund natural resources projects also may become available on a limited basis. In addition, alternate funding sources for special projects and initiatives may be sought from cooperative grants and partnership programs such as the DoD Legacy Program and National Public Lands Day grants. These grants require a written proposal, are competitive, and often are cost-sharing opportunities.

5.2.2 Funding Priorities

Headquarters Marine Corps and U.S. Marine Corps Installations Command have established COLS to characterize program health and degree of risk associated with varying funding levels. COLS level assignments (Table 5-1) must be used to prioritize funding of environmental requirements.

The Office of Management and Budget requires federal agencies to classify natural resources projects based in part on compliance requirements. DoDI 4715.03, Enclosure 4, provides detailed guidance on programming and budgeting natural resources projects. Programming and budgeting priority classifications are either (1) recurring natural resources conservation management requirements or (2) nonrecurring natural resources conservation management requirements.

Recurring conservation requirements include day-to-day costs of sustaining an effective natural resources management program such as personnel and administrative costs, training, supplies, permits, fees, testing and monitoring, sampling and analysis, reporting and recordkeeping, maintenance of natural resources conservation equipment, and compliance self-assessments. These requirements are high priorities for budgeting resources.

Table 5-1
Common Output Levels of Service (COLS) Level Descriptions

Level	Description
COLS 1	1. Provides 100% compliance with applicable, explicit federal, state, or local laws, regulations, Executive Orders, or Final Governing Standards, DoD, DoN, and Marine Corps policy, such that primary installation mission and readiness are supported. 2. Meets official Marine Corps commitments made to Congress, regulatory agencies, and the public. 3. Provides recurring administrative, personnel, and other support associated with managing environmental programs that are specifically necessary to meet mandated requirements as described in this COLS level. 4. Provides ability to address 100% of anticipated emerging mandated requirements based on historical execution, such as new laws, regulations, and incident response. 5. Provides 100% future planning capability. Includes management or planning activities that are prerequisites for future year mandated requirements or improve or enhance capabilities. 6. Provides ability to proactively address mandated requirements with no established deadlines. 7. Provides 100% compliance with DoD, DoN, and Marine Corps policy. 8. Provides investments in land or infrastructure that demonstrates Marine Corps environmental leadership and proactive environmental stewardship.
COLS 2	1. Provides 100% compliance with all known, applicable, and explicit federal, state, or local laws, regulations, Executive Orders, and Final Governing Standards ("mandated requirements") by established deadlines, such that primary installation mission and readiness are supported. 2. Meets official Marine Corps commitments made to Congress, regulatory agencies, and the public. 3. Provides recurring administrative, personnel, and other support associated with managing environmental programs that are specifically necessary to meet mandated requirements as described in this COLS level. 4. Provides ability to address 100% of anticipated emerging mandated requirements based on historical execution, such as new laws, regulations, and incident response. 5. Provides management and planning activities that are explicit prerequisites to meet future year mandated requirements. 6. Provides limited ability to address mandated requirements with no established deadlines that are directly related to protection of Marine Corps operational readiness and human health. 7. Provides 100% compliance with DoD, DoN, and Marine Corps policies that are directly related to protection of Marine Corps operational readiness and human health.
COLS 3	1. Provides 100% compliance with all known, applicable, and explicit federal, state, or local laws, regulations, Executive Orders, and Final Governing Standards ("mandated requirements") by established deadlines, such that primary installation mission and readiness are supported. 2. Meets official Marine Corps commitments made to Congress, regulatory agencies, and the public. 3. Provides recurring administrative, personnel, and other support associated with managing environmental programs that are specifically necessary to meet mandated requirements by established deadlines. 4. Provides ability to address 50% of anticipated emerging mandated requirements (based on historical execution), such as new laws, regulations, and incident response. 5. Provides management and planning activities that are explicit prerequisites just in time to meet future year mandated requirements.

Nonrecurring conservation requirements are prioritized using the following classifications:

Current Compliance. Includes installation projects and activities to support:

1. Installations currently out of compliance (e.g., received an enforcement action from an authorized federal or state agency or local authority).
2. Signed compliance agreement or consent order.
3. Meeting requirements with applicable federal or state laws, regulations, standards, EOs, or DoD policies.
4. Immediate and essential maintenance of operational integrity or military mission sustainment.
5. Projects or activities that will be out of compliance if not implemented in the current program year. Those activities include:
    a) Environmental analyses for natural resources conservation projects, and monitoring and studies required to assess and mitigate potential impacts of the military mission on conservation resources.
    b) Planning documentation, master plans, compatible development planning, and INRMPs.
    c) Natural resources planning-level surveys.
    d) Reasonable and prudent measures included in incidental take statements of BOs, BAs, surveys, monitoring, reporting of assessment results, or habitat protection for listed, at-risk, and candidate species so that proposed or continuing actions can be modified in consultation with USFWS or NOAA Fisheries.
    e) Mitigation to meet existing regulatory permit conditions or written agreements, such as those required by the CWA.
    f) Nonpoint source pollution or watershed management studies or actions needed to meet compliance dates cited in approved state coastal nonpoint source pollution control plans, as required to meet consistency determinations consistent with Coastal Zone Management.
    g) Wetlands delineation critical for the prevention of adverse impacts to wetlands, so that continuing actions can be modified to ensure mission continuity.
    h) Compliance with missed deadlines established in DoD executed agreements.

Maintenance Requirements. Includes those projects and activities needed to meet an established deadline beyond the current program year and maintain compliance. Examples include:

1. Compliance with future deadlines.
2. Conservation, GIS mapping, and data management to comply with federal, state, and local regulations, EOs, and DoD policy.
3. Efforts undertaken in accordance with nondeadline-specific compliance requirements of leadership initiatives.
4. Wetlands enhancement to minimize wetlands loss and enhance existing degraded wetlands.
5. Conservation recommendations in BOs issued pursuant to the ESA.

Enhancement Actions beyond Compliance. Includes those projects and activities that 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:

1. Community outreach activities, such as International Migratory Bird Day, Earth Day, National Public Lands Day, Pollinator Week, and Arbor Day activities.
2. Educational and public awareness projects, such as interpretive displays, oral histories, Watchable Wildlife areas, nature trails, wildlife checklists, and conservation teaching materials.
3. Restoration or enhancement of natural resources when no specific compliance requirement dictates a course or timing of action.
4. Management and execution of volunteer and partnership programs.

5.2.3 Marine Corps Environmental Program Database

Congress and the Secretary of Defense further specify that all environmental requirements and costs must be tracked. Currently, the USMC uses the Status Tool for the Environmental Program (STEP) to fulfill that requirement. The primary functions of STEP are estimating, prioritizing, tracking, and reporting for compliance and natural resources conservation projects, planning annual budgets, and reporting to Congress through the Office of the Secretary of the Navy and Office of the Secretary of Defense. All Marine Corps environmental requirements must be entered into the environmental program database utility as soon as they are identified, and reported. STEP catalogue numbers are included in the INRMP project actions in Appendix P.

5.3 STAFFING NEEDS

The Sikes Act and DoDI 4715.03 require that all DoD components ensure that sufficient numbers of professionally trained natural resources management personnel and natural resources law enforcement personnel are available and assigned responsibility to manage their installations' natural resources.

At Camp Pendleton, the Base has 19 billets within LMS, WMS, and GWS and the Air Station has one billet responsible for natural resources management and the implementation of actions identified in this INRMP. However, one or more permanent positions may be vacant at any given time, which impacts program implementation. Staff from other federal agencies and contract personnel are also available and used when needed on a case-by-case basis.

5.3.1 Professional Development and Natural Resources Training

DoDI 4715.03 requires that necessary supplemental training to ensure the proper and efficient management of those resources be provided in a timely manner (e.g., Naval Civil Engineer Corps Officers School's Natural Resources Compliance Course, DoD Sikes Act Training Course). Personnel with natural resources responsibilities must, as a condition of employment, possess the appropriate knowledge, skills, and professional training/education to perform their duties. Camp Pendleton provides natural resources personnel timely and necessary supplemental training to ensure proper and efficient natural resources management. Camp Pendleton also maintains adequate natural resources staffing levels to provide and sustain installation natural resources. Natural resources personnel participate in required and recommended training opportunities when they are available to ensure that personnel are adequately trained in natural resources management. Staff also participate in annual professional conferences and workshops.

Recommended annual conferences for one or more Camp Pendleton staff includes:

- National Military Fish and Wildlife Association annual workshop;
- North American Natural Resources Conference;
- Western Association of Fish and Wildlife Agencies;
- The Wildlife Society Conference (national, section, and chapter levels);
- International Erosion Control Association Conference; and
- Environmental Systems Research Institute (ESRI) Users GIS Conference.

All training and conference attendance is based on the availability of funding; therefore, the completion or attendance of some training may not be feasible.

5.4 COOPERATIVE AGREEMENTS AND PARTNERSHIPS

Per DoDI 4715.03, DoD installations may enter into cooperative agreements with states, land-grant universities, local governments, nongovernmental organizations, and individuals to provide for the maintenance and improvement of natural resources or conservation research on or off DoD installations. A cooperative agreement is used to acquire goods or services to accomplish a public purpose of support or stimulation authorized by federal statute. Use of a cooperative agreement requires substantial involvement between the federal agency and recipient during performance of the activity. Cooperative agreements authorized by the Sikes Act are not subject to the provisions of the Federal Grant and Cooperative Agreement Act, but must comply with the procedural requirements of the DoD Grant and Cooperative Agreement Regulations. Funds approved for a particular fiscal year may be obligated to cover the costs of goods and services provided under a Cooperative Agreement during any 18-month period beginning in that fiscal year in accordance with the Sikes Act. Cooperative agreements may be executed over a 60-month period. Using cooperative agreements to accomplish projects is an efficient means to implement INRMPs.

5.4.1 Cooperative Ecosystem Studies Units

The Cooperative Ecosystem Studies Unit (CESU) National Network provides coordinated research, technical, and educational assistance to federal agencies and their partners for natural and cultural resources through a network of 17 regional partnerships. As of March 2012, DoD was a member of 15 CESUs. Each CESU is competitively developed under a single cooperative agreement based on the need of INRMP approved projects. DoD and host /partner universities collaborate on specific projects with the host/partner universities providing space, faculty expertise, students, and educational services while DoD provides scientists and funding. CESU objectives include:

- Provide resource managers with high-quality scientific research, technical assistance, and education;
- Deliver research and technical assistance that is timely, relevant to resource managers, and needed to develop and implement sound adaptive management approaches;
- Ensure the independence and objectivity of research;
- Create and maintain effective partnerships among federal agencies and universities to share resources and expertise;
- Take full advantage of university resources while benefiting faculty and students;

- Encourage professional development of federal scientists; and
- Manage federal science resources efficiently.

Using CESU Cooperative Agreements to accomplish projects is another means to implement INRMPs and can be administered through the NAVFAC Southwest Regional Natural Resources Office. Grants Officer authority for Cultural and Natural Resources Management Cooperative Agreements was delegated to NAVFAC Echelon II and can be re-delegated to NAVFAC Echelon III and IV.

5.5 INRMP REVIEWS, REVISIONS, AND UPDATES

It is a statutory requirement of the Sikes Act that a formal review as to operation and effect be completed no less often than every 5 years, and it is DoD policy to review INRMPs annually with the cooperation of USFWS, NOAA Fisheries, and appropriate state fish and wildlife agencies. Camp Pendleton natural resources managers must also engage installation stakeholders (e.g., operations and training and planners) in reviewing and updating the INRMP to ensure goals, objectives, and actions are in line with mission requirements, and to identify potential project conflicts or opportunities for cooperative program implementation.

During the review process, the Base and the cooperating agencies should determine whether the existing INRMP needs formal revision or updating, or whether to continue implementing an existing INRMP that has not been updated or revised. INRMP updates are minor changes to an INRMP that do not result in new biophysical effects, do not change the management prescriptions set forth in the INRMP, and do not require analysis under NEPA nor associated public review. An INRMP revision is required if significant changes are proposed to be made that may result in environmental effects not previously analyzed (e.g., changes to the natural resource management practices that will be implemented). For INRMP revisions, the installation must conduct a new or supplemental environmental impact analysis of the proposed action under NEPA, and make the INRMP and the environmental document available for public review and comment, as appropriate.

The formal HQMC ECE Program assesses and evaluates the implementation of the INRMP. The ECE requires an on-site evaluation every 3 years by an independent team established by HQMC, an annual review and validation of a Plan of Action and Milestones that follows up formally on any deficiencies identified during the HQMC ECE, and an annual Self-Audit Program administered by Camp Pendleton.

5.5.1 Annual Reviews

The RMB will communicate annually with USFWS, NOAA Fisheries, and CDFW personnel regarding INRMP implementation progress, potential areas of improvement, and expected projects for the coming year. Such annual reviews enable project tracking and assessment, help facilitate adaptive management, help determine whether the existing INRMP is contributing to the conservation and rehabilitation of natural resources, and are used to inform changes to future INRMP updates and revisions. Annual reviews should specifically assess conservation goals and objectives and the status of Natural Resources Conservation metrics established by NAVFAC and HQMC (see Section 5.5.2).

The annual review must also assess and verify:

- INRMP is effective in preventing net loss capability of military installation lands to support the military mission,
- Current information on all conservation metrics is available,
- All "must fund" projects and activities have been budgeted for and implementation is on schedule,
- All required trained natural resources positions are filled or are in the process of being filled,
- Projects and activities for the upcoming year have been identified and included in the INRMP (an updated project list does not necessitate revising the INRMP),
- All required coordination has occurred, and
- All significant changes to the installation's mission requirements or its natural resources have been identified.

As part of the annual review process, Camp Pendleton will request participation from USFWS, CDFW, NOAA Fisheries, and other appropriate stakeholders. Reviews may be accomplished via correspondence or in a meeting between appropriate parties and are facilitated by the web-based metrics reporting tool located on the Marine Corps Environmental Management Portal. The documented annual reviews may be used when developing the reports required by section 670a(f) of the Sikes Act, as well as to expedite the more formal 5-year reviews, provided these reviews comprehensively address all items that have changed significantly since the last review, and all parties' mutual agreement is documented. Appendix S provides detailed annual review coordination and documentation.

5.5.2 Annual Metrics

The Sikes Act requires each installation with significant natural resources to report annually on the status of its INRMP implementation. Natural Resources Conservation metrics are used to assess the overall health and trends of the Camp Pendleton natural resources program and to identify and correct potential funding and other resource shortfalls. Metrics have been developed to assess INRMP implementation, measure conservation efforts, ensure no net loss of military training lands, understand the conservation program's installation mission support, and indicate the success of partnerships with USFWS, CDFW, and NOAA Fisheries. Input from these and other appropriate stakeholders is obtained during the annual INRMP review process. This evaluation is facilitated by a web-based metrics reporting tool on the Marine Corps WEBCASS Enterprise Portal, which hosts the USMC Conservation Metrics Portal (CMP). The CMP provides the means to evaluate performance in seven focus areas:

1. **INRMP project implementation.** Evaluate the execution of actions taken to ensure they meet goals/objectives outlined in the INRMP.
2. **Federally listed species and critical habitat.** Evaluate the extent to which federally listed species have been identified and the conservation benefits provided to these species and their habitats.
3. **Ecosystem integrity.** Evaluate the general current condition and trends of managed ecosystems and the extent to which the INRMP benefits each.
4. **Fish and wildlife management and public use.** 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.
5. **Team adequacy.** Evaluate the adequacy of the natural resources team (natural resources management professional and installation support staff) in accomplishing INRMP goals and objectives for the installation.
6. **Partnerships effectiveness.** Evaluate the degree that USFWS and CDFW partnerships are cooperative and ensuring they result in effective INRMP development and review for operation and effect.
7. **INRMP impact on the installation mission.** Evaluate the level to which the existing natural resources program supports the installation's ability to sustain the current operational mission ensuring no net loss of mission capability.

Additionally, Camp Pendleton produces an annual report from data derived from the annual metrics review to meet in-house requirements as well to provide reports to headquarters staff who make information available for Congressional review.

5.5.3 Streamlined INRMP Update Review

To more effectively respond and rapidly adapt to ongoing natural resource activities, the tripartite MOU between the DoD, USFWS, and the Association of Fish and Wildlife Agencies (Appendix B), includes a provision to streamline the review process, which will allow for expedited review and approval (new signatures) of updated sections of each INRMP.

Per the MOU and DoD guidelines, specific procedures for the streamlined INRMP update review process will be as follows:

- Installations will contact the appropriate USFWS regional or field office and/or state offices. Usually (but not always), signature authority for INRMPs is at the field office level of Ecological Services; therefore, installations should contact their local Ecological Services field office first. This notification should be initiated by the DoD component or installation as soon as possible, and no less than 30 days prior to submitting the draft update for review.
- When preparing an updated or revised INRMP for USFWS review, installations will clearly identify all changes made (e.g., highlight, track changes, written summary) when forwarding it for review.
- Once the appropriate USFWS office has received the updated INRMP, the USFWS office will acknowledge receipt and send the installation a proposed timeline for the expedited review within 15 days. This communication may be electronic, by fax, or in a written letter.
- The USFWS field offices and states will provide comments on the draft update to the submitting installation within a maximum of 60 calendar days, but preferably within 30 days, of receipt, unless the affected parties agree to a longer timeline for review. The reviewing USFWS and state(s) offices will focus their review on those parts of the INRMP that reflect changes from the previously reviewed version, as indicated.
- If acceptable, the USFWS reviewing office will use an addendum to the existing INRMP to acknowledge its review and acceptance of changes, or to indicate what changes require further discussion or modification. This addendum may be used for the state review as well, and will become part of the approved INRMP.

- Once complete, the installation shall submit a final update to the appropriate USFWS and state field offices, and to the Sikes Coordinator.
- The USFWS field offices and states will respond and provide signature on the final update within a maximum of 60 calendar days, but preferably within 30 days, of receipt, unless the affected agree that a longer timeline for review is acceptable.

5.6 DATA MANAGEMENT

5.6.1 Marine Corps Environmental Management Portal

The Marine Corps Environmental Management Portal is the Marine Corps' official repository of natural resources information to track INRMP status and implementation measures for regulatory review, generate official reports, record USMC measures of merit and metrics, and centralize and track other documentation. It is a web-based tool used to submit, compile, and retrieve information about the Natural Resources Conservation Program to obtain and maintain the most current information possible to track the status of various natural resources programs, have current data to respond to various program inquiries, and generate accurate reports.

5.6.2 Geographic Information Systems Management

USMC policy and goals for GIS data are established by MCO 11000.25, Installation Geospatial Information and Services. This order provides policy, guidance, and standards for acquiring, protecting, utilizing, and implementing the Marine Corps Installation Geospatial Information and Services (IGI&S), also known as GEOFidelis, in support of Marine Corps installation management. The GEOFidelis Data Management Guide documents the required procedures to create and maintain geospatial data for Marine Corps use and dissemination. It also provides technical procedures and guidance to meet the requirements of MCO 11000.25 and other Marine Corps guidance. GEOFidelis supports the Marine Corps Installation 2020 vision and the Marine Corps Vision and Strategy 2025 for land management, facility planning, environmental compliance, base operation, military training, and other management processes.

The GEOFidelis Data Model 3.0.0 is the standard for all USMC Installation IGI&S geospatial data. The data model is based on Spatial Data Standards for Facilities, Infrastructure, and Environment. It maintains a common USMC IGI&S data standard and provides all USMC installations with a common structure for data layers and attributes. MCIWEST-MCB CamPen and MCAS CamPen's Data Dictionary version 3.0.0.1 (6/25/2015) is based on this data model.

The Installation IGI&S Manager oversees MCIWEST-MCB CamPen's IGI&S effort including maintaining oversight geospatial data assets and creating, maintaining, and implementing the installation geospatial data management plan as well as coordinating with the installation's SMEs for access and release policy implementation.

MCIWEST-MCB CamPen's SMEs are responsible for a particular function or resources on the installation. The SME is the person knowledgeable about the domain or field being represented and is responsible for ensuring that data are properly attributed and collected to meet their needs and the requirement of the business process. The SME reviews sources for data collection and conservation to ensure that the most current data are captured. LMS and WMS are the Base SMEs for GIS natural resource domains. The SME reviews project deliverables to ensure that the geospatial data are returned in a usable and compliant form.

MCIWEST-MCB CamPen's geospatial data are available to United States Government authorized users via GEOFidelis Online through a Citrix-based portal. Requests for MCIWEST-MCB CamPen Environmental Security Department geospatial data are completed via the Base Sponsor and require a GIS Request form completed by the Base Sponsor, a GIS Data Request letter from the contractor/agency requesting the data, a list of data layers being requested, identified area or project boundary file, and signed nondisclosure agreement.

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CHAPTER 6.0
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Appendix A

Public Review Comment and Endorsement Letters on the INRMP

Robert Fletcher
Team Lead – Natural Resources
Environmental Services
San Diego Gas & Electric Co.
8315 Century Park Court; CP21E
San Diego, CA 92123
Direct: (858) 637-7820

August 22, 2017

Danielle Page
Head, Resources Management Branch
Environmental Security
Marine Corps Base Camp Pendleton, California

Via email: Danielle.page@usmc.mil

RE: Comments regarding the Draft 2017 Revision to the Integrated Natural Resources Management Plan, Marine Corps Air Station Camp Pendleton, California.

Dear Ms. Page:

San Diego Gas & Electric Company (SDG&E) appreciates the opportunity to comment on the above-referenced Draft 2017 Revision to the Integrated Natural Resources Management Plan per the notice dated July 24, 2017. SDG&E is a utility regulated by the California Public Utilities Commission (CPUC) that provides electric and gas services to customers throughout San Diego, Orange, and Imperial counties. The CPUC mandates that SDG&E maintain its utility infrastructure. SDG&E hopes to ensure that the Final 2017 revision to the Marine Corps Air Station Camp Pendleton Integrated Natural Resource Management Plan (INRMP) correctly describes the SDG&E Natural Community Conservation Plan (NCCP).

In Section 1.8.3.3, San Diego Gas and Electric Company Subregional Natural Community Conservation Plan, the INRMP describes the SDG&E NCCP. SDG&E suggests the following edits and editions to Section 1.8.3.3:

The San Diego Gas and Electric Company (SDG&E) Subregional NCCP (SDG&E Plan), approved in 1995, covers an area from southern Orange County to the Mexican border. The purpose of the plan is to establish and implement a long-term agreement between SDG&E, USFWS, and CDFW to provide incidental take coverage for 110 plant and animal species while allowing SDG&E to develop, install, maintain, operate, and repair its facilities, which are or will become necessary to provide electric, natural gas, and other services to the customers served by SDG&E within the plan area. The basic formula for addressing the impacts of SDG&E activities in sensitive resource areas is first to attempt to avoid impacts to Covered Species and their habitats, second to minimize necessary impacts to Covered Species to the extent feasible, and third to mitigate for those unavoidable impacts. SDG&E's NCCP includes 69 Operational Protocols as well as behavioral and construction techniques to avoid and minimize impacts to sensitive resources.

The SDG&E Plan established a mitigation bank to compensate for unavoidable impacts and an enhancement program to monitor, enhance and re-establish impacted areas. A total of 354 acres (143 hectares) of mitigation credits have been set aside in several land parcels purchased by SDG&E as a mitigation bank.

In 2017, SDG&E and the USFWS signed a Low-Effect Habitat Conservation Plan (Permit Number: TE26660C-0) that provides an additional 60 acres of impact credit and incidental take coverage for 37 species over a 5-year term. In cooperation with the USFWS and CDFW, SDG&E is also proactively pursuing an amendment to SDG&E's existing Subregional Plan to prepare for future needs.

SDG&E, through its parent company Sempra Energy, holds more than 1,300 acres (526 hectares)

of leases/right-of-way agreements with Camp Pendleton for transmission lines and various associated support facilities. Camp Pendleton supports the mission of the SDG&E Plan by limiting military activity within these areas, and provides a natural habitat linkage to the plan's covered species.

In addition, SDG&E requests the opportunity to review future environmental documents, plans and permits associated with the Base that may affect SDG&E's existing facilities. SDG&E has existing facilities within and in the vicinity of Marine Corps Base Camp Pendleton (electric transmission, distribution, and substations; gas transmission pipelines and facilities) and would like to note that future improvements to these facilities, planned and unplanned, may be required due to regional needs.

SDG&E thanks you for this opportunity to comment on Draft 2017 Revision to the Integrated Natural Resources Management Plan, Marine Corps Air Station Camp Pendleton, California. If you have any questions, feel free to contact me at (858) 637-3720 or at RFletcher@semprautilities.com.

Sincerely,

Robert C. Fletcher Jr.
Team Lead, Natural Resources
Environmental Programs
San Diego Gas & Electric Company

cc:
Edalia Olivo-Gomez, Team Lead Land Planning, SDG&E

Transportation Corridor Agencies™

August 23, 2017

Ms. Danielle Page
Head, Resources Management Branch, Environmental Security
United States Marine Corps Base, Camp Pendleton
Box555010
Camp Pendleton, California 92055-5010

Subject: Integrated Natural Resources Management Plan Revision (July 2017)

Dear Ms. Page:

The Transportation Corridor Agencies (TCA) thanks you for the opportunity to review and comment on the Draft Integrated Natural Resources Management Plan (INRMP) and submits these comments for your consideration.

The Draft INRMP includes discussion on the South Orange County Transportation Infrastructure Improvement Project (SOCTIIP) and the 1988 agreement between TCA and Camp Pendleton that limits any alignment within the base property to the northern portion of Camp Pendleton. This letter re-acknowledges the stipulations provided in the 1988 letter, and we would like to inform you that we have re-initiated efforts to address traffic congestion in South Orange County.

We are presently in the project initiation phase that includes the preliminary evaluation of ideas that have been suggested by the public and stakeholders. Some of these ideas include alignments outside of Camp Pendleton, as well as some within the base property. As we move forward and initiate the formal environmental process, which is estimated to begin in mid-2018, we will keep you apprised and provide you with any information relative to our efforts.

If you have any questions or require further information, please don't hesitate to contact me at (949) 754-3475 or via email: vmcfall@thetollroads.com.

Sincerely,

Valarie McFall
Chief Environmental Planning Officer

The Nature Conservancy
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August 23, 2017

To: Environmental Security
Attn: Danielle Page
MCIWEST-MCB
Box 555008
Camp Pendleton, CA 92055-5008

Subject: 2017 Draft Revised Integrated Natural Resource Management Plan (INRMP)

Dear Ms. Page,

The Nature Conservancy is an international nonprofit organization dedicated to conserving the lands and waters on which all life depends. We have worked with a wide array of landowners, businesses, communities, governments, and other partners to successfully protect over 119 million acres worldwide. We seek to achieve our mission through science-based planning and implementation of conservation strategies that provide for the needs of people and nature.

Within southern California, The Nature Conservancy has been working for nearly 40 years to conserve and manage lands important in maintaining the regions biodiversity. This includes protection and management of nearby lands along the Santa Margarita River and at Santa Rosa Plateau. As a result, we are significantly invested in ensuring the remaining lands in this region are managed to the highest possible standards.

The Nature Conservancy (TNC) would like to thank the Marine Corps Installations West (MCIWEST) – Marine Corps Base (MCB) and Marine Corps Air Station (MCAS) Camp Pendleton for the opportunity to comment on the draft revision of the 2017 Integrated Natural Resources Management Plan (draft INRMP) for MCB and MCAS Camp Pendleton.

Several sections thoroughly address natural resource threats and describe management actions designed to ameliorate such threats. We would like to acknowledge and thank MCB and MCAS Camp Pendleton for including an extensive analysis of current and anticipated effects associated with climate change (pp. 2-57–2-63). As described in the draft INRMP, the 2012 California Climate Change Assessment indicates that southern California will see increased average temperatures, decreased average annual precipitation, increased sea level rise, and increased wildfire risk. We commend MCB and MCAS Camp Pendleton for describing the impacts expected from these changing climate variables, such as: shifts in vegetation communities, including rare, threatened and endangered species they support; spread of invasive species; soil warming, drying, and loss; impacted soil

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function; stream bank erosion and gullying; reduced water quality; water supply constraints; impacted groundwater quality; altered burn regimes; increased dust; impacts to air quality; increases in storm frequency and intensity; shoreline flooding; coastal erosion; increased saltwater intrusion; reduced capacity of protective barrier islands and coastal wetlands; and, increased fire risk and fire frequency.

Given the thorough discussion and acknowledgement of expected climate change impacts, TNC strongly encourages the development of climate change analyses in all MCB and MCAS Camp Pendleton management plans. This is particularly true for several planning documents prepared in the 1990s, which contain no reference to climate change but continue to guide management efforts on base, including but not limited to: Riparian Ecosystem Conservation Plan (1996); Estuarine and Beach Ecosystem Conservation Plan (1996); and, Dune Restoration Plan (1994).

To reduce the use of fossil fuels and in turn, greenhouse gas emissions, the draft INRMP outlines various energy-efficient measures currently being executed to promote energy conservation, improve energy efficiency, and diversify energy resources (pp. 2-62–2-63). These are laudable steps that TNC would like to recognize and applaud.

The Estuarine and Beach Ecosystem Conservation Plan (1996) targets western snowy plover (*Charadrius nivosus nivosus*) and California least tern (*Sterna antillarum browni*) within specific zones. The Santa Margarita River Management Zone contains nesting sites at White Beach and French Creek; however, the foraging areas are not protected. Plovers are precocial and need immediate unimpeded access to a forage source. Without such protection, this threatened species will be exposed to vehicle traffic during training during attempts to feed. In fact, the species description describes one threat to WSP as military training at the wrack line (in the foraging area). There is a nearby forage source at French lagoon; however, the draft INRMP does not describe the proximity to the nesting area. Should military training occur between the nesting and foraging area, plovers will certainly be exposed to mortality from vehicle traffic. We encourage MCB Camp Pendleton to create nesting areas adjacent to forage sources and encourage nesting for western snowy plover through beneficial management in these areas.

The Marine Corps implements the 1994 Dune Restoration Plan (a TNC-authored document) to address the dune system near the Santa Margarita estuary. This document recommends monitoring dune plants every 5 years. We recommend that this document be updated to include 23 years of new information, including information related to climate change and life history requirements. Additionally, monitoring of rare dune plants should occur on a more frequent basis (annually or bi-annually) to monitor expected impacts associated with climate change (increased storm strength and frequency causing beach erosion; sea level rise causing loss of available habitat), as specifically described and acknowledged by MCB Camp Pendleton.

The 1996 Riparian Ecosystem Conservation Plan identifies evaluation of suitable habitat for California red-legged frog (*Rana draytonii*) reintroductions as a primary goal (draft INRMP Appendix L, p. L-8). TNC is interested in understanding the result of California red-legged frog surveys on base. If these surveys are yet to be conducted, TNC strongly recommends they be implemented immediately per the original commitment in the above-referenced plan to investigate potential occupancy by California red-legged frog, and to identify suitable habitat for reintroductions. If such surveys have already occurred, and have positively identified suitable habitat, TNC would like to understand steps that MCB Camp Pendleton is taking to reintroduce the species.

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Although cactus wren (*Campylorhynchus brunneicapillus*) is described as a sensitive species, there is no discussion of management to address this species on base. We encourage the inclusion of an analysis to proactively address this species. Implementation of beneficial management measures could preclude the need for federal and state protections through the Endangered Species Act (ESA) and the California Endangered Species Act (CESA). According to the draft INRMP, MCB Camp Pendleton recently cooperated with the United States Fish and Wildlife Service (USFWS) to develop a Candidate Conservation Agreement providing beneficial management to a sensitive dune plant, Brand's phacelia (*Phacelia stellaris*) (pp. 3-67). This document was developed to aid in the recovery of this species such that federal listing would not be necessary, and the species would not become a management encumbrance for MCB Camp Pendleton. This effort has facilitated beneficial management actions, such as the establishment of new populations on base, which TNC commends. This strategy for proactively addressing sensitive species is a model that can and should be applied to other species, such as cactus wren, which is in regional decline.

The draft INRMP describes the future establishment of a dedicated maneuver corridor through Aliso Canyon (p. 2-47), yet no analysis of potential impacts to sensitive species and habitats is provided in this document. We request that such an analysis be performed and appropriate mitigating factors be determined prior to the construction of a maneuver corridor through Aliso Canyon.

The draft INRMP (p. 3-16) states on that "unnaturally high fire frequency and burned area severity can permanently change the vegetation type (type conversion) of a given site by reducing shrub cover and allowing invasive plants to invade." We believe that the best available science supports this comment and other similar comments in the draft INRMP regarding the type-conversion risk of coastal sage scrub (CSS) and chaparral on-base from too frequent fires. As a result, we are concerned with the mention of using prescribed fire as a management tool to manage the annual grass understory to restore CSS (draft INRMP, p. 4-36 and P-7). The structure of CSS shrubs and presence of an herbaceous understory make understory fires extremely rare and would appear to make using fire to restore CSS unattainable. The threat of starting additional crown fires in CSS that could facilitate additional type conversion to low-quality non-native annual grassland does not appear to out-weigh the potential benefit. If this method is used, please add citations to the plan supporting implementation of such a management practice.

The draft INRMP (p. 3-27) states that Engelmann oaks vigorously resprout after fire. Data from sites in Riverside and San Diego Counties support the fact that Engelmann oak seedlings and sapling can vigorously resprout following fire; however, generally mature trees do not. Care should be taken to avoid excessive repeated fires in Engelmann oak woodlands as it appears that individuals with pre-existing basal scars are most susceptible to being killed by fire where there is moderate to dense herbaceous understory vegetation.

Conservation prescribed burns, as described in the draft INRMP (p. 4-28 and P-7), almost always need to be coupled with spot treatment of highly invasive weeds to meet management objectives. This will be particularly important when the burns are specifically targeted to reduce the abundance of non-native species as described on page P-7. In these cases, spot treatment of target weeds that germinate after the burn should be a required management action.

Finally, the USFWS Biological Opinion containing the Riparian Ecosystem Conservation Plan "Riparian BO" (cited as USFWS 1996a) is not listed in the references section for the draft INRMP. Please address this in the final version of this document.

The Nature Conservancy
Protecting nature. Preserving life.

The Nature Conservancy
San Diego Field Office
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San Diego, CA 92101

Tel (619) 209-5830
Fax (619) 702-7621

nature.org

Thank you for the opportunity to comment.

Sincerely,

Susan North
Stewardship Manager
Susan.north@tnc.org

Zachary Principe
Stewardship Ecologist
Zprincipe@tnc.org

Submitted to: M_PNDL_ENV_Natural Resources@usmc.mil

cc: TNC
USFWS
CDFW

County of San Diego

MARK WARDLAW
DIRECTOR

PLANNING & DEVELOPMENT SERVICES
5510 OVERLAND AVENUE, SUITE 310, SAN DIEGO, CA 92123
(858) 694-2962 • Fax (858) 694-2555
www.sdcounty.ca.gov/pds

August 30, 2017

Danielle Page
Marine Corps Base Camp Pendleton
PO Box 555008
Camp Pendleton, CA 92055
Via e-mail to: NaturalResources@usmc.mil, danielle.page@usmc.mil

REQUEST TO COMMENTS ON THE PUBLIC REVIEW DRAFT FOR THE CAMP PENDLETON INTEGRATED NATURAL MANAGEMENT PLAN – MARINE CORPS BASE AND MARINE CORPS AIR STATION

Dear Ms. Page,

The County of San Diego (County) reviewed the U.S. Marine Corps' request for comments on the Camp Pendleton Integrated Natural Management Plan (INRMP) dated July 24, 2017.

The County appreciates the opportunity review the Project, and offers the following comments for your consideration. Please note that none of these comments should be construed as County support for this Project.

BIOLOGICAL

1. Marine Corps Base Camp Pendleton is located within the northern County, adjacent to the Plan Area for the County's Multiple Species Conservation Program (MSCP) Draft North County Plan. The County appreciates coordination efforts that have taken place to date between Camp Pendleton and the County and appreciates statements in the INRMP that indicate the United States Marine Corps' willingness to work with the County to coordinate land uses and planning efforts in lands within the North County Plan Area that are adjacent to Camp Pendleton. The County looks forward to working with the United States Marine Corps on efforts related to preparing the Draft North County Plan as we develop future partnership opportunities associated with preservation and land use planning in the County.

2. Section 1.8.3.1 has specific information regarding the North County Plan – please make the following corrections to this paragraph: The current draft of the North County Plan includes 29 covered species within the Plan Area that is approximately 345,000 acres in size.

3. Appendix P – Proposed Goals, Objectives, and Actions: Action 4.1.2.1 relates to inventorying species of concern, including "San Diego County MSCP conservation species". We request that coordination occur between the U.S. Marine Corps and the County prior to funding additional survey efforts to ensure that funding is targeted to the highest-need or unfunded survey requirements in the County.

4. Additional information on the County's MSCP Draft North County Plan can be found at: http://www.sandiegocounty.gov/pds/mscp/nc.html

PARKS AND RECREATION

1. MCB and MCAS Camp Pendleton (Base) should work with the County, and other adjacent jurisdictions including regional planning agencies, to ensure goals for ecological (i.e., wildlife movement and habitat connectivity) and recreational (i.e., trails and pathways) connectivity are met on a regional scale. From the County Department of Parks and Recreation's (DPR) perspective, this includes implementation of the County's Community Trails Master Plan (CTMP), which currently identifies trails and pathways along the western boundary of the Base, parallel to the Pacific Ocean, and at the northeast corner of the Base.

2. The County requests that the Base's INRMP ensure connectivity and access through the existing and planned trails/pathways and habitat continuity/connectivity between the Base and adjacent DPR parks/preserves. The following is a list of existing or proposed trails/pathways identified in the CTMP and adjacent parks/preserves:

    a. Santa Margarita Preserve (at the northeast corner of the Base);
    b. De Luz Road Pathway (at the northeast corner of the Base);
    c. Trail/pathway that follows Harbor Drive - Vanderbilt Boulevard – Stuart Mesa Road – Las Pulgas Road – El Camino Real – Old Highway 101 – and San Onofre State Beach

3. Although the County requests that ecological and recreational connectivity be maintained between Base and County lands, future expansion of Base-related stewardship, management and monitoring activities should avoid encroachment into County Parks and Preserves.

4. The County's CTMP can be found at: http://www.sandiegocounty.gov/content/sdc/pds/community-trails-master-plan.html

The County looks forward to receiving future documents and/or notices related to this Project and providing additional assistance at your request. If you have any questions regarding these comments, please contact Timothy Vertino at 858-495-5468 or by e-mail at timothy.vertino@sdcounty.ca.gov.

Sincerely,

MARY KOPASKIE BROWN, AICP, MCIP
Chief, Advance Planning Division
Planning & Development Services

E-mail cc:

Darren Gretler, Chief of Staff, Board of Supervisors, District 5
Vincent Kattoula, CAO Staff Officer, LUEG
Crystal Benham, Land Use / Environmental Planner, PDS
Marcus Lubich, Project Manager, DPR

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Ecological Services
Carlsbad Fish and Wildlife Office
2177 Salk Avenue, Suite 250
Carlsbad, California 92008

In Reply Refer To:
FWS-MCBCP-08B0792-18CPA0168

March 22, 2018
Sent by Email

D. M. Page
Head, Resources Management Branch
Environmental Security
MCIWEST-Marine Corps Base Camp Pendleton
P.O. Box 555008
Camp Pendleton, California 92055-5008

Subject: Concurrence on the Joint Integrated Natural Resources Management Plan Revision for Marine Corps Installations West - Marine Corps Base Camp Pendleton and Marine Corps Air Station Camp Pendleton, San Diego, California

Dear Ms. Page:

This is in response to your March 15, 2018, email requesting our concurrence that the Joint Integrated Natural Resources Management Plan (INRMP) Revision for Marine Corps Installations West - Marine Corps Base Camp Pendleton and Marine Corps Air Station Camp Pendleton, San Diego, California (Joint INRMP Revision) is compliant with the Sikes Act [16 United States Code (U.S.C.) §670a *et seq*.].

Based on our review, we concur that the Joint INRMP Revision meets the requirements of the Sikes Act to manage natural resources on the identified installations.

We appreciate the Marine Corps' coordination on the development and review of the Joint INRMP Revision. If you have any questions regarding further coordination, please contact Peter Beck at 760-431-9440, extension 213.

Sincerely,

G. Mendel Stewart
Field Supervisor

State of California – Natural Resources Agency
DEPARTMENT OF FISH AND WILDLIFE
South Coast Region
3883 Ruffin Road
San Diego, CA 92123
(858) 467-4201
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EDMUND G. BROWN JR., Governor
CHARLTON H. BONHAM, Director

December 4, 2017

D.M. Page
Head, Resources Management Branch
Environmental Security
Marine Corps Base
Box 555010
Camp Pendleton, CA 92055-5010

Subject: Review and Endorsement of the Final Integrated Natural Resources Management Plan Revision, Marine Corps Base Camp Pendleton and Marine Corps Air Station Camp Pendleton, California

Dear Ms. Page:

The California Department of Fish and Wildlife (Department) has reviewed the Final Integrated Natural Resources Management Plan (INRMP) for Marine Corps Base Camp Pendleton (MCB CamPen) and Marine Corps Air Station Camp Pendleton (MCAS CamPen) California, dated September 2017. This INRMP was prepared pursuant to the Sikes Act as amended through 2012 (16 United States Code §670a) in cooperation with the appropriate State Fish and Wildlife Agency (i.e., the Department). The Department is responsible for the conservation, protection, and management of the state's biological resources, including rare, threatened, and endangered plant and animal species, pursuant to the California Endangered Species Act. The Department also administers the Natural Community Conservation Planning program.

The purpose of this 2017 MCB CamPen and MCAS CamPen INRMP is to provide responsible planning and management of the natural resources present on the installation's facilities that integrate the concerns and mission of the Department while efficiently supporting the Marine Corps mission.

The Department commends the Marine Corps' efforts to work closely with the Department and other stakeholders, including the U.S. Fish and Wildlife Service (Service), to develop the INRMP. However, the Department continues to encourage the Marine Corps to develop and fund monitoring and management of California Species of Special Concern and Fully Protected Species. The loggerhead shrike (*Lanius ludovicianus*), tricolored blackbird (*Agelaius tricolor*), American badger (*Taxidea taxus*), and pallid bat (*Antrozous pallidus*) are among the species for which the Department recommends more extensive monitoring and surveying with subsequent adaptive management when applicable. For the western pond turtle (*Emys marmorata*), the Department recommends more analysis and monitoring of upland use for nesting and overwintering by this species in addition to those measures applicable through the Ecosystem Plans, Riparian BO and MCBCP Base Order 3500.1, as noted in Appendix

N. In addition, the Department recommends further investigation into identification of potential habitat for Hermes copper butterfly (*Lycaena hermes*) and Harbison's dun skipper (*Euphyes vestris harbisoni*).

In closing, notwithstanding the Department's outstanding concerns regarding the above, we appreciate the Marine Corps' efforts to work with the Department and other stakeholders to conserve, protect, and manage fish and wildlife resources on MCB CamPen and MCAS CamPen. As part of our efforts to fulfill our role in the Sikes Act Improvement Act as amended and foster improved conservation, protection, and management of particular species and/or habitat types present on MCB CamPen and MCAS CamPen, the Department, by way of this letter, provides endorsement of the 2017 INRMP.

If you have any questions or comments pertaining to this letter, please contact Eric Hollenbeck at (858) 467-2720 or via email at Eric.Hollenbeck@wildlife.ca.gov.

Sincerely,

Edmund Pert
Regional Manager
South Coast Region

Appendix B

Statutory Requirements Applicable to Natural Resources Management on Camp Pendleton

Appendix B

Statutory Requirements Applicable to Natural Resources Management on Camp Pendleton

This appendix includes the following documents:

- Statutory Requirements Applicable to Natural Resources Management on Camp Pendleton
- 2005 MOU – Continuation of the Cooperative Ecosystems Studies Units Network among Federal Resources Management Agencies
- 2006 MOU between DoD and Bat Conservation International
- 2006 MOU among DoD and several other Federal Agencies for Federal Native Plant Conservation
- 2006 MOU between DoD and the USFWS to Promote the Conservation of Migratory Birds
- 2007 Guidance to Implement the Memorandum of Understanding to Promote the Conservation of Migratory Birds
- 2013 MOU between DoD and the USFWS and the Association of Fish and Wildlife Agencies for a Cooperative Integrated Natural Resources Management Program on Military Installations
- 2013 MOU between DoD and Bat Conservation International to extend the 2006 MOU
- 2014 MOU between DoD and the USFWS to extend the 2006 MOU to Promote the Conservation of Migratory Birds
- 2004 MOU between DoD and the State of California to Conserve Habitat Values and Protect Military Missions in California
- 2015 MOU between DoD and the Pollinator Partnership
- 2015 Strategic Plan for Amphibian and Reptile Conservation and Management on DoD Lands
- 2015 Camp Pendleton Base Order MCIWEST-MCB CAMPENO 5090.1 (Marine Corps Installations West-Marine Corps Base, Camp Pendleton Environmental Program Support for Marine Corps Air Station Camp Pendleton)
- 2015 MOU for Executive Departments and Agencies for Incorporating Ecosystem services into Federal Decision Making
- 2015 MOU for DoD Guidelines for Streamlined INRMP Review

Appendix B

Statutory Requirements Applicable to Natural Resources Management on Camp Pendleton

National Environmental Policy Act (NEPA), *as amended*

NEPA established a U.S. national policy promoting the enhancement of the environment and also established the President's Council on Environmental Quality (CEQ). NEPA requires federal agencies to conduct an interdisciplinary analysis of the environmental consequences of their actions early in the decision-making process. NEPA is to ensure that environmental factors are weighted equally when compared to other factors in the decision-making process undertaken by federal agencies. CEQ regulations (40 Code of Federal Regulations [C.F.R.] Parts 1500–1508) set the standard for NEPA compliance. They also require agencies to create their own NEPA implementing procedures. These procedures must meet the CEQ standard while reflecting each agency's unique mandate and mission. Consequently, NEPA procedures vary from agency to agency. Further procedural differences may derive from other statutory requirements and the extent to which federal agencies use NEPA analyses to satisfy other review requirements.

Federal Endangered Species Act (ESA)

Enacted in 1973, the federal ESA provides for the conservation of threatened and endangered species and their ecosystems. The ESA prohibits the "take" of threatened and endangered species except under certain circumstances and only with authorization from the U.S. Fish and Wildlife Service (USFWS) through a permit under Section 4(d), 7, or 10(a) of the ESA. Under the ESA, "take" is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect; or to attempt to engage in any such conduct. Section 7 of the ESA outlines procedures for federal interagency cooperation to conserve federally listed species and designated critical habitat. The ESA mandates that all federal agencies participate in the conservation and recovery of listed threatened and endangered species and that each agency ensure that any action they authorize, fund, or carry out does not jeopardize the continued existence of a listed species or its critical habitat. Formal consultation under Section 7 of the ESA is required if a proposed project has the potential to affect federally listed species that have been detected within or adjacent to a proposed project site.

Migratory Bird Treaty Act (MBTA)

Congress passed the MBTA in 1918 to prohibit the kill or transport of native migratory birds, or any part, nest, or egg of any such bird unless allowed by another regulation adopted in accordance with the MBTA. The prohibition applies to birds included in the respective international conventions between the United States and Great Britain, the United States and Mexico, the United States and Japan, and the United States and Russia. No permit is issued under the MBTA; however, a proposed project must comply with measures that would avoid or minimize effects on migratory birds.

Bald and Golden Eagle Protection Act (BGEPA)

The BGEPA is the primary law protecting eagles, including individuals, and their nests and eggs (16 Unites States Code [U.S.C.] Section 668 et seq.). It defines "take" to include "pursue, shoot, shoot at, poison, wound, kill, capture, trap, collect, destroy, molest, or disturb" (16 U.S.C. 668c). "Disturb" is defined by regulation at 50 C.F.R. 22.3 in 2007 as "to agitate or bother a bald or golden eagle to a degree that causes, or is likely to cause,…(1) injury to an eagle, (2) a decrease in productivity…, or (3) nest abandonment…". Under the BGEPA Eagle Permit Rule (50 C.F.R. 22.26), USFWS may issue permits to authorize limited, non-purposeful take of bald eagles and golden eagles.

Clean Water Act (CWA)

The CWA established a procedure for regulating discharges of pollutants into "waters of the U.S.," and for regulating quality standards for surface waters. Pursuant to Section 404 of the CWA, the U.S. Army Corps of Engineers regulates the discharge of dredged or fill material into wetlands and other waters of the U.S. A Section 404 permit requires a CWA Section 401 Water Quality Certification from the State of California (issued by the applicable Regional Water Quality Control Board and subject to CEQA).

CWA Section 402 set forth regulations that prohibit the discharge of pollutants into waters of the U.S. from any point source without obtaining a National Pollutant Discharge Elimination System (NPDES) permit. The State Water Resources Control Board implements the NPDES program by regulating point-source discharges of wastewater and agricultural runoff to protect the beneficial uses of both land and surface waters.

Coastal Zone Management Act (CZMA)

The CZMA of 1972 created a broad program of land use management based on control by each coastal state, with a focus on protecting sensitive resources that occur within the coastal zone. The CZMA requires that all applicants for federal permits and federal agency project sponsors obtain proof of certification from the coastal state that the activity is consistent with the state's approved coastal program.

Clean Air Act (CAA)

The CAA regulates air emissions from stationary and mobile sources. The CAA authorizes the U.S. Environmental Protection Agency (EPA) to establish National Ambient Air Quality Standards (NAAQS) to protect public health and public welfare and to regulate emissions of hazardous air pollutants.

Emissions of hazardous air pollutants are addressed in Section 112 of the CAA. In 1990, amendments to the CAA revised Section 112 to first require issuance of technology-based standards for major sources and certain area sources. "Major sources" are defined as a stationary source or group of stationary sources that emit or have the potential to emit 10 tons per year or more of a hazardous air pollutant or 25 tons per year or more of a combination of hazardous air

pollutants. For major sources, Section 112 requires that EPA establish emission standards that require the maximum degree of reduction in emissions of hazardous air pollutants. These emission standards are commonly referred to as "maximum achievable control technology" or "MACT" standards.

Marine Mammal Protection Act (MMPA)

The MMPA of 1972 establishes a federal responsibility for the protection and conservation of marine mammal species. The primary authority for implementing the act belongs to the National Marine Fisheries Service (NMFS), a part of the National Oceanic and Atmospheric Administration. The MMPA prohibits, with certain exceptions, the take of marine mammals in U.S. waters and by U.S. citizens in international waters, and the importation of marine mammals and marine mammal products into the United States. Take is defined to include the harassment, hunting, capture, killing, or collecting, or the attempt of such actions, of any marine mammal.

Under the 1994 amendments to the MMPA, harassment is statutorily defined as any act of pursuit, torment, or annoyance that:

> *Level A Harassment* – has the potential to injure a marine mammal or marine mammal stock in the wild; or
> *Level B Harassment* – has the potential to disturb a marine mammal or marine mammal stock in the wild by causing disruption of behavioral patterns, including, but not limited to, migration, breathing, nursing, breeding, feeding, or sheltering but which does not have the potential to injure a marine mammal or marine mammal stock in the wild (NOAA 2010).

Magnuson-Stevens Fishery Management and Conservation Act, as amended 1996 (Public Law 104-267)

Federal agencies must consult with NMFS on actions that may adversely affect Essential Fish Habitat (EFH), which is defined as those “waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity.” NMFS encourages streamlining the consultation process using review procedures under NEPA, Fish and Wildlife Coordination Act, CWA, and/or federal ESA provided that documents meet requirements for EFH assessments under Section 600.920(g). EFH assessments must include (1) a description of the proposed action, (2) an analysis of effects, including cumulative effects, (3) the federal agency’s views regarding the effects of the action on EFH, and (4) proposed mitigation, if applicable.

Federal Noxious Weed Act (FNWA)

The FNWA provides for the control and management of nonindigenous weeds that injure or have the potential to injure the interests of agriculture and commerce, wildlife resources, or public health. FNWA prohibits importing or moving any noxious weed identified by regulations of the Secretary of Agriculture into or through the U.S. The act prohibits knowingly selling, purchasing, bartering, exchanging, giving, or receiving any noxious weed. The Secretary may promulgate inspection and quarantine regulations to prevent the dissemination of noxious weeds.

Executive Order (EO) 13186 – Responsibilities of Federal Agencies to Protect Migratory Birds

EO 13186 directs federal department and agencies to take actions to further implement the MBTA. The EO requires that each agency taking actions that have, or are likely to have, a measurable negative effect on migratory bird populations is directed to develop and implement a Memorandum of Understanding with USFWS that will promote the conservation of migratory bird populations.

EO 13514 – Federal Leadership in Environmental, Energy, and Economic Performance

EO 13514 expanded on the requirements of EO 13423, which set forth goals for federal agencies for reducing energy use, using renewable power, water conservation, and electronics management. EO 13514 established an integrated strategy towards sustainability in the federal government and to make reduction of greenhouse gas emissions a priority for federal agencies.

EO 13112 – Invasive Species

EO 13112 requires federal agencies to "prevent the introduction of invasive species and provide for their control and to minimize the economic, ecological, and human health effects that invasive species cause." An invasive species is defined by the EO as "an alien species [a species not native to the region or area] whose introduction does or is likely to cause economic or environmental harm or harm to human health."

EO 12962 – Recreational Fisheries

EO 12962 instructs federal agencies to the extent permitted by law to improve the quantity, function, sustainable productivity, and distribution of U.S. aquatic resources for increased recreational fishing opportunities. The EO established the National Recreation Fisheries Coordination Council, and instructs the council to develop a comprehensive Recreational Fisheries Resources Conservation Plan.

EO 11990 – Protection of Wetlands

EO 11990 is an overall wetlands policy for all agencies managing federal lands, sponsoring federal projects, or providing federal funds to state or local projects. The purpose of this EO is to "minimize the destruction, loss or degradation of wetlands and to preserve and enhance the natural and beneficial values of wetlands." The EO requires federal agencies, in planning their actions, to consider alternatives to wetland sites and limit potential damage if an activity affecting a wetland cannot be avoided. It requires the determination of whether a proposed project will be in or will affect wetlands. If so, a wetlands assessment must be prepared that describes the alternatives considered. The evaluation process follows the same eight steps as for EO 11988, Floodplain Management. Importantly, this EO applies to all wetlands, not just those falling under jurisdiction of the CWA.

EO 11988 – Floodplain Management

EO 11988 requires federal agencies to avoid to the extent possible the long- and short-term adverse impacts associated with the occupancy and modification of floodplains and to avoid direct and indirect support of floodplain development wherever there is a practicable alternative. To meet this objective "each agency shall provide leadership and 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 in carrying out its responsibilities." This EO provides an eight-step process that agencies should carry out as part of their decision-making process on projects that have potential impacts to or within the floodplain.

MEMORANDUM OF UNDERSTANDING

Continuation of the

COOPERATIVE ECOSYSTEM STUDIES UNITS NETWORK

among the

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

U.S. DEPARTMENT OF AGRICULTURE
Agricultural Research Service
Natural Resources Conservation Service
U.S. Forest Service

U.S. DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration

U.S. DEPARTMENT OF DEFENSE
U.S. Army Corps of Engineers – Civil Works
Office of the Deputy Under Secretary of Defense (Installations and Environment)

U.S. DEPARTMENT OF THE INTERIOR
Bureau of Land Management
Bureau of Ocean Energy Management
National Park Service
Bureau of Reclamation
U.S. Fish and Wildlife Service
U.S. Geological Survey

I. INTRODUCTION

Background

Management and stewardship of the Nation's lands, waters, and public trust resources requires skillful public service supported by sound science. To help meet the need for sound science, a network of Cooperative Ecosystem Studies Units (CESU) was established (pursuant to 16 U.S.C. § 5933). CESUs provide research, studies, assessments, monitoring, technical assistance, and education to federal land and trust resource management, environmental, and research agencies, and their partners. CESUs are organized around biogeographic areas. Their broad scope includes the biological, physical, engineering, social, and cultural sciences needed to address critical natural and cultural resource management and trust resource stewardship issues. Each CESU includes several federal agencies, a host university, partner universities and other institutions. Participating agencies share benefits and interests with CESUs, including, but not limited to, a broadened scope of scientific services, increased technical assistance, and educational

opportunities for resource and environmental managers and others, and increased diversity of research scientists and institutional partners.

Mission

The mission of the CESU Network is to promote, conduct, and provide research, studies, assessments, monitoring, technical assistance, and educational services nationwide in support of the missions of participating federal agencies and their partners concerning natural and cultural resource management on public and/or private lands and waters, and management of public trust resources. To achieve this mission, each CESU project is conducted cooperatively and with substantial involvement by and benefits to federal and non-federal partners.

II. OBJECTIVES

The objectives of the CESU Network are to:

1. Link universities (including minority institutions) and other partners with federal land and trust resource management, environmental, and research agencies in new and innovative ways that deliver high-quality research and studies, provide usable knowledge, and support science-based decision-making;

2. Create new and innovative opportunities for federal resource management, environmental and research agencies to collaborate and coordinate their research, studies, technical assistance, and education activities;

3. Provide an efficient and effective mechanism to promote, conduct and provide research, studies, assessments, monitoring, technical assistance, and educational services through collaborative projects of concern to federal resource managers, their partners, and decision-makers; and

4. Accomplish the above objectives through an efficient, effective and evolving organization that includes federal agencies, universities, and other partners.

III. AUTHORITIES

This Memorandum of Understanding (MOU) is entered into by the following agencies consistent with the mission and any other authorities promoting science cooperation for each agency.

A. National Aeronautics and Space Administration

Among the National Aeronautics and Space Administration's (NASA) missions is the utilization of aeronautical and space activities for scientific purposes, encompassing research designed to expand knowledge of the Earth, its resources, and the effects of climatic change on the transformation of its ecological systems. In addition, NASA is

responsible for the environmental stewardship of the land, water, and wildlife resources under its control. In accordance with Section 203(c) of the National Aeronautics and Space Act of 1958, as amended, 42 U.S.C. § 2473(c), NASA is authorized to enter into agreements with other federal agencies consistent with and in furtherance of its areas of responsibility.

B. Agricultural Research Service

The Agricultural Research Service (ARS) mission is to conduct research to develop and transfer solutions to agricultural problems of high national priority and provide information access and dissemination to: ensure high-quality, safe food and other agricultural products; assess the nutritional needs of Americans; sustain a competitive agricultural economy; enhance the natural resource base and the environment; and provide economic opportunities for rural citizens, communities, and society as a whole. In accordance with 7 U.S.C. § 3101(2), ARS is authorized to enter into a Memorandum of Understanding to assist in providing research, technical assistance, and education to increase the long-term productivity of the United States agriculture and food industry while maintaining and enhancing the natural resource base on which rural America and the United States agricultural economy depend.

C. Natural Resources Conservation Service

The Natural Resources Conservation Service (NRCS) improves the health of our Nation's natural resources while sustaining and enhancing the productivity of American agriculture (16 U.S.C. §§ 590(a)-(f)). We achieve this by providing voluntary assistance through strong partnerships with private landowners, managers, and communities to protect, restore, and enhance the lands and waters upon which people and the environment depend. NRCS scientists and technical specialists identify appropriate technologies in research, development, and transfer them to field staff for recommending the technologies to America’s farmers and ranchers. Under Section 714 of Pub. L. 106-387, 7 U.S.C. § 6962(a), NRCS is authorized to enter into cooperative agreements to assist in providing research, studies, technical assistance, and educational services consistent with the mission of the NRCS and the CESU Network.

D. U.S. Forest Service

The U.S. Department of Agriculture Forest Service's (USFS) mission is to achieve quality land management under the sustainable multiple-use management concept to meet the diverse needs of the people (16 U.S.C. §§ 1641-1646). In accordance with 7 U.S.C. § 3318(b), the USFS is authorized to enter into a joint venture agreement to assist in providing agricultural research and teaching activities. In accordance with the Interior and Related Appropriations Act of 1992 (Pub. L. 102-154), the USFS is authorized to enter into a Challenge Cost-share Agreement to cooperate with others in developing, planning, and implementing mutually beneficial projects that enhance Forest Service activities, where the cooperators provide matching funds or in-kind contributions. In accordance with Wyden Amendment (Pub. L. 105-277, Section 323 as amended by Pub. L. 109-54, Section 434), the USFS is authorized to enter into a

Cooperative Agreement or Participating Agreement for the protection, restoration, and enhancement of fish and wildlife habitat, and other natural or cultural resources on public or private land; the reduction of risk for natural disaster where public safety is threatened; or a combination of both. Wyden Amendment agreements must provide a benefit to the natural or cultural resources on National Forest System lands within the watershed.

E. National Oceanic and Atmospheric Administration

The mission of the National Oceanic and Atmospheric Administration (hereafter NOAA) is to understand and predict changes in the Earth's environment and conserve and manage coastal and marine resources to meet our Nation's economic, social, and environmental needs. Authorities to participate in and conduct activities through the Cooperative Ecosystem Studies Units Network include 33 U.S.C. § 883(e), which gives NOAA the authority to enter into cooperative agreements with States, Federal Agencies, public or private organizations or individuals for authorized surveys or investigations and other specified purposes. NOAA also has the authority under 15 U.S.C. § 2901 *et seq.*, to enter into contracts, grants, or cooperative agreements for climate-related activities. Finally, the Coastal Zone Management Act at 16 U.S.C. § 1451 *et seq.*, grants NOAA the authority to coordinate with Federal Agencies and provide financial and technical assistance to states and territories to preserve, protect, develop, and where possible, to restore or enhance, the resources of the Nation's coastal zone for this and succeeding generations, among other things. In accordance with the authorities listed above, NOAA is authorized to enter into agreements with States, nonprofit organizations, academic institutions, and other partners to support research, technical assistance, and educational services consistent with the mission of NOAA and the CESU Network.

F. U.S. Department of Defense, Office of the Deputy Under Secretary of Defense (Installations and Environment)

The Department of Defense (DoD) manages nearly 30 million acres of land, and the natural and cultural resources found there, and for this agreement includes the Office of the Secretary of Defense, the Military Services, the Defense Logistics Agency, the National Guard Bureaus, and the Military Reserve Components. DoD's primary mission is national defense. DoD's conservation program supports this mission by ensuring realistic training areas, and managing its resources in ways that maximize available land, air, and water training opportunities. DoD environmental stewardship activities are authorized under the Sikes Act, as amended. In accordance with one or more of the following: 16 U.S.C. § 670(c)(1), 10 U.S.C. § 2358, 10 U.S.C. § 2694, 10 U.S.C. § 2684, and Pub. L. 103-139 (FY 94 NDAA, page 107 Stat. 1422), DoD is authorized to enter into cooperative agreements with States, nonprofit organizations, academic institutions, and other partners to support research, technical assistance, and educational services consistent with the mission of the DoD and the CESU Network.

G. U.S. Army Corps of Engineers – Civil Works

The US Army Corps of Engineers' Civil Works Program (USACE-CECW) provides assistance in the development and management of the nation's water resources. The main missions of USACE-CECW, i.e., the Corps, are 1) to facilitate commercial navigation, 2) to protect citizens and their property from flood and storm damages, and 3) to protect and restore environmental resources. The Corps carries out most of its work in partnership with Tribal, state, and local governments and other nonfederal entities. The Corps must rely upon using the best available science in the evaluation of water resources needs and in the development of recommendations for water resources management. The university and scientific institutions that comprise the CESU network have knowledge and expertise of the latest scientific advances that will assist the Corps in reaching sound, scientifically based decisions. Membership in the CESU network thus provides direct access to the sound science and technical base upon which the Corps can develop its sound, credible conclusions.

Corps field offices may avail themselves of support from the regional CESUs by collaborating with the Engineer Research and Development Center, who has the authority to enter into cooperative agreements with such CESUs, thus enabling these Corps offices to receive scientific support from regional CESU members. Each CESU provides independent and objective research and technical assistance that will directly benefit the Corps' missions and programs. In addition, by participating in the CESU, scientists within the Corps will have access to university resources within the CESU network and be able to interact with colleagues in various scientific disciplines, and thereby further their own professional development. Furthermore, by participating in the CESU Council, USACE-CECW will broaden and strengthen its partnerships with the other agencies and entities which comprise the Council.

USACE-CECW is authorized to cooperate with other agencies in accordance with Title 33 U.S.C. § 2323(a) and 10 U.S.C. § 3036(d). USACE-CECW is authorized to perform research and development projects by cooperative agreements or grants by the authority of 10 U.S.C. § 2328. Additionally, USACE-CECW may enter into transactions under the authority of 10 U.S.C. § 2371 in carrying out basic, applied, and advanced research projects.

H. Bureau of Land Management

The Bureau of Land Management (BLM) administers public lands within a framework of numerous laws. The most comprehensive of these is the Federal Land Policy and Management Act of 1976 (FLPMA). All Bureau policies, procedures, and management actions must be consistent with FLPMA and the other laws that govern use of the public lands. It is the mission of the BLM to sustain the health, diversity, and productivity of the public lands for the use and enjoyment of present and future generations (43 U.S.C. § 1701 *et seq.*). In accordance with 43 U.S.C. § 1737(b), the BLM is authorized to enter into contracts and cooperative agreements involving the management, protection, development, and sale of public lands.

I. Bureau of Ocean Energy Management

The Bureau of Ocean Energy Management (BOEM) oversees the exploration and development of oil, natural gas and other minerals and renewable energy alternatives on the Nation's outer continental shelf. BOEM continues to look for better ways to serve the American people and to ensure that the Nation receives the best value for its resources now and into the future. The program not only supports decisions made within the Department of the Interior, but also provides other Federal regulators, and the coastal states, and local governments with the information necessary to ensure that all stages of offshore energy and mineral activities are conducted in a manner to protect both the human and natural environments. Outer Continental Shelf Lands Act (OCSLA) (43 U.S.C. §§ 1331-1356) Section 1346 mandates the conduct of environmental and socioeconomic studies needed for the assessment and management of environmental impacts on the human, marine, and coastal environments which may be affected by oil and gas, renewable energy or mineral development. OCSLA Section 1345 authorizes the use of cooperative agreements with affected States to meet the requirements of OCSLA, including sharing of information, joint utilization of available expertise, formation of joint monitoring arrangements to carry out applicable Federal and State laws, regulations, and stipulations relevant to outer continental shelf operations both onshore and offshore. BOEM can enter into cooperative agreements with State offices, and public colleges and universities within the affected states.

J. National Park Service

The National Park Service (NPS) manages areas of the National Park System to conserve the scenery, natural and historic objects, and wild life therein to provide for the enjoyment of the same in such a manner and by such means as will leave them unimpaired for the enjoyment of future generations (16 U.S.C. § 1 *et seq.*). NPS also provides conservation and recreation assistance to partners to help them achieve goals of mutual interest. In accordance with 16 U.S.C. § 1(a)(2)(j), the NPS is authorized to enter into cooperative agreements to conduct research and training activities. In addition, 16 U.S.C. § 5933 authorizes and directs NPS to enter into cooperative agreements with colleges and universities, including but not limited to land grant schools, in partnership with other federal and state agencies, to establish cooperative study units to conduct multi-disciplinary research and develop integrated information products on the resources of the National Park System, or the larger region of which parks are a part. The NPS is also authorized to enter into agreements which provide contributions by the recipient in furtherance of the project, Cost Share Agreements (16 U.S.C. § 1(f)). [cf. CFDA #15.945]

K. U.S. Bureau of Reclamation

The U.S. Bureau of Reclamation (BOR) manages, develops, and protects water and related resources in an environmentally and economically sound manner in the interest of the American public (43 U.S.C. Chapter 12). The BOR is authorized to enter this agreement under Pub. L. 111-11 Subtitle F, Secure Water, Section 9504(b) Research Agreements, which states that: Authority of Secretary - The Secretary may enter into 1 or more agreements with any university, nonprofit research institution, or organization with water or power delivery authority to fund any research activity that is designed--(A)

to conserve water resources; (B) to increase the efficiency of the use of water resources; or (C) to enhance the management of water resources, including increasing the use of renewable energy in the management and delivery of water. According to Section 9509 - The Secretary may enter into contracts, grants, or cooperative agreements, for periods not to exceed 5 years, to carry out research within the BOR.

L. U.S. Fish and Wildlife Service

The U.S. Fish and Wildlife Service (USFWS), working with others, is responsible for conserving, protecting, and enhancing fish, wildlife, plants and their habitats for the continuing benefit of the American people through federal programs related to migratory birds, endangered species, interjurisdictional fish and marine mammals, inland sport fisheries, and the National Wildlife Refuge System. In accordance with 16 U.S.C. § 661, 16 U.S.C. § 742(f), and 16 U.S.C. § 753(a), the USFWS is authorized to cooperate with other agencies to assist in providing research, technical assistance, and education.

M. U.S. Geological Survey

The U.S. Geological Survey (USGS) serves the Nation by providing reliable scientific information to describe and understand the Earth, minimize the loss of life and property from natural disasters, manage water, biological, energy, and mineral resources, and enhance and protect our quality of life. USGS authority to enter into this MOU is pursuant to Public Law 99-591 that bestows permanent authority on the USGS to "prosecute projects in cooperation with other agencies, Federal, state, and private" (43 U.S.C. § 36(c)) and the USGS Organic Act of March 3,1879, as amended (43 U.S.C. § 31 *et seq.*)

IV. CESU COUNCIL

Membership

This MOU continues the organization of the CESU Council (Council), consisting of representatives from each of the following agencies:

- National Aeronautics and Space Administration
- Agricultural Research Service
- Natural Resources Conservation Service
- U.S. Forest Service
- National Oceanic and Atmospheric Administration
- U.S. Army Corps of Engineers – Civil Works
- Office of the Deputy Under Secretary of Defense (Installations and Environment)
- Bureau of Land Management
- Bureau of Ocean Energy Management
- National Park Service
- U.S. Bureau of Reclamation
- U.S. Fish and Wildlife Service
- U.S. Geological Survey

Additional agencies joining the CESU Network shall appoint agency representatives to serve as primary and alternate members of the CESU Council.

CESU Council Roles and Responsibilities

The CESU Council has the following roles and responsibilities:

1. Serve as the official liaison between the CESU Network and the Council members' individual agencies,

2. Establish, maintain, and revise CESU Network policies and procedures,

3. Approve the addition of new federal agencies into the CESU Network,

4. Select host universities for new CESUs, evaluate existing CESUs, and approve renewal of CESU agreements,

5. Develop and support CESU Network initiatives,

6. Appoint and evaluate the CESU national coordinator,

7. Form Working Groups to assist the CESU Council as described below, and

8. Conduct additional activities appropriate to the Council.

Working Groups

Working Groups will be formed as needed to plan, coordinate, and facilitate the implementation of actions developed by the Council, within existing authority, policy review, and budgets. Working Groups may be formed or dissolved as needed, at the discretion of the Council. Working Groups will report regularly to the Council on their deliberations.

V. ADMISSION AND WITHDRAWAL FROM THE CESU NETWORK

Admission to the CESU Network

The CESU Council approves admission of new federal agencies to the CESU Network upon concurrence of its member agencies. Federal agencies wishing to join the CESU Network shall request admission in writing to the CESU Council. Upon approval, an amendment adding the federal agency to the Network is incorporated in this MOU. Upon admission to the CESU Network, the federal agency is then committed to join at least one CESU.

Withdrawal from the CESU Network

Any federal agency may terminate its participation in the CESU Network under this MOU by delivery of thirty (30) days advance written notice to the CESU Council. Termination by a federal agency of its participation in the CESU Network under this MOU will not affect any ongoing project under an existing CESU agreement to which it is a party.

VI. THE PARTICIPATING FEDERAL AGENCIES AGREE TO DO THE FOLLOWING:

1. Participate in at least one CESU.

2. Assign agency representative(s) to serve on the CESU Council.

3. Provide support for the CESU Network within the missions, authorities, and available resources of the participating federal agencies.

4. Review, update, and approve administrative procedures and guidelines for the CESU Network.

5. Review and revise the CESU Network strategic plan as necessary and appropriate.

6. Provide technical assistance to partners in individual CESUs as requested, available, and appropriate.

7. Facilitate interagency agreements, when necessary, to allow full access to the resources of the CESU Network for all participating agencies.

VII. IT IS MUTALLY AGREED AND UNDERSTOOD BY AND AMONG THE PARTICIPATING FEDERAL AGENCIES THAT:

1. This MOU does not restrict participant - involvement in similar activities with other public and private agencies, organizations, and individuals. This includes separate cooperative agreements with universities participating in the CESU Network.

2. Nothing in this MOU shall be construed as obligating agencies to expend funds or to provide resources or be involved in any obligation for future payment of money or provision of resources.

3. All amendments to this MOU shall be in writing and must have the consent of all member agencies.

4. This instrument is neither a fiscal nor a funds-obligation document. Any activity involving reimbursement or contribution of funds between the parties to this instrument will be handled in accordance with applicable laws, regulations, and procedures including those for federal procurement, assistance, and printing. Such activities will be outlined in separate agreements that shall be made in writing by representatives of the parties and shall be independently authorized by appropriate statutory authority.

5. The activities conducted under this MOU will be in compliance with the nondiscrimination provisions in Title VI and VII of the Civil Rights Act of 1964, as amended; the Civil Rights Restoration Act of 1987 (Pub. L. 100-259); and other nondiscrimination statutes; namely, Section 504 of the Rehabilitation Act of 1973,

Title IX of the Education Amendments of 1972, and the Age Discrimination Act of 1975.

6. No member of Congress shall be admitted to any share or part of this instrument, or any benefits that may arise therefrom.

7. This MOU continues the CESU Network and replaces the previous MOU that was in effect from May 16, 2005 – May 26, 2011.

8. This MOU is effective upon the date of the second signature and expires no later than six (6) years from the date of the second signature, at which time it shall be subject to review, renewal, or expiration. Note: For the U.S. Forest Service, the effective term of this MOU shall not exceed five (5) years from the date of the U.S. Forest Service signature.

VIII. AUTHORIZING SIGNATURES

IN WITNESS WHEREOF, the parties hereto have entered into this MOU as evidenced by their signatures below:

VIII. AUTHORIZING SIGNATURES (continued)

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

Olga M. Dominguez
Assistant Administrator for Strategic Infrastructure

5/18/11
Date

VIII. AUTHORIZING SIGNATURES (continued)

U.S. DEPARTMENT OF AGRICULTURE
Agricultural Research Service

for Caird E. Rexroad Jr.

Edward B. Knipling
Administrator

5/27/2011
Date

VIII. AUTHORIZING SIGNATURES (continued)

U.S. Department OF AGRICULTURE
Natural Resources Conservation Service

Eloris D. Speight — 5-27-2011

ELORIS SPEIGHT, Date
Deputy Chief for Management

VIII. AUTHORIZING SIGNATURES (continued)

U.S. DEPARTMENT OF AGRICULTURE
U.S. Forest Service

Thomas L. Tidwell

THOMAS L. TIDWELL
Chief

8/27/2012
Date

The authority and format of this instrument have been reviewed and approved for signature.

Carol J. Brown

CAROL J. BROWN
U.S. Forest Service
Grants & Agreements Specialist

5/21/2012
Date

VIII. AUTHORIZING SIGNATURES (continued)

U.S. DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration

David W. Titley, Ph.D.
Deputy Under Secretary for Operations
National Oceanic & Atmospheric Administration

10/5/12
Date

VIII. AUTHORIZING SIGNATURES (continued)

U.S. DEPARTMENT OF DEFENSE
U.S. Army Corps of Engineers – Civil Works

Steven L. Stockton, P.E.
Director of Civil Works

5 OCT 11
Date

VIII. AUTHORIZING SIGNATURES (continued)

U.S. DEPARTMENT OF DEFENSE
Office of the Deputy Under Secretary of Defense (Installations and Environment)

John Conger

6-6-11

John Conger
Assistant Deputy Under Secretary of Defense for
Installations and Environment

Date

VIII. AUTHORIZING SIGNATURES (continued)

U.S. DEPARTMENT OF THE INTERIOR
Bureau of Land Management

Robert V. Abbey
Director

5-23-11
Date

VIII. AUTHORIZING SIGNATURES (continued)

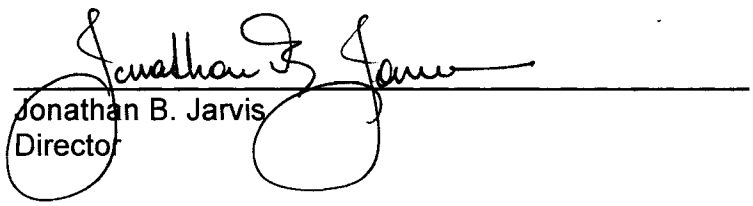
U.S. DEPARTMENT OF THE INTERIOR
Bureau of Ocean Energy Management

Tommy P. Beaudreau
Director

3-20-12
Date

VIII. AUTHORIZING SIGNATURES (continued)

U.S. DEPARTMENT OF THE INTERIOR
National Park Service



Jonathan B. Jarvis
Director

2/28/12
Date

VIII. AUTHORIZING SIGNATURES (continued)

U.S. DEPARTMENT OF THE INTERIOR
Bureau of Reclamation

Acting For

Michael L. Connor
Commissioner

3/16/12
Date

VIII. AUTHORIZING SIGNATURES (continued)

U.S. DEPARTMENT OF THE INTERIOR
U.S. Fish and Wildlife Service

Rowan W. Gould

Rowan W. Gould
Acting Director

5/27/2011
Date

VIII. AUTHORIZING SIGNATURES (continued)

U.S. DEPARTMENT OF THE INTERIOR
U.S. Geological Survey

Marcia McNutt — 5/1/12

Marcia McNutt
Director

Date

MEMORANDUM OF UNDERSTANDING

BETWEEN

THE DEPARTMENT OF DEFENSE

AND

BAT CONSERVATION INTERNATIONAL

PREFACE

1. This agreement establishes a policy of cooperation and coordination between the Department of Defense (DoD) and Bat Conservation International (BCI) to identify, document and maintain bat populations and their habitats on DoD installations.

2. The DoD has a long history of commitment to protection of the environment and the natural resources that have been entrusted to its care while at the same time accomplishing its primary mission of national defense.

3. DoD wishes to receive technical assistance in techniques for improving management of bat populations and their habitats, and to gain access to a nationwide network of compatible data and support that can be used to assess the significance of bat populations and habitat found on DoD lands.

4. BCI was formed to promote conservation, education, and research initiatives involving bats and the ecosystems they serve. BCI provides information and service to scientists, land managers, and the public.

5. Both BCI and the DoD have responsibilities and interests in the management of wildlife and their habitats. Both parties agree that wildlife habitats need to be conserved and managed to protect wildlife and to meet the growing public demand for wildlife conservation and related scientific opportunities. Furthermore, BCI and DoD desire to assist each other in conducting inventories, monitoring, and research; initiating actions which will increase the productivity of bats and enhance their habitats; and educating the public about the roles and values of bats in ecosystems on lands managed or used by the DoD.

PURPOSE

The purpose of this MOU is to establish procedures for planning and conducting cooperative efforts by BCI and DoD on DoD lands. It also establishes policies and procedures for BCI to provide technical assistance to DoD to maintain or increase the productivity of bats and their habitats on DoD lands; to keep once-common bat species from being Federally-listed as threatened or endangered; and to work to recover presently listed species of bats and prevent species extinction.

RESPONSIBILITIES

The Department of Defense and Bat Conservation International do mutually agree that:

1. The DoD will, subject to the availability of resources and under the terms of separately funded subagreements to this MOU, undertake such tasks as:

a. Provide leadership for the planning, implementation, and monitoring of work undertaken pursuant to this agreement and supplemental subagreements.

b. Designate a point of contact for coordination of BCI activities at the Service Headquarters, major command, and/or installation, as deemed appropriate by each Service.

c. Provide BCI representatives at the end of each fiscal year with a summary report of project accomplishments executed supplemental to this agreement.

d. Identify and evaluate appropriate proposed bat conservation proposals and existing projects for possible implementation as partnership initiatives with BCI.

e. Coordinate project planning with appropriate Federal and State agencies to ensure that planned projects are consistent with Federal and State management objectives for bats and other Federal and State legal and statutory requirements.

f. Identify a DoD representative to serve as liaison for any proposal field study.

g. Compensate BCI for their assistance, as mutually agreed upon in supplemental subagreements.

h. Communicate the establishment of this MOU to all Military Departments, major commands, and appropriate installations.

2. Bat Conservation International will, subject to the availability of resources and under the terms of separately funded subagreements to this MOU, undertake such tasks as:

a. Provide expertise, as well as labor, materials, and/or funds for the implementation of agreed-upon inventory, monitoring, and habitat improvement projects; education and public awareness efforts; or research efforts; as feasible and in accordance with BCI policy.

b. Designate a point of contact for coordination of DoD initiatives at BCI, as deemed appropriate.

c. Enter into separate subagreements (e.g. specific collection or donation agreements, volunteer agreements, or contracts) with the DoD to accomplish agreed-upon work developed supplemental to this agreement. Such work may include training, consultation, inventories, monitoring, habitat improvement projects, education, or research projects.

d. Refrain from referring to this MOU in commercial advertising in a manner which states or implies that the activities of the BCI are approved or endorsed by the DoD.

e. Submit for review to the DoD prior to release any proposed releases to the public media which reference this MOU or any employee of the DoD.

f. Communicate the establishment of this MOU to appropriate BCI cooperative units.

g. Make training available for DoD personnel in the survey, inventory and monitoring of bats.

3. DoD and BCI will hold an annual meeting to review progress made under this document and to discuss new project proposals within the purposes of this MOU.

4. Each project requiring a payment of funds by BCI to the DoD will be documented and signed by the responsible organizational unit line officer of the DoD and a BCI representative using an appropriate agreement.

5. Special matching fund projects will be documented via cooperative agreements and signed by the responsible DoD official and BCI representatives.

6. The implementation of this MOU and subsequent supplemental subagreements is subject to required funds being available to both parties of the MOU. Nothing in this MOU shall be construed as obligating the DoD to the expenditure of funds.

7. Nothing herein contained shall be construed as limiting or affecting in any way the delegated authority of the Department of Defense.

8. Nothing herein shall impede the parties from using other mechanisms to accomplish the purposes set out above.

DELEGATION

1. Authorized representatives of BCI and the DoD may execute special use authorizations and enter into supplemental subagreements within the scope of this document

2. Any supplemental subagreement negotiated under the authority of this MOU will remain in full force and effect, unless and until modified or terminated by local signatory parties, per the terms of said supplemental subagreements.

MODIFICATION AND TERMINATION

1. This MOU may be modified or amended upon written request of either party and the written concurrence of the other. The MOU may be terminated with 60-day written notice of either party; however, sufficient attempts should be made to modify, rather than to terminate, the MOU.

2. Five years after signature by both parties, this MOU shall be reviewed and considered for renewal. Signatures must be obtained from both parties to fully execute the renewal.

IMPLEMENTATION

This MOU becomes effective when signed by both parties.

Alex Albert Beehler 10/11/06
Assistant Deputy Under Secretary of Defense Date
(Environment, Safety and Occupational Health)

Merlin D. Tuttle 10/2/06
Executive Director Date
Bat Conservation International

MEMORANDUM OF UNDERSTANDING
among the
BUREAU OF INDIAN AFFAIRS
and the
BUREAU OF LAND MANAGEMENT
and the
DEPARTMENT OF DEFENSE
and the
FEDERAL HIGHWAY ADMINISTRATION
and the
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
and the
NATIONAL PARK SERVICE
and the
SMITHSONIAN INSTITUTION
and the
U.S. BOTANIC GARDEN
and the
USDA AGRICULTURAL RESEARCH SERVICE
and the
USDA ANIMAL AND PLANT HEALTH INSPECTION SERVICE
and the
USDA FOREST SERVICE
and the
USDA NATIONAL INSTITUTE OF FOOD AND AGRICULTURE
and the
USDA NATURAL RESOURCES CONSERVATION SERVICE
and the
U.S. FISH AND WILDLIFE SERVICE
and the
U.S. GEOLOGICAL SURVEY
ESTABLISHING THE
FEDERAL NATIVE PLANT CONSERVATION COMMITTEE
OF THE PLANT CONSERVATION ALLIANCE

This Memorandum of Understanding (MOU) is made and entered into by and between the Bureau of Indian Affairs, Bureau of Land Management, Department of Defense, Federal Highway Administration, National Oceanic and Atmospheric Administration, National Park Service, Smithsonian Institution, United States Botanic Garden, United States Department of Agriculture (USDA) Agricultural Research Service, USDA Animal and Plant Health Inspection Service, USDA Forest Service, USDA National Institute of Food and Agriculture, USDA Natural Resources Conservation Service, U.S. Fish and Wildlife Service, and U.S. Geological Survey, hereinafter referred to as the Committee.

I. PURPOSE

The purpose of this MOU is to continue the work of a Federal Native Plant Conservation Committee, through the Plant Conservation Alliance. The Committee will identify and recommend, as appropriate, priority conservation needs for native plants and their habitats and coordinate implementation of programs for addressing those needs. A native plant species is one that occurs naturally in a particular habitat, ecosystem, or region of the United States and its Territories or Possessions, without direct or indirect human actions. Recognizing that native plant species are of aesthetic, ecological, educational, historical, recreational, and scientific value to the Nation and its people, the Committee's priorities will be driven by the following vision: For the enduring benefit of the Nation, its ecosystems, and its people; to conserve and protect our native plant heritage by ensuring that, to the greatest extent feasible, native plant species and communities are maintained, enhanced, restored, or established on public lands, and that such activities are promoted on private lands.

II. STATEMENT OF MUTUAL BENEFITS AND INTERESTS

Native plants are a key component of national and global biodiversity conservation efforts and they support multiple uses of public lands. Native plants and their communities support ecosystem functions vital to a healthy, productive, and beautiful environment. Native plants also provide innumerable direct and indirect benefits to the Nation's wildlife, its people, and its economy.

The native flora of the United States includes about 17,800 species of flowering plants, or about 5 percent of the world's total, the world's oldest and largest conifers, and a wealth of other vascular and non-vascular plants. All these groups face challenges in the form of habitat loss and alteration including climate change, competition and predation by invasive species, and in some cases over-exploitation for human use.

Opportunities exist for native plant preservation and conservation at Federal, State, Tribal, and local government levels, among public and private land managers, conservation organizations, and the interests of individual citizens. Protection and conservation of areas of highly diverse or rare native plants is key to conserving the Nation's biodiversity and may convey additional benefits to species of both plants and animals that otherwise could become imperiled.

Numerous opportunities exist to employ native plants in a variety of federally implemented, funded, authorized, or permitted activities. For example, native plants can be used to revegetate road and other construction sites, or to assist the stabilization and recovery of wildfire burn sites. Native plants are an essential element of habitat restoration efforts at scales ranging from isolated wetlands to large regional efforts such as the *BayScapes* program which encompasses the entire 64,000 square mile Chesapeake Bay watershed.

Plants represent over half of all species federally listed as endangered and threatened species in the United States. As of August 2013, 1,481 native plant and animal species were federally listed as endangered or threatened in the United States. Of these, 628 were animals, and 853, or 57.6 percent, were plants. Federal lands provide habitat for more than 200 listed plant species and one-fourth of the known occurrences of listed plants. Careful management of these lands can help maintain our Nation's plant heritage. Federal agencies also have the expertise to assist non-Federal land managers in plant conservation and protection efforts. Innovative partnerships are needed among public and private sectors, nationally and internationally, to conserve native plants and their habitats before they become critically endangered.

III. AUTHORITIES

The following statutes provide authority for this Memorandum of Understanding:

1. Bureau of Land Management: Section 307(b) of the Federal Land Policy and Management Act of 1976, as amended, 43 U.S.C. 1737(b) (2011).

2. U.S. Geological Survey: 43 U.S.C. 36c (page 3, Section III).

3. National Park Service: National Park Service Organic Act of 1916, 16 U.S.C. § 1, as amended and supplemented, Fish and Wildlife Coordination Act, 16 U.S.C. § 661

4. Bureau of Indian Affairs: 25 U.S.C. § 2; Snyder Act of 1921, as amended, 25 U.S.C. § 13.

5. USDA Forest Service: Multiple Use-Sustained Yield Act of 1960, 16 U.S.C. 528-531.

6. USDA Natural Resources Conservation Service: Soil Conservation and Domestic Allotment Act of 1935, as amended, 16 U.S.C. 590a-q) (2012).

7. U.S. Fish and Wildlife Service: Endangered Species Act of 1973, as amended, 16 U.S.C. 1531-1544 (2012); Fish and Wildlife Conservation Act of 1980, 16 U.S.C. 2901-2912 (2012); Fish and Wildlife Act of 1956, 16 U.S.C. 742f (2012); Fish and Wildlife Coordination Act, 16 U.S.C. 661-666 (2012).

8. Federal Highway Administration: 23 U.S.C. 329 (2011); 23 U.S.C. 319(b) (2011); 23 USC 138; 49 USC 303 (a) and (d).

9. Smithsonian Institution: 20 U.S.C. §41 et. seq.

IV. COMMITTEE MEMBERSHIP, STRUCTURE, AND OPERATIONS

The Committee members mutually agree that:

1. Membership on the Committee is open at any time to any Federal agency interested in taking an active role in a native plant conservation program. Membership becomes official at such time as the Memorandum of Understanding is signed by the head of the Federal agency or a designee thereof.

2. A member agency may designate one official (with one alternate) to serve as its representative to the Committee, who will attend scheduled meetings at his or her agency's expense. Each member agency will inform the Committee, in writing, of the name and position of its representative and alternate, or of any changes in same.

3. The Committee shall establish its own working rules, including a procedure for designating the Chair. The position of Committee Chair shall rotate every 2 years to a different member agency.

4. The Committee shall meet a minimum of once per year. Additional meetings may be scheduled as agreed to by the Committee, and may include meetings at field locations.

V. PRINCIPAL CONTACTS

Individuals listed in Attachment 1 are authorized to act as principal contacts for matters related to this Memorandum of Understanding.

VI. COMMITTEE RESPONSIBILITIES

The Committee members mutually agree that the Committee will:

1. Develop and serve as a forum for coordination and implementation of a national native plant conservation program, consisting of public education and outreach, research, conservation and restoration actions, native plant materials development coordination including native seed collection, database coordination and information exchange, and international programs. The Committee shall continue to further its goals and objectives for a national native plant conservation program.

2. Encourage Committee members to take appropriate action within the limits of their respective authorities, policies, and budgets.

3. Encourage Committee members to coordinate program implementation with State natural resource agencies and natural heritage programs where appropriate, and promote cooperative efforts with States, Tribal land managers, and local, national, and international conservation organizations through existing agreements or through establishment of new agreements.

4. Evaluate implementation of this MOU on a regular basis to determine how effectively the purposes of the MOU are being met.

VII. WORKING GROUPS

1. Working Groups may be formed or disbanded as needed, at the discretion of the Committee, consistent with the applicable requirements of the Federal Advisory Committee Act.

2. Working Groups will be formed to determine needs for public education/outreach, research, conservation and restoration actions, native plant materials development including native seed collection, databases/information exchange, international programs, and to address other issues as agreed to by the Committee.

3. Working Groups will report regularly to the Committee on their deliberations including planning, coordination, facilitation, and implementation of actions recommended or developed by the Working Groups or by the Committee.

4. Working Groups representing geographic regions will be established to identify regional management needs for native plants and activities of Federal, State, and private interests within the regions. The geographic regions will be determined by the Committee.

VIII. COOPERATORS

1. Any Federal agency not desiring formal representation on the Committee, and any State agency, tribal agency, or tribal consortium program, private organization or individual, or foreign government agency interested in native plant conservation, may become a Cooperator upon acceptance of a written request to the Committee Chair. Cooperators may attend meetings of the Committee as observers, participate in informal open forums with the Committee, and participate in Working Groups. Cooperator agencies and organizations may designate one individual as a contact person, informing the Committee Chair in writing of the selection and of any changes in same.

2. As of July 2013, 291 governmental and non-governmental organizations have Cooperator status. The complete list is available as Attachment 2.

IX. IT IS MUTUALLY AGREED AND UNDERSTOOD BY AND BETWEEN THE SIGNATORIES TO THIS MEMORANDUM OF UNDERSTANDING AND COOPERATORS THAT:

1. Nothing in this MOU shall cause any agency which is a party to the MOU to take any action which conflicts with any existing authority, responsibility, or obligation,

established under Federal law or regulation.

2. This MOU in no way restricts participants from involvement in similar activities with other public and private agencies, organizations, and individuals.

3. Nothing in this MOU shall be construed as obligating Committee members or Cooperators to expend funds or to provide resources or be involved in any obligation for future payment of money or provision of resources.

4. Modifications within the scope of this MOU shall be made by formal consent of the parties, by the issuance of a written modification, signed and dated by the parties, prior to any changes becoming effective.

5. Any Committee member may terminate or withdraw membership in whole or in part at any time before the date of expiration, by providing 30-day written notice to the Committee Chair.

6. This MOU is neither a fiscal nor a funds-obligation document. Any endeavor involving reimbursement or contribution of funds between the parties to this instrument will be handled in accordance with applicable laws, regulations, and procedures including those for Government procurement and printing. Such endeavors will be outlined in separate agreements that shall be made in writing by representatives of the parties and shall be independently authorized by appropriate statutory authority. This instrument does not provide such authority. Specifically, this instrument does not establish authority for noncompetitive award to any Cooperator of any contract or other agreement. Any contract or agreement for training or other services must fully comply with all applicable requirements for competition.

7. This instrument expires no later than 5 years upon the date of the second agency signature, at which time it is subject to renewal through execution of a new MOU by the Committee.

X. GENERAL REQUIREMENTS

1. The program or activities conducted under this MOU will be in compliance with the nondiscrimination provisions contained in Titles VI and VII of the Civil Rights Act of 1964, as amended; the Civil Rights Restoration Act of 1987 (P.L. 100-259); and other nondiscrimination statutes: namely, Section 504 of the Rehabilitation Act of 1973, Title IX of the Education Amendments of 1972, and the Age Discrimination Act of 1975.

2. No member of, or Delegate to, Congress shall be admitted to any share or part of this instrument, or any benefits that may arise therefrom.

3. FREEDOM OF INFORMATION ACT (FOIA). Public access to MOU or agreement

records must not be limited, except when such records must be kept confidential and would have been exempted from disclosure pursuant to FOIA regulations (5 U.S.C. 552).

4. TEXT MESSAGING WHILE DRIVING. In accordance with Executive Order (EO) 13513, “Federal Leadership on Reducing Text Messaging While Driving,” any and all text messaging by Federal employees is banned: a) while driving a Government owned vehicle (GOV) or driving a privately owned vehicle (POV) while on official Government business; or b) using any electronic equipment supplied by the Government when driving any vehicle at any time. All cooperators, their employees, volunteers, and contractors are encouraged to adopt and enforce policies that ban text messaging when driving company owned, leased or rented vehicles, POVs or GOVs when driving while on official Government business or when performing any work for or on behalf of the Government.

5. PUBLIC NOTICES. It is the U.S. Forest Service's policy to inform the public as fully as possible of its programs and activities. The Federal Native Plant Conservation Committee is encouraged to give public notice of the receipt of this agreement and, from time to time, to announce progress and accomplishments. Press releases or other public notices should include a statement substantially as follows:

   "National Forest Systems of the U.S. Forest Service, Department of Agriculture, botany/celebrating wildflowers program." Federal Native Plant Conservation Committee members may call on the U.S. Forest Service's Office of Communication for advice regarding public notices. Federal Native Plant Conservation Committee is requested to provide copies of notices or announcements to the U.S. Forest Service Program Manager and to The U.S. Forest Service's Office of Communications as far in advance of release as possible.

6. ACKNOWLEDGEMENTS IN PUBLICATIONS, AUDIOVISUALS AND ELECTRONIC MEDIA. The Federal Native Plant Conservation Committee shall acknowledge, by name, any Federal member agency support in any publications, audiovisuals, and electronic media developed as a result of this MOU.

XI. EFFECTIVE DATE

IN WITNESS WHEREOF, the parties hereto have entered into this MOU establishing the Federal Native Plant Conservation Committee of the Plant Conservation Alliance, originally signed May 25, 1994, as evidenced by their signatures below. The terms of this MOU are in effect as long as at least two Federal agencies are Committee members. The MOU is effective upon the date of the second agency signature and will remain in effect until 5 years upon the date of the second agency signature, or until such time as it is modified or terminated.

SIGNATURE ON FILE

_____ _____

Neal Kornze Date
Acting Director, Bureau of Land Management

SIGNATURE ON FILE

_____ _____

(name to be added) Date
Bureau of Indian Affairs

SIGNATURE ON FILE

_____ _____

(name to be added) Date
Department of Defense

SIGNATURE ON FILE

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(name to be added) Date
Federal Highway Administration

SIGNATURE ON FILE

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(name to be added) Date
National Oceanic and Atmospheric Administration

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(name to be added) Date
National Park Service

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Smithsonian Institution

SIGNATURE ON FILE

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(name to be added) Date
U.S. Botanic Garden

SIGNATURE ON FILE

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(name to be added) Date
USDA Agricultural Research Service

SIGNATURE ON FILE

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(name to be added) Date
USDA Animal and Plant Health Inspection Service

SIGNATURE ON FILE

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(name to be added) Date
USDA Forest Service

SIGNATURE ON FILE

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(name to be added) Date
USDA National Institute of Food and Agriculture

SIGNATURE ON FILE

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(name to be added) Date
USDA Natural Resources Conservation Service

SIGNATURE ON FILE

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(name to be added) Date
U.S. Fish and Wildlife Service

SIGNATURE ON FILE

_____ _____

(name to be added) Date
U.S. Geological Survey

For the:
Federal Native Plant Conservation Memorandum of Understanding

MEMORANDUM OF UNDERSTANDING
BETWEEN THE
U.S. DEPARTMENT OF DEFENSE
AND THE
U.S. FISH AND WILDLIFE SERVICE
TO PROMOTE THE CONSERVATION OF MIGRATORY BIRDS

This Memorandum of Understanding (MOU) is entered into between the U.S. Department of Defense (DoD) and the U.S. Fish and Wildlife Service (FWS) (hereinafter "the Parties").

A. Purpose and Scope

Pursuant to Executive Order 13186 (January 17, 2001), Responsibilities of Federal Agencies to Protect Migratory Birds, this MOU outlines a collaborative approach to promote the conservation of migratory bird populations.

This MOU does not address incidental take during military readiness activities, which is being addressed in a rulemaking in accordance with section 315 of the National Defense Authorization Act for Fiscal Year 2003 (Pub. L. 107-314, 116 Stat. 2458).

This MOU specifically pertains to the following categories of DoD activities:

(1) Natural resource management activities, including, but not limited to, habitat management, erosion control, forestry activities, agricultural outleasing, conservation law enforcement, invasive weed management, and prescribed burning;

(2) Installation support functions, including but not limited to, the maintenance, construction or operation of administrative offices, military exchanges, road construction, commissaries, water treatment facilities, storage facilities, schools, housing, motor pools, non-tactical equipment, laundries, morale, welfare, and recreation activities, shops, landscaping, and mess halls;

(3) Operation of industrial activities;

(4) Construction or demolition of facilities relating to these routine operations; and

(5) Hazardous waste cleanup.

This MOU identifies specific activities where cooperation between the Parties will contribute substantially to the conservation of migratory birds and their habitats. This MOU does not authorize the take of migratory birds.

B. Authorities

The Parties' responsibilities under the MOU are authorized by provisions of the following laws:

Alaska National Interest Lands Conservation Act of 1980 (16 USC 410hh-3233)
Bald and Golden Eagle Protection Act of 1940 (16 U.S.C. 668-668d)
Endangered Species Act of 1973 (16 U.S.C. 1531 et seq.)
Fish and Wildlife Act of 1956 (16 U.S.C. 742 et seq.)
Fish and Wildlife Conservation Act of 1980 (16 U.S.C. 2901-2911)
Fish and Wildlife Coordination Act (16 U.S.C. 661-667)
Migratory Bird Conservation Act (16 U.S.C. 715-715d, 715e, 715f-715r)
Migratory Bird Treaty Act (16 U.S.C. 703-711)
National Environmental Policy Act of 1969 (42 U.S.C. 4321-4347)
Sikes Act Improvement Act of 1997 (16 USC 670a-670o)
Agreements to limit encroachments and other constraints on military training, testing, and operations (10 U.S.C. § 2684a)

C. Background

The Parties have a common interest in the conservation and management of America's natural resources. The Parties agree that migratory birds are important components of biological diversity and that the conservation of migratory birds will both help sustain ecological systems and help meet the public demand for conservation education and outdoor recreation, such as wildlife viewing and hunting opportunities. The Parties also agree that it is important to: 1) focus on bird populations; 2) focus on habitat restoration and enhancement where actions can benefit specific ecosystems and migratory birds dependent upon them; and 3) recognize that actions taken to benefit some migratory bird populations may adversely affect other migratory bird populations.

The DoD mission is to provide for the Nation's defense. DoD's conservation program works to ensure continued access to land, air, and water resources for realistic military training and testing while ensuring that the natural and cultural resources entrusted to DoD's care are sustained in a healthy condition.

The DoD is an active participant in international bird conservation partnerships including Partners in Flight (PIF) and the North American Bird Conservation Initiative (NABCI). Military lands frequently provide some of the best remaining habitat for migratory bird species of concern, and DoD plans to continue its leadership role in bird conservation partnerships.

Through the PIF initiative, DoD works in partnership with numerous Federal and State agencies and nongovernmental organizations for the conservation of migratory and resident birds and to enhance migratory bird survival. Through DoD PIF, a list of species of concern (see Definitions) has been developed for each Bird Conservation Region where DoD facilities occur, thus improving DoD's ability to evaluate any migratory bird conservation concerns on respective DoD lands.

Integrated Natural Resources Management Plans (INRMPs) offer a coordinated approach for incorporating habitat conservation efforts into installation management.

INRMPs are a significant source of baseline conservation information and conservation initiatives used when preparing National Environmental Policy Act (NEPA) documents for all DoD management activities. This linkage helps to ensure that appropriate conservation and mitigation measures are identified in NEPA documents and committed to, when appropriate, in final decision documents.

The DoD PIF program provides a framework for incorporating landbird, shorebird and waterbird habitat management efforts into INRMPs. DoD's strategy focuses on inventorying and long-term monitoring to determine changes in migratory bird populations on DoD installations. Effective on-the-ground management may then be applied to those areas identified as having the highest conservation value. DoD's PIF goal is to support the military's training and testing mission while being a vital and supportive partner in regional, national, and international bird conservation initiatives. DoD strives to implement cooperative projects and programs on military lands to benefit the health and well-being of birds and their habitats, whenever possible. The Department of Defense implements bird inventories and monitoring programs in numerous ways including Monitoring Avian Productivity and Survivorship (MAPS) and Next Generation Radar (NEXRAD) for studying bird movements in the atmosphere. DoD also maintains an integrated pest management (IPM) program designed to reduce the use of pesticides to the minimum necessary.

The mission of the FWS is to work with others to conserve, protect, manage, and enhance fish, wildlife, plants, and their habitats for the continuing benefit of the American people. The FWS is legally mandated to implement the provisions of the Migratory Bird Treaty Act (MBTA), which include responsibilities for population management (e.g., monitoring), habitat protection (e.g., acquisition, enhancement, and modification), international coordination, and regulation development and enforcement. The FWS also promotes migratory bird conservation through its coordination and consultation efforts with other entities.

Many FWS programs are involved in bird conservation activities, including:

1. The Division of Migratory Bird Management and Regional Migratory Birds and Habitat Programs serve as focal points in the United States for policy development and strategic planning, developing and implementing monitoring and management initiatives that help maintain healthy populations of migratory birds and their habitat, and providing continued opportunities for citizens to enjoy bird-related recreation.

2. The Division of Bird Habitat Conservation is instrumental in supporting habitat conservation partnerships through the administration of bird conservation grant programs and development of Joint Ventures that serve as major vehicles for implementing the various bird conservation plans across the country.

3. Ecological Services Field Offices across the country serve as the primary contacts for environmental reviews that include, when requested, projects developed by local military installations and DoD regional offices involving migratory bird issues. The Field Offices coordinate with the Regional Migratory Bird Offices, as necessary, during these reviews regarding permits

and overall migratory bird conservation coordination for DoD activities.

4. The Office of Law Enforcement is the principal FWS program that enforces the legal provisions of the MBTA .

The Parties agree this MOU shall be implemented to the extent permitted by law and in harmony with agency missions, subject to the availability of appropriations and budgetary limits.

D. <u>Responsibilities</u>

1. **Each Party shall**:

a. Emphasize an interdisciplinary, collaborative approach to migratory bird conservation in cooperation with other governments, State and Federal agencies, and non-federal partners within the geographic framework of the NABCI Bird Conservation Regions

b. Strive to protect, restore, enhance, and manage habitat of migratory birds, and prevent or minimize the loss or degradation of habitats on DoD-managed lands, by:

(1) Identifying and avoiding management actions that have the potential to adversely affect migratory bird populations, including breeding, migration, or wintering habitats; and by developing and implementing, as appropriate, conservation measures that would avoid or minimize the take of migratory birds or enhance the quality of the habitat used by migratory birds.;

(2) Working with partners to identify, conserve, and manage Important Bird Areas, Western Hemisphere Shorebird Reserve Network sites, and other significant bird conservation sites that occur on DoD-managed lands;

(3) Preventing or abating the pollution or detrimental alteration of the habitats used by migratory birds;

(4) Developing and integrating information on migratory birds and their habitats into outreach and education materials and activities; and

(5) Controlling the introduction, establishment, and spread of non-native plants or animals that may be harmful to migratory bird populations, as required by Executive Order 13112 on Invasive Species.

c. Work with willing landowners to prevent or minimize the loss or degradation of migratory bird habitats on lands adjacent or near military installation boundaries. This cooperative conservation may include:

(1) Participating in efforts to identify, protect, and conserve

important migratory bird habitats or other significant bird conservation sites and ecological conditions that occur in landscapes or watersheds that may be affected by activities on DoD lands;

(2) Developing and integrating information on migratory bird resources found on DoD lands into other partners' outreach and education materials and activities; and

(3) Using available authorities to enter into agreements with other Federal agencies, States, other governmental entities, and private conservation organizations to conserve and enhance habitat in a compatible manner so military operations are not restricted.

d. Promote collaborative projects such as:

(1) Developing or using existing inventory and monitoring programs, at appropriate scales, with national or regional standardized protocols, to assess the status and trends of bird populations and habitats, including migrating, breeding, and wintering birds;

(2) Designing management studies and research projects using national or regional standardized protocols and programs, such as MAPS to identify the habitat conditions needed by applicable species of concern, to understand interrelationships of co-existing species, and to evaluate the effects of management activities on habitats and populations of migratory birds;

(3) Sharing inventory, monitoring, research, and study data for breeding, migrating, and wintering bird populations and habitats in a timely fashion with national data repositories such as Breeding Bird Research and Monitoring Database (BBIRD), National Point Count Database, National Biological Information Infrastructure, and MAPS;

(4) Working in conjunction with each other and other Federal and State agencies to develop reasonable and effective conservation measures for actions that affect migratory birds and their natural habitats;

(5) Participating in or promoting the implementation of existing regional or national inventory and monitoring programs such as Breeding Bird Survey (BBS), BBIRD, Christmas Bird Counts, bird atlas projects, or game bird surveys (e.g., mid-winter waterfowl surveys) on DoD lands where practicable and feasible.

(6) Using existing partnerships and exploring opportunities for expanding and creating new partnerships to facilitate combined funding for inventory, monitoring, management studies, and research.

e. Provide training opportunities to DoD natural resources personnel on migratory bird issues, to include bird population and habitat inventorying,

monitoring methods, and management practices that avert detrimental effects and promote beneficial approaches to migratory bird conservation.

f. Participate in the Interagency Council for the Conservation of Migratory Birds to evaluate implementation of this MOU.

g. Promote migratory bird conservation internationally, as it relates to wintering, breeding and migration habitats of birds that breed on DoD lands.

h. Promote and undertake ecologically sound actions to curb the introduction in the wild of exotic or invasive species harmful to migratory birds.

2. **The Department of Defense Shall**:

a. Follow all migratory bird permitting requirements for non-military readiness activities that are subject to 50 CFR Parts 21.22 (banding or marking), 21.23 (scientific collecting), 21.26 (special Canada goose permit), 21.27 (special purposes), or 21.41 (depredation). No permit is required to take birds in accordance with Parts 21.43 - 21.47 (depredation orders).

b. Encourage incorporation of comprehensive migratory bird management objectives in the preparation of DoD planning documents, including Integrated Natural Resource Management Plans, Pest Management Plans, Installation Master Plans, NEPA analyses, and non-military readiness elements of Bird Aircraft Strike Hazard documents. Comprehensive planning efforts for migratory birds include PIF Bird Conservation Plans, the North American Waterfowl Management Plan, U.S. Shorebird Conservation Plan, and North American Waterbird Conservation Plan and associated regional plans where available.

c. Incorporate conservation measures addressed in Regional or State Bird Conservation Plans in INRMPs.

d. Consistent with imperatives of safety and security, allow the FWS and other partners reasonable access to military lands for conducting sampling or survey programs such as MAPS, BBS, BBIRD, International Shorebird Survey, and breeding bird atlases.

e. Prior to starting any activity that is likely to affect populations of migratory birds:

(1) Identify the migratory bird species likely to occur in the area of the proposed action and determine if any species of concern could be affected by the activity;

(2) Assess and document, through the project planning process, using NEPA when applicable, the effect of the proposed action on species of concern. Use best available demographic, population, or habitat

association data in the assessment of effects upon species of concern;

(3) Engage in early planning and scoping with the FWS relative to potential impacts of a proposed action, to proactively address migratory bird conservation, and to initiate appropriate actions to avoid or minimize the take of migratory birds.

f. Manage military lands and non-military readiness activities in a manner that supports migratory bird conservation, giving consideration to the following factors:

(1) Habitat protection, restoration, and enhancement. Military lands contain many important habitats for migratory birds. Some unique, sensitive, endangered and/or declining habitat types that may require special management attention include:

(a) Grasslands. Many native grassland communities require intensive management to maintain and restore vigor and species diversity and to provide habitat for migratory birds and other wildlife dependent on native grasslands. Grassland management and restoration tools include controlled burning, mowing, grazing, native species planting, and exotic plant removal. Many grasslands have evolved with a natural fire regime, and the management activities often emulate this fire regime.

(b) Riparian and wetland habitats. Military lands contain riparian and wetland habitats that may be critical for migratory birds. DoD will strive to prevent the destruction or degradation of wetlands and riparian vegetation, and also restore those habitats, when feasible, where they have been degraded.

(c) Coastal beach, salt marsh, and dune habitats. Military lands support some of the best remaining undisturbed coastal habitats. DoD will strive to protect, restore and prevent the destruction of coastal and island habitats that are important to breeding, migrating and wintering shorebirds, salt marsh land birds and colonial water birds.

(d) Longleaf pine ecosystem. Some of the best remaining examples of the longleaf pine ecosystem occur on military lands. Such habitats benefit from prescribed fire and other management measures which DoD regularly implements on thousands of acres in the Southeast. The DoD manages and will continue to manage this ecosystem to benefit and promote migratory bird conservation.

(2) Fire and fuels management practices. Fire plays an important role in shaping plant and animal communities and is a valuable tool in restoring habitats altered by decades of fire suppression. Fire management may include fire suppression, but also involves fire

prevention and fuels treatment, including prescribed burning and monitoring, to protect communities and provide for healthy ecosystems. Fire management planning efforts will consider the effects of fire management strategies on the conservation of migratory bird populations.

(3) Invasive Species and Aquatic Nuisance Species management practices. Invasive Species and Aquatic Nuisance Species are a threat to native habitats and wildlife species throughout the United States, including military lands. Efforts to control/contain these species must take into account both the impacts from invasive species and the effects of the control efforts on migratory bird populations. Invasive Species and Aquatic Nuisance Species that can threaten migratory birds and their habitats include, but are not limited to, exotic grasses, trees and weeds, terrestrial and aquatic insects and organisms, non-native birds, and stray and feral cats.

(4) Communications towers, utilities and energy development. Increased communications demands, changes in technology and the development of alternative energy sources result in impacts on migratory birds. DoD will review wind turbine and powerline guidelines published by FWS and the Avian Power Line Interaction Committee, respectively, and consult with FWS as needed, in considering potential effects on migratory birds of proposals for locating communications towers, powerlines or wind turbines on military lands. Construction of new utility and energy systems and associated infrastructure should be designed to avoid and minimize impacts on migratory bird populations. Existing utilities may also be considered for retrofitting to reduce impacts.

(5) Recreation and public use. The demand for outdoor recreational opportunities on public lands is increasing. Impacts on migratory birds may occur both through direct and indirect disturbances by visitors and through agency activities associated with providing recreational opportunities to visitors and installation personnel and morale facilities (e.g., facilities construction). DoD provides access to military lands for recreation and other public use, such as Watchable Wildlife and bird watching, where such access does not compromise security and safety concerns or impact migratory birds, other species, or their habitats.

Many conservation measures have been developed to benefit a variety of migratory bird species and their associated habitats. Some of these conservation measures may be directly applicable to DoD non-military readiness related activities; however, the appropriateness and practicality of implementing any specific conservation measure may have to be determined on a case-by-case basis. The FWS will work cooperatively with DoD in providing existing conservation measures and developing new ones as needed. Examples of some conservation measures may be found at http://www.partnersinflight.org/pubs/BMPs.htm for landbird

species.

g. Develop and implement new and/or existing inventory and monitoring programs, at appropriate scales, using national standardized protocols, to evaluate the effectiveness of conservation measures to minimize or mitigate take of migratory birds, with emphasis on those actions that have the potential to significantly impact species of concern.

h. Advise the public of the availability of this MOU through a notice published in the Federal Register.

i. In accordance with DoD INRMP guidance, promote timely and effective review of INRMPs with respect to migratory bird issues with the FWS and respective state agencies. During the INRMP review process, evaluate and coordinate with FWS on any potential revisions to migratory bird conservation measures taken to avoid or minimize take of migratory birds.

3. **The Fish and Wildlife Service Shall**:

a. Work with DoD by providing recommendations to minimize adverse effects upon migratory birds from DoD actions.

b. Through the Division of Migratory Bird Management, maintain a Web page on permits that provides links to all offices responsible for issuing permits and permit application forms for take of migratory birds.

c. Provide essential background information to the DoD when requested to ensure sound management decisions. This may include migratory bird distributions, status, key habitats, conservation guidelines, and risk factors within each BCR. This includes updating the FWS publication of *Birds of Conservation Concern* at regular intervals so it can be reliably referenced.

d. Work to identify special migratory bird habitats (i.e., migration corridors, stop-over habitats, ecological conditions important in nesting habitats) to aid in collaborative planning.

e. Through the Ecological Service Field Office, provide to DoD, upon request, technical assistance on migratory bird species and their habitats.

f. In accordance with FWS Guidelines for Coordination with DoD and Implementation of the 1997 Sikes Act (2005), work cooperatively with DoD in the development, review and revision of INRMPs.

g. Review and comment on NEPA documents and other planning documents forwarded by military installations.

E. <u>It is Mutually Agreed and Understood That:</u>

1. This MOU will not change or alter requirements associated with the MBTA, Endangered Species Act, NEPA, Sikes Act or other statutes or

legal authority.

2. The responsibilities established by this MOU may be incorporated into existing DoD actions; however, DoD may not be able to implement some responsibilities identified in the MOU until DoD has successfully included them in formal planning processes. This MOU is intended to be implemented when new actions are initiated as well as during the initiation of new, or revisions to, INRMPs, Pest Management Plans, and non-military readiness elements of Bird Aircraft Strike Hazard plans. It does not apply to ongoing DoD actions for which a NEPA decision document was finalized prior to, or within 180 days of the date this MOU is signed.

3. This MOU in no way restricts either Party from participating in similar activities with other public or private agencies, governments, organizations, or individuals.

4. An elevation process to resolve any dispute between the Parties regarding a particular practice or activity is in place and consists of first attempting to resolve the dispute with the DoD military installation and the responsible Ecological Services Field Office. If there is no resolution at this level, either Party may elevate the issue to the appropriate officials at the applicable Military Service's Chain of Command and FWS Regional Offices. In the event that there is no resolution by these offices, the dispute may be elevated by either Party to the headquarters office of each agency.

5. This MOU is neither a fiscal nor a funds obligation document. Any endeavor involving reimbursement, contribution of funds, or transfer of anything of value between the Parties will be handled in accordance with applicable laws, regulations, and procedures, including those for government procurement and printing. Such endeavors will be outlined in separate agreements that shall be made in writing by representatives of the Parties and shall be independently authorized by appropriate statutory authority.

6. The Parties shall schedule periodic meetings to review progress and identify opportunities for advancing the principles of this MOU.

7. This MOU is intended to improve the internal management of the executive branch and does not create any right or benefit, substantive or procedural, separately enforceable at law or equity by a party against the United States, its agencies or instrumentalities, its officers or employees, or any other person.

8. Modifications to the scope of this MOU shall be made by mutual consent of the Parties, through issuance of a written modification, signed and dated by both Parties, prior to any changes.

9. Either Party may terminate this instrument, in whole or in part, at any time before the date of expiration by providing the other Party with a written statement to that effect.

The principal contacts for this instrument are as follows:

Brian Millsap, Chief Division of Migratory Bird Management US Fish and Wildlife Service 4401 N. Fairfax Drive MS4107 Arlington, VA 22203	L. Peter Boice, Conservation Team Leader Office of the Secretary of Defense 1225 S. Clark St. Suite 1500 Arlington, VA 22202-4336

This MOU is executed as of the last date signed below and expires no later than five (5) years thereafter, at which time it is subject to review and renewal, or expiration.

F. Definitions

Action – a program, activity, project, official policy, rule, regulation or formal plan directly carried out by DoD, but not a military readiness activity.

Breeding Biology Research and Monitoring Database (BBIRD) - national, cooperative program that uses standardized field methodologies for studies of nesting success and habitat requirements of breeding birds (http://pica.wru.umt.edu/BBIRD/).

Breeding Bird Survey (BBS) – a standardized international survey that provides information on population trends of breeding birds, through volunteer observations located along randomly selected roadside routes in the United States, Canada and Mexico (http://www.mbr-pwrc.usgs.gov/bbs/bbs.html).

Bird Conservation Region – a geographic unit used to facilitate bird conservation actions under the North American Bird Conservation Initiative (http://www.manomet.org/USSCP/bcrmaps.html).

Birds of Conservation Concern – published by the FWS Division of Migratory Bird Management, refers to the list of migratory and non-migratory birds of the United States and its territories that are of conservation concern. The current version of the list Birds of Conservation Concern 2002 is available at (http://migratorybirds.fws.gov/reports/bcc2002.pdf).

Comprehensive Planning Efforts for Migratory Birds – includes Partners in Flight, North American Waterfowl Management Plan, U.S. Shorebird Conservation Plan, Western Hemisphere Shorebird Reserve Network, North American Waterbird Conservation Plan, and other planning efforts integrated through the North American Bird Conservation Initiative.

Conservation Measure – an action undertaken to improve the conservation status of one or more species of migratory birds. Examples include surveys and inventories, monitoring, status assessments, land acquisition or protection, habitat restoration, population manipulation, research, and outreach.

Conservation Planning – strategic and tactical planning of agency activities for the long-

term conservation of migratory birds and their habitats.

Council for the Conservation of Migratory Birds – an interagency council established by the Secretary of the Interior to oversee the implementation of Executive Order 13186.

Ecological Condition – the composition, structure, and processes of ecosystems over time and space. This includes the diversity of plant and animal communities, the productive capacity of ecological systems and species diversity, ecosystem diversity, disturbance processes, soil productivity, water quality and quantity, and air quality. Often referred to in terms of ecosystem health, which is the degree to which ecological factors and their interactions are reasonably complete and functioning for continued resilience, productivity, and renewal of the ecosystem.

Effect (adverse or beneficial) – "effects" and "impacts," as used in this MOU are synonymous. Effects may be direct, indirect, or cumulative, and refer to effects from management actions or categories of management actions on migratory bird populations, habitats, ecological conditions and/or significant bird conservation sites.

Important Bird Areas (IBAs) – a network of sites that provide essential habitat for the long-term conservation of birds. In the United States, the IBA network is administered by the American Bird Conservancy and the National Audubon Society. (http://www.audubon.org/nird/iba/)

Integrated Natural Resources Management Plan (INRMP) – an integrated plan based, to the maximum extent practicable, on ecosystem management that shows the interrelationships of individual components of natural resources management (e.g., fish and wildlife, forestry, land management, outdoor recreation) to military mission requirements and other land use activities affecting an installation's natural resources. INRMPs are required for all DoD installations with significant natural resources, pursuant to the Sikes Act Improvement Act.

International Shorebird Survey – a monitoring program started in 1974 to survey shorebirds (sandpipers, plovers, etc.) across the Western Hemisphere. (http://www.manomet.org/programs/shorebirds).

Management Action – an activity by a government agency that could cause a positive or negative impact on migratory bird populations or habitats. Conservation measures to mitigate potential negative effects of actions may be required.

Migratory Bird – any bird listed in 50 CFR §10.13, Code of Federal Regulations.

Military Readiness Activity – all training and operations of the Armed Forces that relate to combat, including but not limited to the adequate and realistic testing of military equipment, vehicles, weapons and sensors for proper operation and suitability for combat use.

Monitoring Avian Productivity and Survivorship (MAPS) – a program that uses the banding of birds during the breeding season to track the changes and patterns in the number of young produced and the survivorship of adults and young

(http://www.birdpop.org/maps.htm).

National Environmental Policy Act (NEPA) – a Federal statute that requires Federal agencies to prepare a detailed analysis of the environmental impacts of a proposed action and alternatives, and to include public involvement in the decision making process for major Federal actions significantly affecting the quality of the human environment 42 U.S.C. §4321, et. seq.

North American Bird Conservation Initiative (NABCI) – an initiative to align the avian conservation community to implement bird conservation through regionally-based, biologically driven, landscape-oriented partnerships across the North American continent. NABCI includes Federal agencies of Canada, Mexico and the United States, as well as most landbird, shorebird, waterbird, and waterfowl conservation initiatives (http://www.nabci-us.org).

North American Waterbird Conservation Plan – a partnership of Federal and State government agencies, non-governmental organizations, and private interests focusing on the conservation of waterbirds, primarily including marshbirds and inland, coastal, and pelagic colonial waterbirds (www.nacwcp.org/pubs/). The vision of the partnership is that the distribution, diversity and abundance of populations and breeding, migratory, and nonbreeding waterbirds are sustained throughout the lands and waters of North America, Central America, and the Caribbean.

North American Waterfowl Management Plan —a partnership of Federal and State agencies, non-governmental organizations, and private interests focusing on the restoration of waterfowl populations through habitat restoration, protection, and enhancement (http://birdhabitat.fws.gov/NAWMP/nawmphp.htm).

Partners in Flight (PIF) – a cooperative partnership program of more than 300 partners including Federal and State government agencies, non-governmental organizations, conservation groups, foundations, universities and industry focusing on the conservation of landbirds. DoD was an original signatory to the PIF Federal Agencies' MOA. (http://www.partnersinflight.org and http://www.dodpif.org).

Species of Concern – refers to those species listed in the periodic report *Birds of Conservation Concern;* priority migratory bird species documented in the comprehensive bird conservation plans (North American Waterbird Conservation Plan, U.S. Shorebird Conservation Plan, Partners in Flight Bird Conservation Plans); species or populations of waterfowl identified as high, or moderately high, continental priority in the North American Waterfowl Management Plan; listed threatened and endangered bird species in 50 CFR. 17.11; and MBTA listed game birds below desired population sizes.

Take – as defined in 50 C.F.R. 10.12, to include pursue, hunt, shoot, wound, kill, trap, capture, collect, or to attempt to pursue, hunt, shoot, wound, kill, trap, capture, or collect.

U.S. Shorebird Conservation Plan – an effort undertaken by a partnership of Federal and State government agencies, as well as non-governmental and private organizations to ensure that stable and self-sustaining populations of all shorebird species are restored

and protected (http://www.fws.gov/shorebird).

The Parties hereto have executed this agreement as of the date shown below.

Director US Fish and Wildlife Service	Assistant Deputy Under Secretary of Defense (Environment, Safety and Occupational Health) US Department of Defense
H. Dale Hall 7/7/06 Signature Date	Alex Albert Beehler 7/31/06 Signature Date

–

OFFICE OF THE UNDER SECRETARY OF DEFENSE

3000 DEFENSE PENTAGON
WASHINGTON, DC 20301-3000

ACQUISITION,
TECHNOLOGY
AND LOGISTICS

APR 0 3 2007

MEMORANDUM FOR DEPUTY ASSISTANT SECRETARY OF THE ARMY
(ENVIRONMENT, SAFETY AND OCCUPATIONAL HEALTH)
DEPUTY ASSISTANT SECRETARY OF THE NAVY
(ENVIRONMENT)
DEPUTY ASSISTANT SECRETARY OF THE AIR FORCE
(ENVIRONMENT, SAFETY AND OCCUPATIONAL HEALTH)
DIRECTOR, DEFENSE LOGISTICS AGENCY

SUBJECT: Guidance to Implement the Memorandum of Understanding to Promote the Conservation of Migratory Birds

On July 31, 2006, the Department of Defense (DoD) and the U.S. Fish and Wildlife Service (FWS) entered into a Memorandum of Understanding (MOU) to Promote the Conservation of Migratory Birds, in accordance with Executive Order 13186, "Responsibilities of Federal Agencies to Protect Migratory Birds." This MOU describes specific actions that should be taken by DoD to advance migratory bird conservation; avoid or minimize the take of migratory birds; and ensure DoD operations—other than military readiness activities—are consistent with the Migratory Bird Treaty Act. The MOU also describes how the FWS and DoD will work together cooperatively to achieve these ends. The MOU does not authorize the take of migratory birds; the FWS, however, may develop incidental take authorization for federal agencies that complete an Executive Order MOU.

I strongly encourage all DoD personnel to work cooperatively with the FWS to implement the actions described in the MOU and to take steps to further migratory bird conservation. This MOU specifically pertains to the following categories of DoD activities:

(1) Natural resource management activities, including, but not limited to, habitat management, erosion control, forestry activities, agricultural outleasing, conservation law enforcement, invasive weed management, and prescribed burning;

(2) Installation support functions, including but not limited to, the maintenance, construction or operation of administrative offices, military exchanges, road

construction, commissaries, water treatment facilities, storage facilities, schools, housing, motor pools, non-tactical equipment, laundries, morale, welfare, and recreation activities, shops, landscaping, and mess halls;

(3) Operation of industrial activities;

(4) Construction or demolition of facilities relating to these routine operations; and

(5) Hazardous waste cleanup.

This MOU does not address incidental take during military readiness activities, which was addressed in a rulemaking in accordance with section 315 of the National Defense Authorization Act for Fiscal Year 2003. The final rule, Migratory Bird Permits: Take of Migratory Birds by the Armed Force, was published as 50 CFR Part 21 in the February 28, 2007 Federal Register, pages 8931-8950.

Successful implementation of the MOU will require early planning and coordination between individual military bases and local FWS offices for particular projects that may affect migratory birds. A variety of useful tools are available to assist DoD natural resource managers in integrating bird conservation measures with DoD activities, as described in the attachment. If you have any questions, please contact Mr. Peter Boice at (703) 604-0524.

Alex A. Beehler
Assistant Deputy Under Secretary of Defense
(Environment, Safety and Occupational Health)

Attachments:
As stated

USEFUL TOOLS IN IMPLEMENTING MIGRATORY BIRD CONSERVATION BY THE DOD

The following is not an exhaustive list of tools available to help address migratory bird conservation but are excellent sources to start.

Partners in Flight (http://www.partnersinflight.org)
Partners in Flight is an umbrella network of which the DoD bird conservation program is a vital part. Partners in Flight was launched in 1990 in response to growing concerns about declines in the populations of many landbirds, and to address the conservation of birds not covered by existing conservation initiatives.

The PIF web site provides helpful information including links to regional plans that discuss bird conservation goals and objectives for individual species in a specific physiographic region.

DoD Partners in Flight (http://www.dodpif.org/)
The Management Strategy for DoD PIF is to promote and support a partnership role in the protection and conservation of birds and their habitats by protecting vital DoD lands and ecosystems, enhancing biodiversity, and maintaining healthy and productive natural systems consistent with the military mission. The DoD PIF web site provides a number of useful resources for addressing or learning more about migratory bird conservation, including fact sheets and a database of installation-specific information.

Installation Bird Checklist (http://www.dodpif.org/)
This is an ongoing effort to providing a list of birds known to occur on or in the vicinity of individual military bases in addition to seasonal occurrence records.

Species of Concern (http://www.dodpif.org/)
Although migratory bird conservation should address all migratory birds, the MOU places a priority on addressing the conservation of species of concern as resources are limited to effectively address all birds. Species of concern refers to those species listed in the periodic report FWS *Birds of Conservation Concern;* priority migratory bird species documented in the comprehensive bird conservation plans (North American Waterbird Conservation Plan, U.S. Shorebird Conservation Plan, Partners in Flight Bird Conservation Plans); species or populations of waterfowl identified as high, or moderately high, continental priority in the North American Waterfowl Management Plan; listed threatened and endangered bird species in 50 CFR. 17.11; and Migratory Bird Treat Act listed game birds below desired population sizes. To assist DoD staff in determining what species may be impacted by activities on military bases, DoD PIF is in the process of developing a list of species of concern for each military base in the continental U.S. Until these individual base lists are finalized, list of species of concern are available at the larger Bird Conservation Region (BCR) scale. BCRs are ecologically distinct regions in North America with similar bird communities, habitats, and resource management issues.

The **DoD Bird Conservation Database** (Database) (http://www.dodpif.org/projects/)
This database was created to document, consolidate, and disseminate bird conservation efforts on or involving military lands and civil works projects and make that information available as a resource for planners, land managers and other professionals involved in bird conservation.

This database can provide a valuable resource for biologists to share natural resource management information on their base including species accounts, research and monitoring, bird surveys, etc. Base biologists are encouraged to insert abstracts on their natural resource projects into the database.

Conservation Measures (http://www.partnersinflight.org/pubs/BMPs.htm)
There is currently a lack of a single resource database that provides easy reference to migratory bird conservation measures that may be implemented for a diversity of species or habitat types. However, several efforts are underway and will be available in the future. One resource that is currently underdevelopment but readily available are Best Management Practices on the Partners in Flight web site.

DoD PIF-L List Serve (http://www.dodpif.org/).
This Listserve supports the natural resource managers at DoD sites to more effectively address migratory and resident bird issues, and incorporate bird habitat conservation plans into the INRMP process. The list should be used for items that will benefit natural resource managers with bird conservation issues, including as requests for information or assistance. See the web site for how to subscribe to the list.

US Shorebird Conservation Plan (http://www.fws.gov/shorebirdplan/) is an effort undertaken by a partnership of Federal and State government agencies, as well as non-governmental and private organizations to ensure that stable and self-sustaining populations of all shorebird species are restored and protected. Both the U.S. Plan and regional step down plans provide useful information regarding population goals and objectives for individual priority shorebird species.

North American Waterbird Conservation Plan
(http://www.waterbirdconservation.org/)
This partnership of Federal and State government agencies, non-governmental organizations, and private interests focuses on the conservation of waterbirds, primarily including marshbirds and inland, coastal, and pelagic colonial waterbirds). As with the Partners in Flight and Shorebird initiatives, waterbird conservation plans are available at both the continental and regional scale. These include population and habitat objectives for individual waterbird species and management recommendations.

FWS Course for DoD Natural Resource Managers: Migratory Bird Conservation – A Trust Responsibility
The FWS periodically offers a MBTA course specifically modified for DoD participants. FWS hopes to offer the course approximately once a year.

DoD Conservation Page (http://www.denix.osd.mil/)
The Conservation Web page on DENIX offers a wide variety of bird conservation reports and other products. Of particular note are the sections on "Wildlife" and "Endangered Species."

DoD Legacy Resource Management Program (http://www.dodlegacy.org)
The Legacy program funds efforts that preserve our nation's natural and cultural heritage on DoD lands. Three principles guide the Legacy Program: *stewardship*, *leadership*, and *partnership*. Stewardship initiatives assist DoD in safeguarding its irreplaceable resources for future generations. By embracing a leadership role as part of the program, DoD serves as a model for respectful use of natural and cultural resources. Through partnerships, Legacy strives to access the knowledge and talents of individuals outside of DoD. The Legacy Web site describes proposal submittal guidelines, lists previously funded projects, and provides links to many products. Bird conservation is one of Legacy's eleven areas of interest.

Strategic Environmental Research and Development Program (http://www.serdp.org)
SERDP is DoD's environmental science and technology program, planned and executed in full partnership with the Department of Energy and the Environmental Protection Agency, with participation by numerous other federal and non-federal organizations. To address the highest priority issues confronting the Army, Navy, Air Force, and Marines, SERDP focuses on cross-service requirements and pursues high-risk/high-payoff solutions to the Department's most intractable environmental problems. The development and application of innovative environmental technologies support the long-term sustainability of DoD's training and testing ranges as well as significantly reduce current and future environmental liabilities. SERDP offers funding in the following four focus areas: Environmental Restoration, Munitions Management, Sustainable Infrastructure, and Weapons Systems and Platforms. Sustainable Infrastructure (SI) encompasses the technologies required to sustain training and testing ranges, as well as the installation infrastructure that supports those ranges and the deployed forces. SI is subdivided into natural resources, facilities, and cultural resources.

Environmental Security Technology Certification Program
(http://www.serdp-estcp.org)
ESTCP is DoD's environmental technology demonstration and validation program. The goal of ESTCP is to identify, demonstrate, and transfer technologies that address DoD's highest priority environmental requirements. The Program promotes innovative, cost-effective environmental technologies through demonstrations at DoD facilities and sites. These technologies provide a return on investment through improved efficiency, reduced liability, and direct cost savings. ESTCP's strategy is to select lab-proven technologies with broad DoD application and aggressively move them to the field for rigorous trials documenting their cost, performance, and market potential. ESTCP offers funding in the following four focus areas: Environmental Restoration, Munitions Management, Sustainable Infrastructure, and Weapons Systems and Platforms. Sustainable Infrastructure (SI) encompasses the technologies required to sustain training and testing

ranges, as well as the installation infrastructure that supports those ranges and the deployed forces. SI is subdivided into natural resources, facilities, and cultural resources.

North American Bird Conservation Initiative (NABCI)
The U.S. NABCI Committee is a forum of government agencies, non-profit organizations, and initiatives dedicated to advancing integrated bird conservation in North America. Its strategy is to foster coordination and collaboration among the bird conservation community on key issues of concern. Through annual work plans, NABCI focuses its efforts on advancing bird monitoring, conservation design, international conservation, and institutional support in state and federal agencies for bird habitat conservation.

DoD Coordinated Bird Monitoring Plan
A Coordinated Bird Monitoring (CBM) approach now is being followed in the United State and Canada by many public and private agencies. The CBM approach stresses clear specification of management issues that bird monitoring can help address, careful attention to quantitative issues, and coordination among the different bird initiatives and between these groups and managers who will use the information. DoD is undertaking a three-year project that will develop four products to help improve bird monitoring programs on DoD land -- a review of existing monitoring programs, guidelines for selected surveys, a plan for monitoring species of special concern on DoD land, and recommendations for DoD's role in continental bird monitoring programs.

Note: **The three year DoD project was completed in 2010 and the report available here: http://www.dodpif.org/groups/monitoring/dodcbm.php.**

MEMORANDUM OF UNDERSTANDING
BETWEEN
THE U.S. DEPARTMENT OF DEFENSE
AND
THE U.S. FISH AND WILDLIFE SERVICE
AND
THE ASSOCIATION OF FISH AND WILDLIFE AGENCIES
FOR A
COOPERATIVE INTEGRATED NATURAL RESOURCE MANAGEMENT PROGRAM
ON MILITARY INSTALLATIONS

A. PURPOSE

The purpose of this Memorandum of Understanding (MOU) is to further a cooperative relationship between the U.S. Department of Defense (DoD), U.S. Department of the Interior – Fish and Wildlife Service (FWS), and state fish and wildlife agencies (states) acting through the Association of Fish and Wildlife Agencies (AFWA) (hereafter referred to as the Parties) in preparing, reviewing, revising, updating and implementing Integrated Natural Resource Management Plans (INRMPs) for military installations.

B. BACKGROUND

In recognition that military lands have significant natural resources, Congress enacted the Sikes Act in 1960 to address wildlife conservation and public access on military installations. The 1997 amendments to the Sikes Act require the DoD to develop and implement an INRMP for each military installation with significant natural resources. A 2012 amendment to the Sikes Act now authorizes the preparation of INRMPs for state-owned National Guard installations used for training pursuant to chapter 5 of title 32 of the United States Code. DoD must prepare all INRMPs in cooperation with the FWS and states. Each INRMP must reflect the mutual agreement of the Parties concerning conservation, protection, and management of fish, wildlife, plants and their habitats on military lands.

INRMPs provide for the management of natural resources, including fish and wildlife and their habitats. To the maximum extent practicable, they incorporate ecosystem management principles, and describe procedures and projects that manage and maintain the landscapes necessary to sustain military-controlled lands for mission purposes. INRMPs also allow for multipurpose uses of resources, including public access appropriate for those uses, provided such access does not conflict with military land use, security requirements, safety, or ecosystem needs, including the needs of fish and wildlife resources. Effective communications and coordination among the Parties, initiated early in the planning process at national, regional, and the military installation levels, is essential to developing, reviewing, and implementing comprehensive INRMPs. When such partnering involves the participation and coordination of all Parties regarding existing FWS and state natural resources management plans or initiatives, such as threatened and endangered species recovery plans or State Wildlife Action Plans, the mutual agreement of all Parties is achieved more easily. INRMPs provide for the conservation

and rehabilitation of natural resources on military lands in ways that help ensure the readiness of the Armed Forces. Thus, a clear understanding of land use objectives for military lands should enable the Parties to have a common understanding of DoD's land management requirements.

This MOU addresses the responsibilities of the Parties to facilitate optimum management of natural resources on military installations. It replaces a DoD-FWS-AFWA MOU for *Cooperative Integrated Natural Resources Management Program on Military Installations* dated January 31, 2006, which expired January 31, 2011.

C. AUTHORITIES

This MOU is established under the authority of the Sikes Act, as amended, 16 U.S.C. 670a-670f, which 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 FWS and states. The DoD's primary mission is national defense. DoD manages approximately 28 million acres of land and waters under the Sikes Act to support sustained military activities while conserving and protecting biological resources.

The FWS manages approximately 150 million acres of the National Wildlife Refuge System, and administers numerous fish and wildlife conservation and management statutes and authorities, including the: Fish and Wildlife Coordination Act, Migratory Bird Treaty Act of 1918, Endangered Species Act, Marine Mammal Protection Act, Bald and Golden Eagle Protection Act, Anadromous Fish Conservation Act, Nonindigenous Aquatic Nuisance Prevention and Control Act of 1990, Federal Noxious Weed Act, Alien Species Prevention Enforcement Act of 1992, North American Wetland Conservation Act, and Coastal Barrier Resources Act.

The states in general possess broad trustee and police powers over fish and wildlife within their borders, including – absent a clear expression of Congressional intent to the contrary – fish and wildlife on federal lands within their borders. Where Congress has given federal agencies certain conservation responsibilities, such as for migratory birds or species listed as threatened or endangered under the Endangered Species Act, the states, in most cases, have cooperative management responsibilities.

The Sikes Act (16 U.S.C. 670c-1) allows the Secretary of a military department to enter into cooperative agreements with the states, local governments, Indian tribes, nongovernmental organizations, and individuals to provide for the maintenance and improvement of natural resources, or to benefit natural and historic research, both on and off DoD installations.

The Sikes Act (16 U.S.C. 670a(d)(2) also encourages the Secretary of Defense, to the greatest extent practicable, to enter into agreements to use the services, personnel, equipment, and facilities, with or without reimbursement, of the Secretary of the Interior or states in carrying out the provisions of this section.

The Economy Act (31 U.S.C. 1535 and 1536) allows a federal agency to enter into an agreement with another federal agency for services, when those services can be rendered in a more

convenient or cost effective manner by another federal agency.

D. RESPONSIBILITIES

The Parties to this agreement hereby enter into a cooperative program of INRMP development, review, and implementation with mutually agreed-upon fish and wildlife conservation objectives to satisfy Sikes Act goals.

1. **The DoD, the FWS and AFWA (Parties) mutually agree:**

   a. To meet at least annually at the headquarters' level to discuss implementation of this MOU. The DoD and FWS will alternate responsibilities for coordinating this annual meeting and any other meetings related to this MOU. Proposed amendments to the MOU should be presented in writing to the parties at least 15 days prior to the annual meeting. The terms of this MOU and any proposed amendments may be reviewed at the annual meeting. The meeting may also review mutual Sikes Act research and technology needs, accomplishments, and other emerging issues.

   b. To participate in a Sikes Act Tripartite Core Group consisting of representatives from the Parties. This Core Group will meet at least quarterly, coordinated by the DoD, to discuss and develop projects and guidance to help prepare and implement INRMPs and to discuss Sikes Act issues of national importance.

   c. To engage in sound management practices for natural resource protection and management pursuant to this MOU with full consideration for military readiness; native fish and wildlife; threatened, endangered and at-risk species; and the environment.

   d. To promote the sustainable multipurpose use of natural resources on military installations – including hunting, fishing, trapping, and non-consumptive uses such as wildlife viewing, boating, and camping – in ways that are consistent with DoD's primary military mission and to the extent reasonably practicable.

   e. To develop and implement supplemental Sikes Act MOUs or other agreements, as needed, at the regional and/or state level.

   f. To recognize the most current DoD and FWS Sikes Act Guidance as the guidance for communication and cooperation of the Parties represented by this MOU.

   g. To post current DoD, FWS, and state Sikes Act guidance documents within 14 days of completion on the following sites:

      i. For DoD: https://www.denix.osd.mil/nr

      ii. For FWS: http://www.fws.gov/habitatconservation/sikes_act.html

      iii. For the states: http://www.fishwildlife.org

h. To cooperatively prepare and conduct full reviews of all new INRMPs in a timely manner.

i. To require the DoD Components and appropriate FWS and state offices to conduct a review for operation and effect of each INRMP no less often than every five years, as required by the Sikes Act, and to document these reviews. As a means of facilitating and streamlining this statutory requirement, use the annual progress review of each INRMP as conducted by each DoD Component per DoD policy.

j. To encourage collaboration in annual progress reviews between representatives from each military installation with an INRMP and appropriate representatives from the other Parties.

    i. The Parties shall discuss the performance of each military installation in meeting relevant DoD Natural Resources Focus Area metrics, and potential improvements to INRMP implementation, such as new projects or management practices.

    ii. Meetings may be in person or by another mutually acceptable means.

    iii. The Parties shall discuss methods and projects that the FWS and states can implement that support INRMP goals and objectives.

k. To streamline and expedite the review of INRMP updates or revisions, and to effectively address review for critical habitat exclusions based on the INRMP conservation benefit, when feasible:

    i. DoD and the FWS will develop and implement a streamlined review process within six months of signature of this MOU that will allow for expedited review and approval (new signatures) of updated sections of each INRMP.

    ii. DoD will provide a means of easily identifying all changes to each updated or revised INRMP when forwarding it for review.

    iii. FWS will focus review on those parts of updated INRMPs that reflect changes from the previously reviewed version.

    iv. FWS and the appropriate states will review all INRMPs with major revisions (e.g., changes required by mission realignments, the listing of new species or other significant action that has the potential to affect military operations or readiness).

    v. DoD, FWS, and the states (acting through AFWA) will continue to seek opportunities to make INRMP review processes more efficient while sustaining and enhancing INRMP conservation effectiveness.

    vi. The DoD Components may submit to the USFWS, a priority INRMP list

to address those installations seeking critical habitat exclusions to facilitate coordination with USFWS Endangered Species office.

vii. To ensure consistency, the Parties accept the following definitions:

a) Compliant INRMP: An INRMP that has been both approved in writing, and reviewed, within the past five years, as to operation and effect, by authorized officials of DoD, DOI, and each appropriate state fish and wildlife agency.

b) Review for operation and effect: A comprehensive, joint review by the parties to the INRMP, conducted no less often than every five years, to determine whether the plan needs an update or revision to continue to address adequately Sikes Act purposes and requirements.

c) INRMP update: Any change to an INRMP that, if implemented, is not expected to result in consequences materially different from those in the existing INRMP and analyzed in an existing NEPA document. Such changes will not result in a significant environmental impact, and installations are not required to invite the public to review or to comment on the decision to continue implementing the updated INRMP.

d) INRMP revision: Any change to an INRMP that, if implemented, may result in a significant environmental impact, including those not anticipated by the parties to the INRMP when the plan was last approved and/or reviewed as to operation and effect. All such revisions require approval by all parties to the INRMP, and will require a new or supplemental NEPA analysis.

l. That none of the Parties to the MOU is relinquishing any authority, responsibility, or duty established by law, regulation, policy, or directive.

m. To designate the officials listed below, or their delegates to participate in the activities pursuant to this MOU.

i. DoD: Deputy Director, Natural Resources Conservation Compliance, ODUSD (I&E) ESOH

ii. FWS: National Sikes Act Coordinator, Fish and Aquatic Conservation

iii. AFWA: Director, Government Affairs

2. DoD agrees to:

a. Communicate the establishment of this MOU to all DoD Components.

b. Take the lead in developing policies and guidance related to INRMP development, updates, revisions, and implementation, and to ensure the involvement, as appropriate, in these processes of the FWS and state fish and wildlife agencies.

c. Ensure distribution of the DoD and FWS Sikes Act Guidance to all appropriate DoD Components.

d. Encourage DoD Components to invite appropriate FWS and state fish and wildlife agency offices to participate in annual INRMP reviews. All such invitations should be extended at least 15 business days in advance of the scheduled review to facilitate meaningful participation by all three Parties. Meetings may be in person or by other mutually agreed upon means.

e. Encourage DoD Components to take full advantage of FWS and state fish and wildlife agency natural resources expertise through the use of Economy Act transfers and cooperative agreements. Encourage DoD Components and FWS to explore the use of the Fish and Wildlife Coordination Act for technical assistance, fish stocking, and other conservation projects. Priority should be given to projects that:

    i. Sustain the military mission.

    ii. Effectively apply ecosystem management principles.

    iii. Consider the strategic planning priorities of the FWS and the state fish and wildlife agency.

f. Encourage DoD Components to give priority to INRMP requirements that:

    i. Sustain military mission activities while ensuring conservation of natural resources.

    ii. Provide adequate staffing with the appropriate expertise for updating, revising, and implementing each INRMP within the scope of DoD Component responsibilities, mission, and funding constraints.

g. Encourage DoD Components to discuss with the FWS and state fish and wildlife agencies all issues of mutual interest related to the protection, conservation, and management of fish and wildlife resources on DoD installations.

h. Subject to mission, safety, security, and ecosystem requirements, provide public access to military installations to facilitate the sustainable multipurpose use of its natural resources.

i. Identify natural resource research needs, and develop research proposals with input from the Parties.

j. Identify opportunities to work with the DoD Components to facilitate:

    i. Cooperative regional and local natural resource conservation partnerships and initiatives with FWS and state fish and wildlife agency offices.

    ii. Natural resources conservation technology transfer and training initiatives

between the DoD Components, federal land management agencies, and state fish and wildlife agencies.

k. Provide law enforcement support to protect fish, wildlife, and plant resources on military installations consistent with jurisdiction and authority.

3. FWS agrees to:

a. Communicate the establishment of this MOU to each FWS Regional Office and appropriate field offices in close proximity to military installations.

b. Distribute the DoD and FWS Sikes Act Guidelines to each FWS Regional Office and appropriate field office in close proximity to military installations.

c. Designate regional and field office FWS liaisons to develop partnerships and help DoD implement joint management of ecosystem-based natural resource management programs, and provide a list of those liaisons to the DoD as needed.

d. Provide technical assistance with the appropriate expertise to the DoD in managing its resources within the scope of FWS responsibilities and funding constraints.

e. Encourage field offices to coordinate current and proposed FWS natural resource initiatives and research efforts with those that may relate to DoD installations, and to provide applicable installations with new and relevant information pertaining to distribution and/or research regarding listed and candidate species and species at-risk.

f. Inform DoD Components and affected installations regarding upcoming and reasonably foreseeable proposed listing and critical habitat designations that may potentially affect military installations in a timely manner before publication of such proposals in the Federal Register.

g. Encourage regional and field offices to expedite pending INRMP reviews that may affect foreseeable proposed listing of threatened and endangered species and critical habitat designations.

h. Provide law enforcement support as appropriate to protect fish, wildlife, and plant resources on military installations within the jurisdiction of the FWS.

i. Identify FWS refuges and other potential federal management areas in close proximity to military installations, and, where appropriate, participate in the joint management of ecosystem-based natural resource management projects that support INRMP and other planning goals, objectives, and implementation.

4. AFWA agrees to:

a. Communicate the establishment of this MOU to each state fish and wildlife agency director and appropriate personnel.

b. Distribute the DoD and FWS Sikes Act Guidelines to each state fish and wildlife agency director and appropriate staff.

c. Facilitate and coordinate with the states to encourage them to:

i. Participate in developing, reviewing, updating, revising, approving and, as appropriate implementing INRMPs in a timely way upon request by military installation personnel.

ii. Designate state liaisons to help develop partnerships and to help DoD installation staff implement natural resource conservation and management programs.

iii. Identify state wildlife management areas in close proximity to military installations and, where appropriate, participate in the joint management of ecosystem-based natural resources projects that support INRMP goals, objectives, and implementation.

iv. Provide technical assistance to DoD installation staff in adaptively managing natural resources within the scope of state responsibilities, funding constraints, and expertise.

v. Identify state personnel needs to develop, review, update/revise, approve, and implement INRMPs, and facilitate the identification of funding opportunities to address the fulfillment of state priorities.

vi. Coordinate current and proposed state natural resources research efforts with those that may relate to DoD installations.

vii. Coordinate with DoD installations to develop new, and implement existing, conservation plans and strategies, including, but not limited to State Wildlife Action Plans; the National Fish, Wildlife and Plants Climate Adaptation Strategy; goals or initiatives of the North American Bird Conservation Initiative (NABCI) and/or Partners in Amphibian and Reptile Conservation (PARC); and the National Fish Habitat Action Plan.

E. STATEMENT OF NO FINANCIAL OBLIGATION

This MOU does not impose any financial obligation on the part of any signatory.

F. ESTABLISHMENT OF COOPERATIVE AGREEMENTS

The Parties are encouraged to enter into cooperative or interagency agreements to coordinate and implement natural resource management on military installations. If fiscal resources are required, the Parties must develop a separately funded cooperative or interagency agreement.

Such cooperative or interagency agreements may also be entered into under the authority of the Sikes Act (16 U.S.C. 670c-l). Interagency agreements may be entered into under the authority of the Economy Act (31 U.S.C. 1535 and 1536). The Parties should also explore opportunities to utilize the Fish and Wildlife Coordination Act, as amended (16 U.S.C. 661-666c) to facilitate agreements for FWS technical assistance, fish stocking, and other conservation activities. Each funded cooperative or interagency agreement shall include a work plan and a financial plan that identify goals, objectives, and a budget and payment schedule. A cooperative or interagency agreement to accomplish a study or research also will include a study design and methodology in the work plan. It is understood and agreed that any funds allocated via these cooperative or interagency agreements shall be expended in accordance with its terms and in the manner prescribed by the fiscal regulations and/or administrative policies of the party making the funds available.

G. AMENDMENTS

This MOU may be amended at any time by mutual written agreement of the Parties.

H. TERMINATION

Any party to this MOU may remove itself upon sixty (60) days written notice to the other parties.

I. EFFECTIVE DATE AND DURATION

This MOU will be in effect upon date of final signature, and will continue for ten years from date of final signature. The parties will meet six (6) months prior to the expiration of this MOU to discuss potential modifications and renewal terms.

7-29-13
Date

John Conger
Acting Deputy Under Secretary of Defense
(Installations and Environment)
U.S. Department of Defense

6.24.13
Date

Dan Ashe
Director
Fish and Wildlife Service
U.S. Department of Interior

7-15/2013
Date

Ron Regan
Executive Director
Association of Fish and Wildlife Agencies

MEMORANDUM OF UNDERSTANDING

BETWEEN

THE DEPARTMENT OF DEFENSE

AND

BAT CONSERVATION INTERNATIONAL

PREFACE

1. This agreement establishes a policy of cooperation and coordination between the Department of Defense (DoD) and Bat Conservation International (BCI) to identify, document and maintain bat populations and their habitats on DoD installations.

2. The DoD has a long history of commitment to protection of the environment and the natural resources that have been entrusted to its care while at the same time accomplishing its primary mission of national defense.

3. DoD wishes to receive technical assistance in techniques for improving management of bat populations and their habitats, and to gain access to a nationwide network of compatible data and support that can be used to assess the significance of bat populations and habitat found on DoD lands.

4. BCI was formed to promote conservation, education, and research initiatives involving bats and the ecosystems they serve. BCI provides information and service to scientists, land managers, and the public.

5. Both BCI and the DoD have responsibilities and interests in the management of wildlife and their habitats. Both parties agree that wildlife habitats need to be conserved and managed to protect wildlife and to meet the growing public demand for wildlife conservation and related scientific opportunities. Furthermore, BCI and DoD desire to assist each other in conducting inventories, monitoring, and research; initiating actions which will increase the productivity of bats and enhance their habitats; and educating the public about the roles and values of bats in ecosystems on lands managed or used by the DoD.

PURPOSE

The purpose of this MOU is to establish procedures for planning and conducting cooperative efforts by BCI and DoD on DoD lands. It also establishes policies and procedures for BCI to provide technical assistance to DoD to maintain or increase the productivity of bats and their habitats on DoD lands; to keep once-common bat species from being Federally-listed as threatened or endangered; and to work to recover presently listed species of bats and prevent species extinction.

RESPONSIBILITIES

The Department of Defense and Bat Conservation International do mutually agree that:

1. The DoD will, subject to the availability of resources and under the terms of separately funded subagreements to this MOU, undertake such tasks as:

a. Provide leadership for the planning, implementation, and monitoring of work undertaken pursuant to this agreement and supplemental subagreements.

b. Designate a point of contact for coordination of BCI activities at the Service Headquarters, major command, and/or installation, as deemed appropriate by each Service.

c. Provide BCI representatives at the end of each fiscal year with a summary report of project accomplishments executed supplemental to this agreement.

d. Identify and evaluate appropriate proposed bat conservation proposals and existing projects for possible implementation as partnership initiatives with BCI.

e. Coordinate project planning with appropriate Federal and State agencies to ensure that planned projects are consistent with Federal and State management objectives for bats and other Federal and State legal and statutory requirements.

f. Identify a DoD representative to serve as liaison for any proposal field study.

g. Compensate BCI for their assistance, as mutually agreed upon in supplemental subagreements.

h. Communicate the establishment of this MOU to all Military Departments, major commands, and appropriate installations.

2. Bat Conservation International will, subject to the availability of resources and under the terms of separately funded subagreements to this MOU, undertake such tasks as:

a. Provide expertise, as well as labor, materials, and/or funds for the implementation of agreed-upon inventory, monitoring, and habitat improvement projects; education and public awareness efforts; or research efforts; as feasible and in accordance with BCI policy.

b. Designate a point of contact for coordination of DoD initiatives at BCI, as deemed appropriate.

c. Enter into separate subagreements (e.g. specific collection or donation agreements, volunteer agreements, or contracts) with the DoD to accomplish agreed-upon work developed supplemental to this agreement. Such work may include training, consultation, inventories, monitoring, habitat improvement projects, education, or research projects.

d. Refrain from referring to this MOU in commercial advertising in a manner which states or implies that the activities of the BCI are approved or endorsed by the DoD.

e. Submit for review to the DoD prior to release any proposed releases to the public media which reference this MOU or any employee of the DoD.

f. Communicate the establishment of this MOU to appropriate BCI cooperative units.

g. Make training available for DoD personnel in the survey, inventory and monitoring of bats.

3. DoD and BCI will hold an annual meeting to review progress made under this document and to discuss new project proposals within the purposes of this MOU.

4. Each project requiring a payment of funds by BCI to the DoD will be documented and signed by the responsible organizational unit line officer of the DoD and a BCI representative using an appropriate agreement.

5. Special matching fund projects will be documented via cooperative agreements and signed by the responsible DoD official and BCI representatives.

6. The implementation of this MOU and subsequent supplemental subagreements is subject to required funds being available to both parties of the MOU. Nothing in this MOU shall be construed as obligating the DoD to the expenditure of funds.

7. Nothing herein contained shall be construed as limiting or affecting in any way the delegated authority of the Department of Defense.

8. Nothing herein shall impede the parties from using other mechanisms to accomplish the purposes set out above.

DELEGATION

1. Authorized representatives of BCI and the DoD may execute special use authorizations and enter into supplemental subagreements within the scope of this document

2. Any supplemental subagreement negotiated under the authority of this MOU will remain in full force and effect, unless and until modified or terminated by local signatory parties, per the terms of said supplemental subagreements.

MODIFICATION AND TERMINATION

1. This MOU may be modified or amended upon written request of either party and the written concurrence of the other. The MOU may be terminated with 60-day written notice of either party; however, sufficient attempts should be made to modify, rather than to terminate, the MOU.

2. Five years after signature by both parties, this MOU shall be reviewed and considered for renewal. Signatures must be obtained from both parties to fully execute the renewal.

IMPLEMENTATION

This MOU becomes effective when signed by both parties.

Alex Albert Beehler 10/11/06
Assistant Deputy Under Secretary of Defense Date
(Environment, Safety and Occupational Health)

Merlin D. Tuttle 10/2/06
Executive Director Date
Bat Conservation International

MEMORANDUM OF UNDERSTANDING
BETWEEN THE
U.S. DEPARTMENT OF DEFENSE
AND
BAT CONSERVATION INTERNATIONAL
TO PROMOTE BAT CONSERVATION

The Memorandum of Understanding (MOU) between the Bat Conservation International and the Department of Defense (hereinafter referred to "the Parties"), signed in 2006, expired on October 11, 2011. Both Parties have agreed to extend the MOU as currently written for eight years to meet its stated purpose, scope and responsibilities.

The principal contacts for this instrument are as follows:

Mylea Bayless
Conservation Programs Manager
Bat Conservation International
PO Box 162603
Austin, Texas 78716

Deputy Director, Natural Resources
Office of the Secretary of Defense
1225 S. Clark St.
Suite 1500
Arlington, VA 22202-4336

The Parties hereto have extended this agreement as of the date shown below to remain effective through October 11, 2019.

Nina Fascione
Executive Director
Bat Conservation International

12/19/11
Signature Date

VP Operations
David L. Waldien
for
Nina Fascione

John Conger
Assistant Deputy Under Secretary of Defense
(Installations and Environment)
U.S. Department of Defense

12/9/2011
Signature Date

MEMORANDUM OF UNDERSTANDING
BETWEEN THE

U.S. DEPARTMENT OF DEFENSE
AND THE
U.S. FISH AND WILDLIFE SERVICE

TO PROMOTE THE CONSERVATION OF MIGRATORY BIRDS

This Memorandum of Understanding (MOU) is entered into between the U.S. Department of Defense (DoD) and the U.S. Fish and Wildlife Service (FWS) (hereinafter "the Parties").

A. Purpose and Scope

This MOU is entered into pursuant to Executive Order 13186, *Responsibilities of Federal Agencies to Protect Migratory Birds* (66 FR 3853 [January 17, 2001]). The purpose of this MOU is to promote the conservation of migratory bird populations while sustaining the use of military managed lands and airspace for testing, training, and operations.

This MOU does not address incidental take resulting from military readiness activities or active DoD airfield operations. Military readiness activities are covered by 50 CFR 21.15 (Authorization of take incidental to military readiness activities). Bird-related management activities with a potential to affect airfield operations or safety will be managed according to DoDI 4165.57 and the airfield's Bird/Wildlife Aircraft Strike Hazards (BASH) Program.

Installation commanders responsible for military airfields will not implement wildlife conservation prescriptions set forth in this MOU if they conclude that such actions will negatively impact military mission or combat capability, or if such action will increase the possibility of aircraft-wildlife strikes. Should installation commanders choose to implement wildlife conservation measures, they must follow BASH guidelines, and consider military mission impacts and elevated risk to aircraft and aircrew.

This MOU specifically pertains to the following categories of DoD activities:

1) Natural resource management activities, including, but not limited to, habitat management, erosion control, forestry activities, hunting, fishing, agricultural outleasing, conservation law enforcement, invasive-weed management, and prescribed burning;[1]

2) Installation support activities, including, but not limited to, administration, retail sales, food service, health care, water and sewage treatment, supply and storage, education, housing, equipment maintenance, base transportation, laundry and dry cleaning, recreation, and religious activities;

3) Operation of industrial activities;

[1] Vegetation management within the airfield environment shall be governed by the installation Integrated Natural Resource Management Plans (INRMP) and associated Bird/Wildlife Aircraft Strike Hazard (BASH) Plan.

4) Construction, maintenance, renovation, or demolition of facilities that support the activities described in items 1 through 3; and

5) Prevention or abatement of pollution or detrimental alteration of the environment for the benefit of migratory birds, as practicable.

This MOU identifies specific activities where cooperation between the Parties will contribute substantially to the conservation of migratory birds and their habitats. This MOU does not alter or waive any responsibilities of DoD or FWS, as applicable, under the Migratory Bird Treaty Act (MBTA), the Bald and Golden Eagle Protection Act (Eagle Act), and the Endangered Species Act (ESA); nor does it authorize the take of migratory birds.

B. Authorities

The Parties' responsibilities under the MOU are authorized by provisions of the following laws and authorities:

- Alaska National Interest Lands Conservation Act of 1980 (16 U.S.C. 410hh-3233)
- Bald and Golden Eagle Protection Act of 1940, as amended (16 U.S.C. 668-668d)
- Endangered Species Act of 1973, as amended (16 U.S.C. 1531-1544)
- Executive Order 13186: Responsibilities of Federal Agencies to Protect Migratory Birds, 2001 (66 FR 3853 [January 17, 2001])
- Fish and Wildlife Act of 1956, as amended (16 U.S.C. 791a *et seq.*)
- Fish and Wildlife Conservation Act of 1980, as amended (16 U.S.C. 2901-2911)
- Fish and Wildlife Coordination Act of 1980, as amended (16 U.S.C. 661-667)
- Migratory Bird Conservation Act of 1929, as amended (16 U.S.C. 715 *et seq.*)
- Migratory Bird Treaty Act, of 1918, as amended (16 U.S.C. 703-711)
- National Environmental Policy Act of 1969 (42 U.S.C. 4321-4347)
- Sikes Act Improvement Act of 1997 (16 U.S.C. 670a-670o)
- Agreements to limit encroachments and other constraints on military training, testing, and operations (10 U.S.C. 2684a)

C. Background

Department of Defense

The DoD mission is to provide for the Nation's defense. DoD's Natural Resources Program works to ensure continued access to land, air, and water resources for realistic military training and testing, while ensuring that the natural and cultural resources entrusted to DoD's care are sustained in a healthy condition.

The DoD is an active participant in international bird conservation partnerships including Partners in Flight (PIF) and the North American Bird Conservation Initiative (NABCI). Through PIF and NABCI, DoD works in partnership with numerous federal and state agencies and nongovernmental organizations to conserve migratory and resident birds and to enhance their survival. Military lands frequently provide some of the best remaining habitat for migratory and resident bird species, and DoD plans to continue supporting bird conservation activities.

Integrated Natural Resources Management Plans (INRMPs) offer a coordinated approach for incorporating habitat conservation efforts into installation management. INRMPs provide significant baseline information that can be used when preparing National Environmental Policy Act (NEPA) documents for all DoD management activities. This linkage helps to ensure that appropriate conservation and mitigation measures are identified in NEPA documents and committed to, when appropriate, in final decision documents.

The DoD develops INRMPs cooperatively with the FWS and appropriate state fish and wildlife agencies. DoD's strategy focuses on inventorying and long-term monitoring to determine changes in migratory bird populations on DoD installations. Effective on-the-ground management may then be applied to those areas identified as having the highest conservation value. DoD's goal is to support military training and testing by providing for no net loss of an installation's military readiness capability and capacity. DoD implements cooperative projects and programs on military lands to benefit the health and well-being of birds and their habitats, when consistent with the military mission, military readiness, and the safety of DoD personnel.

The DoD has a cooperative network of natural resources personnel and others from military installations across the United States that provides technical assistance, including how to incorporate landbird, shorebird, and waterbird habitat management efforts into INRMPs. These bird conservation experts work collaboratively to conserve migratory and resident birds and their habitats on DoD lands.

The DoD implements bird inventories and monitoring programs in numerous ways, including Next Generation Radar (NEXRAD) for studying bird movements in the atmosphere, and maintains an integrated pest management (IPM) program designed to reduce the use of pesticides, herbicides, fungicides, etc. In addition, the management of natural resources on DoD properties benefits migratory birds through efforts such as invasive-species control, habitat enhancement/restoration, water-quality improvement, and wetland conservation.

Fish and Wildlife Service

As a federal agency within the U.S. Department of the Interior, the FWS mission is to work with others to conserve, protect, manage, and enhance fish, wildlife, plants, and their habitats for the continuing benefit of the American people. The FWS Migratory Bird Program serves as a focal point in the United States for policy development and strategic planning, program implementation, and evaluation of actions designed to conserve migratory birds and their habitats.

The FWS is legally mandated to implement the conservation provisions of the MBTA, which includes responsibilities for managing migratory bird populations, domestic and international coordination, and the development and enforcement of regulations that govern authorized take of migratory birds. The Migratory Bird Conservation Act established the Migratory Bird Conservation Commission to approve land acquisition with Migratory Bird Conservation Funds. The Fish and Wildlife Coordination Act (FWCA) requires consultation under certain circumstances and added provisions to recognize the important contribution of wildlife resources to the Nation. The FWCA requires consideration and coordination of wildlife conservation, including habitat protection, through acquisition, enhancement, and/or management and avoidance and minimization of avian stressors related to federal activities.

The following FWS programs have responsibilities with regards to bird conservation activities:

1) The Division of Migratory Bird Management and the Migratory Bird Programs in FWS Regional Offices serve as focal points for policy development and strategic planning. These offices develop and implement monitoring and management initiatives that help maintain healthy populations of migratory birds and their habitats, and provide continued opportunities for citizens to enjoy bird-related recreation.

2) The Division of Bird Habitat Conservation is instrumental in supporting habitat conservation partnerships through the administration of bird conservation grant programs and development of Joint Ventures that serve as major vehicles for implementing the various bird conservation plans across the country.

3) Ecological Services Field Offices across the country serve as the primary contacts for technical assistance and environmental reviews involving migratory bird issues. The Field Offices coordinate with the Regional Migratory Bird Offices, as necessary, regarding permits and overall migratory bird conservation coordination.

4) The Office of Law Enforcement is the principal FWS program that enforces the legal provisions of the MBTA, Eagle Act, ESA, and other laws pertaining to migratory birds.

5) The National Wildlife Refuge (NWR) System manages NWRs and Waterfowl Production Areas across the country, many of which were established to protect and conserve migratory birds. NWRs not only protect important bird habitat, but also focus on monitoring migratory bird populations, restoring and maintaining native habitats, and educating the public on recreational and economic benefits of migratory birds.

6) The Science Applications program works with other FWS programs and partners to ensure that the necessary science, tools, and capacity are available for planning and implementing the most efficient and effective conservation actions to protect fish and wildlife, including migratory birds. The office facilitates regional self-directed science management partnerships called Landscape Conservation Cooperatives to develop and apply shared science capacity to conservation.

D. Statement of Mutual Interest and Benefit

The Parties have a common interest in the conservation and management of America's natural resources. The Parties agree that migratory birds are important components of biological diversity, and that the conservation of migratory birds will help sustain ecological systems and help meet the public demand for conservation education and outdoor recreation, such as wildlife viewing and hunting opportunities. The Parties also agree that it is important to focus on reducing stressors on bird populations, restore and enhance habitat where actions can benefit specific ecosystems and migratory birds dependent upon them, and recognize that actions taken to benefit some migratory bird populations may adversely affect other migratory bird populations. The Parties also agree that while it is the FWS' aim to ensure biologically diverse, thriving habitat for migratory birds away from airfields, it is DoD's aim to ensure flight safety by making airfield environments as unattractive as possible to migratory birds while supporting FWS' efforts away from airfields.

E. Responsibilities of Both Parties

The Parties agree that this MOU shall be implemented to the extent permitted by law and in harmony with evolving requirements of agency missions, subject to the availability of appropriations and budgetary limits. Both Parties shall:

1) Support the conservation intent of Executive Order 13186, and the migratory bird conventions by:

    a) Integrating bird conservation principles, measures, and practices into agency planning and actions; and

    b) Avoiding or minimizing, to the extent practicable, the exposure of birds and their resources to avian stressors that result in take.

2) Emphasize an interdisciplinary, collaborative approach to migratory bird conservation in cooperation with other governments, state and federal agencies, and non-federal partners within the geographic framework of the NABCI Bird Conservation Regions.

3) Work to protect, restore, and enhance migratory bird habitats, as practicable, on DoD-managed lands, in ways that do not conflict with or impede military training and testing, by:

    a) Designing and executing actions to minimize, to the extent practicable and consistent with the military mission, avian stressors on migratory bird populations, including impacts to breeding, migration, or wintering habitats; and by developing and implementing, as appropriate, conservation measures that could reduce the take of migratory birds or enhance the quality of the habitats they use;

    b) Working to identify, conserve, and manage significant bird conservation sites that occur on DoD-managed lands;

    c) Preventing or abating pollution or detrimental alteration of the environment for the benefit of migratory birds, as practicable; and

    d) Preventing the introduction and establishment of, and controlling and reducing the spread of existing, non-native invasive species that may be harmful to native flora and fauna, including migratory bird populations, as required by Executive Order 13112 on Invasive Species.

4) Work with willing landowners to prevent or minimize the loss or degradation of migratory bird habitats on lands adjacent or near military installation boundaries. This cooperative conservation may include:

    a) Participating in efforts to identify, protect, and conserve important migratory bird habitats or other significant bird conservation sites and ecological conditions that occur in landscapes or watersheds that may be of conservation value to migratory

birds found on DoD lands, and that also buffer one or more installations from adverse impacts to DoD mission or resource-management activities;

b) Providing information on migratory bird resources found on DoD lands for partners to include and integrate into their outreach and education materials and activities; and

c) Using available authorities to enter into agreements with federal, state, tribal, or other governmental entities, or nongovernmental organizations to conserve and enhance habitats in a manner compatible with military operations.

5) Promote collaborative projects such as:

a) Developing or using existing inventory and monitoring programs, at appropriate scales, with national or regional standardized protocols, to assess the status and trends of bird populations and habitats, including migrating, breeding, and wintering birds;

b) Designing management studies and research/monitoring projects using national or regional standardized protocols and programs to identify the habitat conditions needed by applicable species of concern, to understand interrelationships of co-existing species, and to evaluate the effects of management activities on habitats and populations of migratory birds;

c) Sharing inventory, monitoring, research, and study data for breeding, migrating, and wintering bird populations and habitats in a timely fashion with national data repositories such as the Avian Knowledge Network, National Point Count Database, and Monitoring Avian Productivity and Survivorship (MAPS);

d) Working in conjunction with each other and federal and state agencies to develop reasonable and effective conservation measures for actions that reduce the exposure of birds and their habitats to avian stressors;

e) Participating in or promoting the implementation of existing regional or national inventory and monitoring programs such as Breeding Bird Survey (BBS), Christmas Bird Counts, bird atlas projects, or game-bird surveys (e.g., mid-winter waterfowl surveys) on DoD lands where practicable and feasible;

f) Using existing partnerships and exploring opportunities for expanding and creating new partnerships to facilitate combined funding for inventory, monitoring, management studies, and research; and

g) Improving habitat on lands adjacent to DoD-managed lands through programs such as the DoD Readiness and Environmental Protection Integration and Land and Water Conservation Fund programs.

6) Work cooperatively to identify and utilize existing conservation measures to avoid or minimize the effects of avian stressors, and develop new conservation measures as

needed.

7) Per Executive Order 13186 (Sec. 3(12)), provide training opportunities to appropriate personnel on responsibilities under the MBTA, the Eagle Act, and other regulations protecting birds, current processes for coordination on bird conservation issues, strategies for properly assessing how actions effect bird populations, and recommended approaches on how to avoid or minimize the exposure of birds and their habitats to avian stressors.

8) Participate annually in the interagency Council for the Conservation of Migratory Birds. The duties of the Council include the following:

    a) Sharing resource information to help conserve and manage migratory birds;

    b) Fostering partnerships to further the goals of Executive Order 13186;

    c) Reporting annually on Executive Order accomplishments and recommendations; and

    d) Selecting an annual recipient of a Presidential Migratory Bird Federal Stewardship Award.

9) Promote migratory bird conservation nationally and internationally through activities such as National Public Lands Day and International Migratory Bird Day.

F. Department of Defense Responsibilities

1) Follow all migratory bird permitting requirements for intentional take under 50 CFR 21.22 (banding or marking), 21.23 (scientific collecting), 21.26 (special Canada Goose permit), 21.27 (special purposes), or 21.41 (depredation). Though no permit is required to take birds in accordance with 50 CFR 21.43 - 21.47 (depredation orders), follow all regulatory requirements set forth in those sections when applicable.

2) Consistent with military mission requirements, encourage incorporation of comprehensive migratory bird management objectives into relevant DoD planning documents, including INRMPs, Integrated Pest Management Plans (IPMPs), Installation Master Plans, NEPA analyses, and other relevant documents. Comprehensive planning efforts for migratory birds include PIF Bird Conservation Plans, the North American Waterfowl Management Plan, U.S. Shorebird Conservation Plan, North American Waterbird Conservation Plan, and associated regional plans where available.

3) Consistent with current and emerging mission requirements, manage military lands and non-military readiness activities in a manner that supports migratory bird conservation, habitat protection, restoration, and enhancement.

4) Inventory and monitor bird populations on DoD lands to the extent feasible to facilitate decisions about the need for, and effectiveness of, conservation efforts

5) In accordance with DoD *INRMP Implementation Manual* (DoDM 4715.03, 2013),work

cooperatively with FWS and state and fish and wildlife agencies to promote timely development, effective review, and revisions of INRMPs, including any potential revisions to promote the conservation of migratory birds.

6) Incorporate conservation measures addressed in regional or state bird conservation plans in the INRMP development process.

7) Consistent with safety and security requirements, allow the FWS and other partners reasonable access to military lands for conducting sampling or survey programs, including but not limited to MAPS, BBS, International Shorebird Survey, game-bird surveys, and breeding bird atlases.

8) Consistent with safety and security requirements and bird conservation responsibilities, support the economic and recreational benefits of bird-related activities by allowing public access to military lands for recreational uses, such as bird watching and other non-consumptive activities.

9) Develop policies and procedures for facilities design that will promote the conservation of migratory bird populations and habitat, including:

    a) Mitigating the negative impacts of reflective glass in building design by considering building location and orientation with respect to migratory bird areas, and use of other mitigation techniques, such as reducing the amount of reflective glass on buildings;

    b) Maximizing the use of native landscaping to promote migratory bird habitat, except in areas subject to BASH hazards.

    c) Turning off interior building lighting at night, especially lighting in offices with exterior windows that face outward to exterior building surfaces that may be visible to migratory or resident birds.

10) Prior to implementing any activity that has, or is likely to have, a measurable negative effect on migratory bird populations:

    a) Identify the migratory bird species likely to occur in the area of the proposed action, and determine if any species of concern could be affected by the activity;

    b) Assess and document, through the project planning process (e.g., NEPA), the potential effects of the proposed action on species of concern. Use best available demographic, population, or habitat-association data in the assessment of effects upon species of concern; and

    c) Engage in early planning and scoping with the FWS to proactively address migratory bird conservation, and to initiate appropriate actions to avoid or minimize the exposure of birds and their habitats to avian stressors that may result in the take of migratory birds.

11) Continue to promote the conservation of migratory birds on military lands, to the extent

permitted by law, subject to the availability of appropriations, within Administration budgetary limits, and where in harmony with DoD missions.

a) Fire and fuels-management practices. Fire plays an important role in shaping plant and animal communities, and is a valuable tool in restoring habitats altered by decades of fire suppression. Fire management may include fire suppression, fire prevention, fuels treatment, and prescribed burning. Prescribed burning is one of the most effective tools in managing grassland and longleaf pine/wiregrass ecosystems. Fire-management planning efforts will consider the effects of fire management strategies on the conservation of migratory bird populations, and should be combined with monitoring to properly assess fire management on relevant habitats and species.

b) Management practices for invasive and aquatic nuisance species. Invasive and aquatic nuisance species are a threat to native plants and wildlife throughout the United States, including on military lands. Efforts to prevent, control, and contain these species must take into account both the impacts from invasive species and the effects of the control efforts on migratory bird populations. Invasive species that can threaten migratory birds and their habitats include, but are not limited to, exotic grasses, trees and weeds, terrestrial and aquatic insects and organisms, non-native birds, and stray and feral cats.

c) Communications towers, utilities, and energy development. Increased communications demands, changes in technology, and the development of alternative energy sources have resulted in additional exposure of migratory birds and their resources to avian stressors. DoD will review best practices outlined in FWS Guidance, and consult with FWS as needed when considering the development of these technologies on military lands. Construction of new utility and energy systems and associated infrastructure should avoid or minimize the exposure of birds and their resources to avian stressors. Consideration also may be given to retrofitting existing utilities to reduce impacts. Available guidance includes (but is not limited to):

   i. Avian Power Line Interaction Committee - *Suggested Practices for Avian Protection on Power Lines* (2006)
   ii. Avian Power Line Interaction Committee - *Reducing Avian Collisions with Power Lines* (2012)
   iii. U.S. Fish and Wildlife Service *Land-based Wind Energy Guidelines* (2012)
   iv. U.S. Fish and Wildlife Service *Guidance on the Siting, Construction, Operation, and Decommissioning of Communication Towers* (2000) and FWS comments to the FCC on towers and lighting (2007)

12) To the extent reasonable and practicable, use a best-practices approach for routine maintenance, retrofitting, and management actions to the extent they do not diminish military readiness, including:

a) Turning out lights in buildings, especially multiple-story buildings, at night,

except where needed for safety or security reasons;

b) Reducing or eliminating activities that can attract invasive species, including feeding or managing outdoor or feral cats;

c) Minimizing or eliminating the use of pesticides (e.g., insecticides, herbicides, rodenticides);

d) Covering open pipes in which birds may be able to enter but not escape (e.g., in-ground pipes, outhouses, roofs);

e) Minimizing exposure to hazardous chemicals, including covering or removing open pits containing oil or other chemicals; and

f) Minimizing vegetation removal and manipulation during the breeding season, as practicable and when not in conflict with airfield BASH management.

G. Responsibilities of the Fish and Wildlife Service

1) Work with DoD by providing recommendations to minimize the effects of avian stressors on migratory birds from DoD actions.

2) Through the Division of Migratory Bird Management, maintain a Web page of permits that provides links to all offices responsible for issuing migratory bird take permits and permit applications.

3) Provide essential background information to DoD, when requested, to ensure sound management decisions. This may include information on migratory bird distributions, status, key habitats, conservation guidelines, and risk factors within each BCR. FWS will regularly update its *Birds of Conservation Concern* publication so it can be reliably referenced.

4) Work to identify special migratory bird habitats (e.g., nesting, stopover, migration corridors), and the ecological conditions important in those habitats.

5) Using the Points of Contact list (Appendix A), the FWS will continue to provide general guidance and information regarding migratory birds and their habitats to DoD, upon request. This guidance includes technical assistance for avoiding or minimizing project-related impacts on migratory birds.

6) The Migratory Bird Program will develop and provide FWS guidance to the Ecological Services Field Offices to ensure consistency in the interpretation and implementation of the MBTA as it applies to all federal actions.

7) In accordance with FWS Guidelines for Coordination with DoD and Implementation of the 1997 Sikes Act, promote timely and effective review of INRMPs, including any potential recommendations and revisions related to the conservation of migratory birds.

8) Review and comment on NEPA and other planning documents forwarded by military

installations.

9) Notify installations of any proposed or current actions that may result in a significant take of migratory birds.

H. Dispute Resolution

Preventing potential conflicts or resolving disagreements between the Parties will be attempted first at staff levels and elevated through the respective organizational levels if necessary. If staff level resolution is not possible, the conflict will be addressed through Alternative Dispute Resolution processes.

I. Mutual Agreement

1) This MOU will not change or alter requirements associated with the MBTA, Eagle Act, ESA, NEPA, Sikes Act, or other statutes or legal authority. This MOU is intended to provide internal guidance to federal agency staff.

2) The discretionary responsibilities established by this MOU may be incorporated into planned DoD actions; however, DoD may not be able to implement these discretionary responsibilities until DoD has successfully included them in formal planning, programming, and budgeting processes. This MOU is intended to be implemented when new actions are initiated as well as when INRMPs, IPMPs, and BASH plans are initiated or revised, and if the MOU's discretionary responsibilities are successfully included in formal planning, programming, and budgeting processes.

3) This MOU in no way restricts either Party from participating in similar activities with other public or private agencies, governments, organizations, or individuals.

4) This MOU is neither a fiscal nor a funds-obligation document. Any endeavor involving reimbursement, contribution of funds, or transfer of anything of value between the Parties will be handled in accordance with applicable laws, regulations, and procedures, including those for government procurement and printing. Such endeavors will be outlined in separate agreements that shall be made in writing by representatives of the Parties, and shall be independently authorized by appropriate statutory authority.

5) The Parties shall schedule periodic meetings to review progress and identify opportunities for advancing the principles of this MOU.

6) This MOU is intended to improve the internal management of the executive branch, and does not create any right or benefit, substantive or procedural, separately enforceable as law or equity by a party against the United States, its agencies or instrumentalities, its officers or employees, or any other person.

7) Modifications to the MOU's scope shall be made by the Parties' mutual consent, through issuance of a written modification, signed and dated by the Parties, prior to any changes.

8) Either Party may terminate this MOU, in whole or in part, at any time before the

expiration date by providing the other Party with a written statement to that effect.

F. Definitions

Action – a program, activity, project, official policy, rule, regulation, or formal plan directly carried out by one of the Parties.

Airfield Environment – UFC 3-260-01 defines what an airfield is and all of its component parts, and defines clearance criteria. DoDI 4165.57 AICUZ describes the acceptable land uses for component parts of the airfield. The Airfield's BASH Program is responsible for maintaining hazard-free airfields.

Avian Knowledge Network – an international organization of government and non-government institutions focused on understanding the patterns and dynamics of bird populations across the Western Hemisphere (www.avianknowledge.net).

Avian Stressor – any alteration of or addition to the environment that affects birds or their resources.

Bird/Wildlife Aircraft Strike Hazard (BASH) – an actual or potential collision between wildlife (i.e., a bird, mammal, or reptile) and an aircraft (e.g., plane or helicopter).

Breeding Bird Survey (BBS) – a standardized international survey that provides information on population trends of breeding birds, through volunteer observations located along randomly selected roadside routes in the United States, Canada and Mexico (www.mbr-pwrc.usgs.gov/bbs/bbs.html).

Bird Conservation Region (BCR) – a geographic unit used to facilitate bird conservation actions under the North American Bird Conservation Initiative (www.nabci-us.org/bcrs.htm).

Birds of Conservation Concern – a list that is published and periodically updated by the FWS Division of Migratory Bird Management intended to identify the migratory and non-migratory bird species that-- in addition to species already listed under the ESA, proposed or candidate-- represent the FWS's highest conservation priorities, including ESA candidate species. The most current version of the list, Birds of Conservation Concern 2008, is available at www.fws.gov/migratorybirds/CurrentBirdIssues/Management/BCC.html.

Cantonment Area – the principal built-up area of a DoD installation, typically containing housing, barracks, military organizational areas, and community support infrastructure.

Comprehensive Planning Efforts for Migratory Birds – includes Partners in Flight, North American Waterfowl Management Plan, U.S. Shorebird Conservation Plan, Western Hemisphere Shorebird Reserve Network, North American Waterbird Conservation Plan, and other partnership planning efforts integrated through the North American Bird Conservation Initiative.

Conservation Measure – any action undertaken to address project-related stressors/impacts that ultimately improve the conservation status of one or more migratory bird species. Conservation measures split into two categories: Ecological/Habitat measures (driven by EO 13186) and Avian

Mortality measures (driven by MBTA). Conservation measures work to avoid or minimize an impact, reduce the impact over time, or rectify or compensate for the impact. Conservation Measures are also referred to as Mitigation, Best Practices, and Best Management Practices.

Conservation Planning – strategic and tactical planning of agency activities for the long-term conservation of migratory birds and their habitats.

Council for the Conservation of Migratory Birds – an interagency council established by the Secretary of the Interior to oversee the implementation of Executive Order 13186.

Ecological Condition – the composition, structure, and processes of ecosystems over time and space. This includes the diversity of plant and animal communities, the productive capacity of ecological systems and species diversity, ecosystem diversity, disturbance processes, soil productivity, water quality and quantity, and air quality. Often referred to in terms of ecosystem health, which is the degree to which ecological factors and their interactions are reasonably complete and functioning for continued resilience, productivity, and renewal of the ecosystem.

Effect (adverse or beneficial) – the biological consequences of an impact or the implementation of a conservation measure. Effects can be adverse (habitat avoidance) or beneficial (improved habitat quality). The effect is determined by the exposure of the bird or resource to the stressor/impact and the response to the impact. Effects may be direct, indirect, or cumulative, and refer to effects from actions or categories of actions on migratory birds, their populations, habitats, ecological conditions, and significant bird conservation sites.

Impact – the combined result of an action/project, all of its associated activities and components, and the stressors (see below) produced by those actions.

Integrated Natural Resources Management Plan (INRMP) – an integrated plan based, to the maximum extent practicable, on ecosystem management that shows the interrelationships of individual components of natural resources management (e.g., fish and wildlife, forestry, land management, outdoor recreation) to military mission requirements and other land use activities affecting an installation's natural resources. INRMPs are required for all DoD installations with significant natural resources, pursuant to the Sikes Act.

International Shorebird Survey – a monitoring program started in 1974 to survey shorebirds (sandpipers, plovers, etc.) across the Western Hemisphere (www.pwrc.usgs.gov/iss/iss.html).

International Migratory Bird Day (IMBD) – IMBD celebrates, brings attention to, and educates people about the migration of nearly 350 species of migratory birds that nest and breed throughout the Western Hemisphere. IMBD is celebrated in Canada, the United States, Mexico, Central and South America, and the Caribbean (http://birdday.org/birdday).

Management Action – an activity by a government agency that could cause a positive or negative impact to migratory bird populations or habitats. Conservation measures to mitigate potential activity-related stressors may be required.

Migratory Bird – an individual of any species protected by the Migratory Bird Treaty Act (MBTA) as listed in 50 CFR § 10.13.

Military Readiness Activity – all Armed Forces training and operations that relate to combat, including but not limited to the adequate and realistic testing of military equipment, vehicles, flight operations, weapons, and sensors for proper operation and suitability for use in combat.

Monitoring Avian Productivity and Survivorship (MAPS) – a program that uses the banding of birds during the breeding season to track the changes and patterns in the number of young produced, and the survivorship of adults and young (www.birdpop.org/maps.htm).

National Environmental Policy Act (NEPA) – a federal statute that requires federal agencies to prepare a detailed analysis of the environmental impacts of a proposed action and alternatives, and to include public involvement in the decision making process for major federal actions significantly affecting the quality of the human environment 42 U.S.C. 4321, et seq.

North American Bird Conservation Initiative (NABCI) – a partnership to align the avian conservation community to implement bird conservation through regionally-based, biologically driven, landscape-oriented partnerships across the North American continent. NABCI includes federal agencies of Canada, Mexico and the United States, as well as most landbird, shorebird, waterbird, and waterfowl conservation initiatives (www.nabci-us.org).

North American Waterbird Conservation Plan – a partnership of federal and state government agencies, non-governmental organizations, and private interests focusing on the conservation of waterbirds, primarily including marshbirds and inland, coastal, and pelagic colonial waterbirds (www.waterbirdconservation.org/plans.html). The partnership's vision is that the distribution, diversity, and abundance of breeding, migratory, and nonbreeding waterbirds are sustained throughout the lands and waters of North America, Central America, and the Caribbean.

North American Waterfowl Management Plan – a partnership of federal and state agencies, non-governmental organizations, and private interests focusing on the restoration of waterfowl populations through habitat restoration, protection, and enhancement (http://birdhabitat.fws.gov/NAWMP/nawmphp.htm).

Partners in Flight (PIF) – a cooperative partnership of more than 300 partners including federal and state government agencies, non-governmental organizations, conservation groups, foundations, universities, and industry focusing on the conservation of landbirds. DoD was an original signatory to the 1991 PIF Federal Agencies' MOA (www.partnersinflight.org).

Ranges & Training Areas (RTAs) – as defined within each installation's INRMP.

Species of Concern – refers to several categories of birds including: 1) species listed in the periodic report, *Birds of Conservation Concern*, published by the FWS Division of Migratory Bird Management (www.fws.gov/migratorybirds); 2) priority migratory bird species documented in the comprehensive bird conservation plans (North American Waterbird Conservation Plan, United States Shorebird Conservation Plan, Partners in Flight Bird Conservation Plans); 3) species or populations of waterfowl identified as high, or moderately high, continental priority in

the North American Waterfowl Management Plan; 4) listed threatened and endangered bird species in 50 CFR § 17.11; and 5) MBTA-listed gamebirds of management concern, as listed in the *Birds of Management Concern* list (www.fws.gov/migratorybirds/CurrentBirdIssues/Management/BMC.html).

Take – to pursue, hunt, shoot, wound, kill, trap, capture or collect or attempt to pursue, hunt, wound, kill, trap, capture or collect (50 CFR § 10.12). The Executive Order 13186 further defines "take" to include intentional take, meaning take that take is the purpose of the activity in question, and unintentional (incidental) take, meaning take that results from, but is not the purpose of, the activity in question. Both intentional and unintentional take constitute take as defined by the MBTA. The regulations implementing the Eagle Act define take to mean pursue, shoot, shoot at, poison, wound, kill, capture, trap, collect, destroy, molest, or disturb bald and golden eagles (50 CFR § 22.3).

U.S. Shorebird Conservation Plan – a partnership of federal and state government agencies, non-governmental organizations, and private interests focusing on restoring and protecting stable and self-sustaining populations of all shorebird species (www.shorebirdplan.org).

K. Agreement Contacts and Execution

The principal contacts for this instrument are as follows:

Brad Bortner, Chief Division of Migratory Bird Management US Fish and Wildlife Service	L. Peter Boice, Deputy Director Natural Resources Program Office of the Secretary of Defense

This MOU is executed as of the last date signed below and expires no later than five (5) years thereafter, at which time it is subject to review and renewal, or expiration.

The Parties hereto have executed this agreement as of the date shown below:

Dan Ashe Director US Fish and Wildlife Service	John Conger Acting, Deputy Under Secretary of Defense (Installations & Environment) US Department of Defense
Signature 9.5.2014 Date	Signature 7/10/2014 Date

Appendix A: FWS Points of Contact list

Contact Information for Headquarters and Regional U.S. Fish and Wildlife Service Migratory Bird and Ecological Services Offices. For a complete listing of field offices see http://www.fws.gov/offices/.

FWS Region	States Covered	Migratory Bird Office	Migratory Bird Permits	Endangered Species
Headquarters		703-358-1714	703-358-1825	703-358-2171
Region 1	Hawaii, Idaho, Oregon, Washington	503-231-6164	503-872-2715	503-231-6151
Region 2	Arizona, New Mexico, Oklahoma Texas	505-248-6875	505-248-7882	505-248-6920
Region 3	Illinois, Indiana, Iowa, Michigan, Minnesota, Missouri, Ohio Wisconsin	612-713-5473	612-713-5436	612-713-5350
Region 4	Alabama, Arkansas Florida, Georgia Kentucky, Louisiana Mississippi, North Carolina, South Carolina, Tennessee	404-679-7070	404-679-7070	404-679-7140
Region 5	Connecticut, Delaware, Maine Maryland, Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania Rhode Island, Vermont, Virginia West Virginia	413-253-8643	413-253-8643	413-253-8304
Region 6	Colorado, Kansas Montana, Nebraska North Dakota, South Dakota, Utah Wyoming	303-236-4409	303-236-8171	303-236-4252
Region 7	Alaska	800-368-8890	907-786-3693	907-786-3856
Region 8	California, Nevada	916-414-6464	916-414-6464	916-414-6464

MEMORANDUM OF UNDERSTANDING BETWEEN THE DEPARTMENT OF DEFENSE AND THE STATE OF CALIFORNIA TO CONSERVE HABITAT VALUES AND PROTECT MILITARY MISSIONS IN CALIFORNIA

The Great Seal

This Memorandum of Understanding (MOU) between the Department of Defense and the State of California (collectively, the "Parties") is made this 3rd day of November, 2004.

WHEREAS, the Secretary of Defense or the Secretary of a military department has the authority under Section 2684a of Title 10, United States Code to enter into agreements with eligible entities (a State, political subdivisions of a State, or private entity whose principal mission is the conservation, restoration or preservation of land and natural resources) for the acquisition of property interests for the purpose of preserving property that provides habitat in a manner that relieves or eliminates restrictions that inhibit military testing, operations or training or for the purposes of limiting incompatible development in the vicinity of military installations,

WHEREAS, the people of California have passed through ballot initiatives a number of bond measures whose purposes include the protection of property that provides habitat, and which provide funding for purchases of lands and interests in lands accomplished through certain of the constituent agencies within the California Resources Agency;

WHEREAS, military installations in California are often located in areas of high biodiversity so that there may be a high correlation between military lands and airspace and property that provides habitat values in California;

WHEREAS, the protection of habitat values by the State of California and the use of these lands for buffers to military installations and military airspace use are compatible;

WHEREAS, the California Resources Agency has created a California Digital Atlas GIS information system which brings together a number of mapping resources available at a scale sufficient to identify certain types of issues concerning specific parcels to any internet user;

WHEREAS the inclusion of information on military installations, military special use airspace and military training routes in the California Digital Atlas will assist the Parties to implement the goals of this MOU by providing access to information useful for the identification of potential land use conflicts as well as allow for the planning of cooperative projects to protect property that provides habitat and to buffer military installations and military airspace;

WHEREAS the military services have identified some high priority projects that they believe would provide for the protection of military readiness and the protection of important California natural resources;

NOW THEREFORE, in recognition of the above, the Parties hereby pledge to work together to develop and implement a process for evaluating and, as appropriate, undertaking projects identified by either Party that have the dual purpose of protecting habitat values in California and providing buffers to California military installations and military airspace from development that could threaten California's rich biodiversity or limit the military's ability to ensure the preparedness of the Nation's Armed Forces. To this end, the Parties intend to work together cooperatively to evaluate and, as appropriate, complete one or more of the high priority projects identified by the military services. The period during which the Parties undertake this preliminary cooperative effort shall be referred to as the "Test Project Phase." If projects completed during the Test Project Phase are deemed to be successful by the Parties, the Parties intend to enter into a Memorandum of Agreement that shall outline a process and address the roles of these and other interested parties to support a State/Department of Defense cooperative program consistent with the above-stated goals and objectives and all applicable federal, state and local law as shall be further specified in the Memorandum of Agreement. The Parties shall use their best efforts to enter into such a Memorandum of Agreement within 180 days after the successful completion of the Test Project Phase or as soon as reasonably feasible.

Alex A. Beehler

DEPARTMENT OF DEFENSE
Alex A. Beehler
Assistant Deputy Under Secretary of Defense
(Environment, Safety and Occupational Health)

Mike Chrisman

STATE OF CALIFONRIA
Mike Chrisman
Secretary of Resources

MEMORANDUM OF UNDERSTANDING
between the
Department of Defense
and the
Pollinator Partnership

This Memorandum of Understanding (MOU) is entered into by and between the Department of Defense, hereinafter written as DoD, and the Pollinator Partnership (the "Parties").

ARTICLE I – BACKGROUND AND OBJECTIVES

The objective of this MOU is to establish a framework for cooperative programs that promote the conservation and management of pollinators, their habitats and associated ecosystems.

The DoD has a long history of commitment to protecting the environment and the natural resources that have been entrusted to its care, while at the same time accomplishing its primary mission of national defense.

Through federal law and regulations, DoD is responsible for the conservation and management of natural and cultural resources, ecological processes, and threatened, endangered and sensitive or rare plant and animal species and their habitats. Cooperative relationships are essential to the effectiveness of resource management on and off military owned lands.

The Pollinator Partnership's mission is to act as a catalyst for stewardship, working to improve the health and survival of all species by promoting the health of pollinating animals, and by protecting and restoring their habitats. The Pollinator Partnership coordinates the North American Pollinator Protection Campaign (NAPPC), a unique, tri-national collaboration working to promote awareness and scientific understanding of pollinators; to gather, organize and disseminate information about pollinators; to provide a forum to identify and discuss pollinator issues; and to promote projects, initiatives and activities that enhance pollinators and their habitats.

It is the goal of both Parties to cooperate with each other in matters relating to the management and conservation of pollinators and the ecosystems they depend upon. The framework for cooperation and coordination is especially important to ensure that pollinator management activities are incorporated, where practicable, into installation integrated natural resource management plans (INRMPs) and practices.

ARTICLE II – AUTHORITIES

This MOU is made and entered into pursuant to the provisions of the Sikes Act (16 U.S.C. 670a-670o, as amended), and supports the Presidential Memorandum *Creating a Federal Strategy to Promote the Health of Honey Bees and Other Pollinators* (June 2014). In addition, requirements under other applicable laws, regulations, and specific DoD directives and guidance also apply.

ARTICLE III – RESPONSIBILITIES

A. DoD will, subject to the availability of resources and under the terms of separately funded sub-agreements to this MOU, and consistent with requirements and activities described in its INRMPs, undertake such tasks as:

1. Support and, as feasible, undertake activities that help, conserve, protect, and restore pollinators and their habitats in accordance with DoD mission and policies.

2. Conserve and manage pollinators and their habitats in accordance with applicable federal laws and regulations to foster conservation.

3. Enter into supplemental sub-agreements with the Pollinator Partnership, including but not limited to special use permits, research permits, cooperative agreements, or contracts to accomplish work projects agreed upon by both Parties.

4. Provide unclassified/publicly releasable information on DoD mission requirements and constraints that will assist the understanding of for Pollinator Partnership personnel performing activities on DoD lands.

5. Meet annually, or as necessary, to identify projects and activities of mutual benefit and to plan and implement agreed to projects.

6. Work with the INRMP signatories to identify pollinator management activities in support of the Presidential Memorandum.

B. The Pollinator Partnership will:

1. Cooperate with DoD to implement actions that both Parties have agreed upon.

2. Provide DoD with expertise to implement agreed upon projects.

3. Enter into appropriate sub-agreements with DoD to accomplish specific projects agreed upon by both Parties.

4. Meet annually, or as necessary, to identify projects/activities of mutual benefit and to plan and implement agreed upon projects.

5. Help implement specific projects on DoD lands that support both Parties' missions while conserving pollinators and their habitats in accordance with DoD policies.

6. Inform the general public about DoD pollinator conservation projects.

7. Help train DoD personnel about pollinators and pollinator habitat conservation and management.

ARTICLE IV – DELEGATION

A. Authorized representatives of NAPPC and the DoD may execute special use authorizations, and enter into supplemental sub-agreements within the scope of this MOU.

B. Any supplemental sub-agreement negotiated under the authority of this MOU will remain in full force and effect, unless and until modified or terminated by local signatory Parties, per the terms of said supplemental sub-agreements.

ARTICLE V – TERMS OF AGREEMENT

This MOU will remain in effect from the date of final signature until it is terminated pursuant to Article VII.

ARTICLE VI – KEY OFFICIALS

Key officials are essential to ensure maximum coordination and communication among the Parties regarding the work being performed. The designated officials are:

Department of Defense	**Pollinator Partnership**
L. Peter Boice	Laurie Davies Adams
Deputy Director, Natural Resources Program	Executive Director
Office of the Assistant Secretary of Defense (Energy, Installation & Environment)	Pollinator Partnership
4800 Mark Center Drive, 16G14	423 Washington Street, 5th Floor
Alexandria, VA 22350-0001	San Francisco, CA 94111-2339
Phone: 571-372-6905	Phone: 415-362-1137
Fax: 703-607-4237	FAX: 415-362-3070
E-mail: L.P.Boice.civ@mail.mil	E-mail: LDA@pollinator.org

ARTICLE VII – MODIFICATION AND TERMINATION

A. This MOU will remain in effect until one of the Parties executes item B or C under this article.

B. This MOU may be amended upon written request of either the DoD or the Pollinator Partnership, and the subsequent written concurrence of the other.

C. Either Party may terminate this MOU by providing the other Party with sixty (60) days advance written notice.

ARTICLE VIII – STANDARD CLAUSES

A. **Public Information Release**

1. The Pollinator Partnership will not publicize or otherwise circulate promotional material (such as advertisements, sales brochures, press releases, speeches, pictures, still and motion pictures, articles, manuscripts, or other publications) that states or implies federal government, departmental, bureau, or federal government employee endorsement of a product, service or position that the Pollinator Partnership represents. No release of information relating to this MOU may state or imply that the federal government approves of the work product of the Pollinator Partnership or considers the Pollinator Partnership's work product to be superior to other products or services.

2. The Pollinator Partnership will ensure that all information submitted for publication or other public releases of information regarding this project will carry the following disclaimer:

   "The views and conclusions contained in this document are those of the authors, and should not be interpreted as representing the opinions or policies of the U.S. Government. Mention of trade names or commercial products does not constitute their endorsement by the U.S. Government."

3. The Pollinator Partnership will obtain prior DoD approval from the key DoD official for this MOU for any DoD-wide public information release that refers to DoD, the Military Services, offices, programs, or employee (by name or title), or to this MOU. For specific installation information, the Pollinator Partnership will obtain prior approval form that installation's public affairs office. The specific text, layout, photographs, etc., of the proposed release must be submitted to the MOU's technical representative, who will forward such materials to the public affairs office, along with the request for approval, or from the specific DoD installation public affairs office.

4. The Pollinator Partnership agrees to include the above provisions of this Article in any sub-award, except for a sub-award to a state government, a local government, or to a federally recognized Indian tribal government.

B. **Freedom of Information Act (FOIA).** Any information furnished to DoD under this MOU is subject to the Freedom of Information Act (5 U.S.C. 552).

C. **Participation in Similar Activities.** This MOU in no way restricts DoD or the Pollinator Partnership from participating in similar activities with other public or private agencies, organizations, or individuals.

D. **Non-Fund Obligating Document.** Nothing in this MOU shall require either DoD or the Pollinator Partnership to obligate, expend, or transfer any funds. Specific work projects or activities that involve the transfer of funds, services or property among the various agencies and offices of DoD and the Pollinator Partnership will require execution of separate agreements and be contingent upon the availability of appropriated funds. Such activities must be independently authorized by appropriate statutory authority. This MOU does not provide such authority. Negotiation, execution and administration of each such agreement must comply with all applicable statutes and regulations.

E. **Establishment of Responsibility** This MOU is not intended to, nor does it, create any right, benefit, or trust responsibility, substantive or procedural, enforceable at law or equity, by a Party against the United States, its agencies, its officers, or any person.

F. **Authorized Representatives**. By signing below, the individuals listed in this document certify that they are representatives of their organizations, and are authorized to act in their respective areas for matters related to this MOU.

THE PARTIES HERETO have executed this MOU:

POLLINATOR PARTNERSHIP

Laurie Davies Adams — 02/09/15

Laurie Davies Adams
Executive Director
Pollinator Partnership

Date

DEPARTMENT OF DEFENSE

John Conger — 1/28/2015

John Conger
Performing the Duties of the Assistant Secretary of Defense
(Energy, Installations & Environment)
Department of Defense

Date

OFFICE OF THE ASSISTANT SECRETARY OF DEFENSE
3400 DEFENSE PENTAGON
WASHINGTON, DC 20301-3400

ENERGY,
INSTALLATIONS
AND ENVIRONMENT

FEB 19 2015

MEMORANDUM FOR ASSISTANT SECRETARY OF THE ARMY (INSTALLATIONS, ENERGY AND ENVIRONMENT)
ASSISTANT SECRETARY OF THE NAVY (ENERGY, INSTALLATIONS AND ENVIRONMENT)
ASSISTANT SECRETARY OF THE AIR FORCE (INSTALLATIONS, ENVIRONMENT AND ENERGY)
DIRECTOR, DEFENSE LOGISTICS AGENCY

SUBJECT: Strategic Plan for Amphibian and Reptile Conservation and Management on Department of Defense Lands

The Department of Defense's core responsibility is to defend our Nation and care for our Service personnel and their families. Consistent with this objective, the American public also expects us to protect and conserve the land, sea, and airspace we require for military operations. *The Strategic Plan for Amphibian and Reptile Conservation and Management on Department of Defense Lands* document is intended to help natural resource managers better address the conservation and protection of amphibians and reptiles and their habitats; to help Commanders comply with the Endangered Species Act and the National Environmental Policy Act; and to help both Commanders and resource managers achieve their mission objectives by providing relevant technical guidance on priorities such as:

- implementing proactive, habitat-based management strategies that maintain healthy landscapes and training lands in ways that sustain and enable DoD's mission activities;
- promoting proven conservation partnerships to help leverage financial and human resources to achieve common goals, such as preventing species from becoming listed as threatened or endangered; and
- minimizing environmental encroachment, which continues to impact the military's ability to conduct operations in once-remote areas.

This document provides a framework for our natural resources managers to use as they update, revise, and implement Integrated Natural Resources Management Plans to ensure that we are supporting Commanders by meeting environmental requirements and mission readiness. In updating this Strategic Plan, we worked closely with many of your staff, I appreciate the time and effort they invested, and wholeheartedly support this endeavor. I ask that you join me in its advocacy and distribute this document as widely as possible.

My lead for amphibian and reptile conservation and management activities is Mr. L. Peter Boice, at (571) 372-6905 or by email at l.p.boice.civ@mail.mil.

John Conger
Performing the Duties of the Assistant Secretary of Defense
(Energy, Installations and Environment)

Attachment:
As stated

UNITED STATES MARINE CORPS
MARINE CORPS INSTALLATIONS WEST-MARINE CORPS BASE
BOX 555010
CAMP PENDLETON, CALIFORNIA 92055-5010

MCIWEST-MCB
CAMPENO 5090.1
ENVSEC

29 JUL 2015

MCIWEST-MCB CAMPEN ORDER 5090.1

From: Commanding General
To: Distribution List

Subj: MARINE CORPS INSTALLATIONS WEST-MARINE CORPS BASE, CAMP PENDLETON ENVIRONMENTAL PROGRAM SUPPORT FOR MARINE CORPS AIR STATION CAMP PENDLETON

Ref: (a) MCO P5090.2

Reports Required:

I. EPCRA Section 311/312 and Section 313 Reports (Report Control Symbol DD-5090-30) par. 3,c.,(d),1.
II. Hazardous Waste Pollution and Prevention Annual Data (Report Control Symbol DD-5090 -11) par. 3,c.,(d),2.
III. Solid Waste Pollution and Prevention Annual Data (Report Control Symbol DD-5090 -12) par. 3,c.,(d),2.
IV. Annual Air Emissions Inventory Report (Report Control Symbol DD-5090-28) par. 3, c.,(d),3.
V. National Pollutant Discharge Elimination System (NPDES) Report (Report Control Symbol DD-5090-07) par. 3,c.,(d),5.

1. Situation. Marine Corps Air Station Camp Pendleton (MCAS CamPen) is located in the Santa Margarita River watershed and within Marine Corps Base, Camp Pendleton (MCB CamPen). MCAS CamPen is almost entirely built-out and its limited inventory of regulated resources is a portion of a much greater population, acreage, and inventory that are managed by the Base. MCB CamPen has the capability to include Marine Corps Air Stations' resources in the Base's Environmental Management Programs, which will benefit both MCB CamPen and MCAS CamPen by generating contractual efficiencies and providing a consistent voice to the agencies that regulate those resources.

2. Mission. This Order sets forth Marine Corps Installations West-Marine Corps Base, Camp Pendleton's (MCIWEST-MCB CAMPEN) Policy and supporting/supported responsibilities for the management of select

Marine Corps Environmental Program functions aboard MCAS CamPen that will support compliance with the reference and those environmental statutes referenced therein.

3. Execution

a. Commander's Intent. The purpose of this Order is to formalize existing environmental services support relationships and to realize economies of scale and program efficiencies between MCB CamPen and MCAS CamPen.

b. Concept of Operations. MCIWEST-MCB CAMPEN Environmental Security (ENVSEC) will coordinate, execute, and monitor selected installation environmental support functions for MCAS CamPen.

c. Tasks

(1) Director, ENVSEC

(a) Provide for disposal of MCAS CamPen Hazardous Waste (HW) generated by operational activities under MCB CamPen's Environmental Protection Agency Identification Number on a non-reimbursable basis.

(b) Provide emergency emptying and routine servicing of oil-water separators and spill tanks on a non-reimbursable basis.

(c) Coordinate all Installation Restoration (IR) activities that occur within the MCAS CamPen fence line.

(d) Incorporate MCAS CamPen data when preparing and submitting the following documents and reports to regulators and higher Headquarters:

1. Emergency Planning and Community Right to Know Act (EPCRA) Toxic Release Inventory Reports and EPCRA 312 reports.

2. Solid Waste and HW Annual Reports to Headquarters Marine Corps.

3. Annual Emissions Inventory Report for submission to the San Diego Air Pollution Control District.

4. Portable Equipment Registration Program Reports, Refrigerant Management Program Report, and other Greenhouse Gas Reports for submission to the California Air Resources Board.

5. Industrial and Municipal Storm water National Pollutant Discharge Elimination System (NPDES) Permit Annual Reports and Industrial Storm water Pollution Prevention Plans (SWPPP).

6. Reports as required under the Riparian Biological Opinion (BO 1-6-95-F-02) to the United States (U.S.) Fish and Wildlife Service (Carlsbad Field Office).

7. Integrated Natural Resources Management Plan (INRMP) and Integrated Cultural Resources Management Plan (ICRMP) objectives, projects, and actions.

(e) In coordination with MCAS CamPen, include Air Station resources in the MCB CamPen INRMP and ICRMP and related programming and contracting actions, such as resource surveys, invasive species management, and artifact recovery/curation.

(f) Provide annual reports to MCAS CamPen, documenting actions taken to support MCAS CamPen's natural and cultural resources.

(g) Require visiting ENVSEC personnel and/or authorized representatives to coordinate with the MCAS CamPen ENVSEC Office prior to entering the Air Station and to report to the MCAS CamPen ENVSEC Office prior to starting work.

(h) Issue burn permits to MCAS CamPen for crash, fire and rescue training.

(2) Commanding Officer, MCAS CamPen

(a) Dispose of HW in accordance with the procedures established by MCIWEST-MCB CAMPEN ENVSEC.

(b) Notify MCIWEST-MCB CAMPEN ENVSEC in the event of a release or discovery of contamination.

(c) Reimburse MCB CamPen for disposal of HW generated in response to a spill.

(d) Maintain records and conduct required inspections of underground and aboveground storage tanks within MCAS CamPen, to include the aboveground storage tank located at the 25 Area burn pit.

(e) Implement Industrial and Municipal Storm water NPDES Permit provisions in accordance with applicable Industrial SWPPP and relevant MCB CamPen storm water procedures.

(f) Provide information to MCIWEST-MCB CAMPEN ENVSEC, as required, for reports to regional, state, and federal regulatory agencies with oversight of the following media and resource areas: air quality, greenhouse gases, HW, storm water, EPCRA, and IR.

(g) Provide information to MCB CamPen, as required, to prepare the annual report to the U.S. Fish and Wildlife Service for actions covered under the Biological Opinion (BO 1-6-95-F-02) for Programmatic Activities and Conservation Plans in Riparian and Estuarine/Beach Ecosystems on MCAS CamPen.

(h) Provide information, as required, to update the MCB CamPen INRMP and ICRMP (e.g. MCAS CamPen specific objectives, targets, and associated projects).

(i) Provide installation access to MCIWEST-MCB CAMPEN ENVSEC personnel or their representatives, as required, to support the objectives of this Order.

(j) Coordinate with MCIWEST-MCB CAMPEN ENVSEC to obtain burn permits for crash, fire and rescue training.

4. Administration and Logistics. Directives issued by this Headquarters are published and distributed electronically. Electronic versions of MCIWEST-MCB CAMPEN directives can be found at: https://www.mciwest.usmc.mil/inst/mciwest/manpower/MCIWMCBADJ/default.aspx.

5. Command and Signal

a. Command. This Order is applicable to all commands, organizations, units and activities aboard MCB CamPen.

b. Signal. This Order is effective the date signed.

J. K. ARRUDA
Chief of Staff

DISTRIBUTION LIST: A-4
B
C

October 7, 2015

M-16-01

MEMORANDUM FOR EXECUTIVE DEPARTMENTS AND AGENCIES

FROM: Shaun Donovan, Director
Office of Management and Budget

Christina Goldfuss, Managing Director
Council on Environmental Quality

John Holdren, Director
Office of Science and Technology Policy

SUBJECT: Incorporating Ecosystem Services into Federal Decision Making

Overview. Nature provides vital contributions to economic and social well-being that are often not traded in markets or fully considered in decisions. This memorandum provides direction to agencies on incorporating ecosystem services into Federal planning and decision making. (Broadly defined, ecosystem services are the benefits that flow from nature to people, e.g., nature's contributions to the production of food and timber; life-support processes, such as water purification and coastal protection; and life-fulfilling benefits, such as places to recreate.)

Specifically, this memorandum:

(1) Directs agencies to develop and institutionalize policies to promote consideration of ecosystem services, where appropriate and practicable, in planning, investments, and regulatory contexts. (Consideration of ecosystem services may be accomplished through a range of qualitative and quantitative methods to identify and characterize ecosystem services, affected communities' needs for those services, metrics for changes to those services and, where appropriate, monetary or nonmonetary values for those services.)
(2) Sets forth the process for development of implementation guidance and directs agencies to implement aforementioned policies and integrate assessments of ecosystem services, at the

appropriate scale, into relevant programs and projects, in accordance with their statutory authority.

Purpose. The goal of this memorandum and subsequent implementation guidance is to better integrate into Federal decision making due consideration of the full range of benefits and tradeoffs among ecosystem services associated with potential Federal actions, including benefits and costs that may not be recognized in private markets because of the public-good nature of some ecosystem services. An ecosystem-services approach can: (1) more completely inform planning and decisions, (2) preserve and enhance the benefits provided by ecosystems to society, (3) reduce the likelihood of unintended consequences, and, (4) where monetization is appropriate and feasible, promote cost efficiencies and increase returns on investment. Adoption of an ecosystem-services approach is one way to organize potential effects of an action within a framework that explicitly recognizes the interconnectedness of environmental, social, and, in some cases, economic considerations, and fosters consideration of both quantified and unquantified information. This memorandum sets a course to implement this approach.

Scope. This memorandum complements but does not supersede agency activities prescribed by or pursuant to law, tribal consultation policy, Executive Order, regulation, or other relevant guidance. This document provides direction for relevant Federal programmatic and planning activities (including activities such as natural-resource management and land-use planning, climate-adaptation planning and risk-reduction efforts, and, where appropriate, environmental reviews under the National Environmental Policy Act (NEPA)) and other analyses of Federal and Federally-assisted programs, policies, projects, and regulatory proposals. For example, should an agency's analysis require consideration of costs, the agency should consider ecosystem-services assessment methods, where appropriate and feasible.

Background. Ecosystem services provide vital contributions to economic and social well-being. These include, but are not limited to, provisioning food and materials, improving the quality and moderating the quantity of water, providing wildlife habitat and spawning and nursery habitats for fisheries, enhancing climate resilience, mitigating storms and floods, buffering pollutants, providing greater resilience for communities and ecosystems, and supporting a wide array of cultural benefits, recreational opportunities, and aesthetic values. Since the President's Council of Advisors on Science and Technology (PCAST) underscored the value of the Nation's natural capital in its 1998 report, *Teaming with Life*, successive Administrations have worked to develop methodologies and have convened interagency dialogues to advance ecosystem-services approaches in Federal decision making. In 2011, the PCAST revisited the 1998 report, making a specific recommendation to improve the capabilities of Federal agencies to promote consideration of ecosystem services in decision making. The Federal government has made progress toward this goal within individual agencies—for example, in the U.S. Forest Service's 2012 Forest Planning Rule—and in setting broad policy across agencies—for example, by including ecosystem-services concepts in the recent Principles, Requirements and Guidelines for Federal Investment in Water Resources (PR&G).

In recent years, considerable attention has also focused on the role that healthy and intact natural habitats can play in enhancing resilience of communities and ecosystems, including reducing

vulnerability to climate-change impacts. Multiple efforts are underway to incorporate natural and nature-based infrastructure (e.g., dunes and barrier islands) to enhance storm and flood protection, along with efforts to restore natural features (e.g., oyster reefs in the Chesapeake Bay) to benefit multiple ecosystem services, such as fish habitat and water quality. Increased emphasis on ecosystem services to enhance resilience underscores the need for a consistent framework for incorporating ecosystem services into Federal decision making.

Today, the links among land, air, fresh water, ocean, and human activities are better understood. Advances in science and technology have provided timely and usable information to guide decision making. For example, advances in the social sciences have further developed methods to articulate the value of ecosystem services in both monetary and non-monetary terms. By incorporating ecosystem services into Federal agency planning and decision making, and recognizing that healthy ecosystems are essential to human welfare, security, and the health of social and economic systems, Federal agencies will more effectively address the challenges facing the Nation and ensure ecosystems are healthy for this and future generations.

Directive. Agencies shall develop policies to promote consideration of ecosystem-services assessments within existing agency planning and decision frameworks, where appropriate and practicable, in accordance with their statutory authorities and consistent with their specific missions.

1. Policies should describe approaches for conducting decision-relevant and scale-specific ecosystem-services assessments, as well as plans for effective monitoring and evaluation.
2. These policies do not need to be standalone documents and may be most useful when incorporated into existing decision-making frameworks and analyses. Agencies are encouraged to carry out the provisions of this guidance through existing planning and strategic processes such as: Agency and Departmental Strategic Plans, Strategic Sustainability Performance Plans, and Annual Performance Reports.
3. To support agencies in this process, a forthcoming appendix will provide implementation guidance for this memorandum to suggest best practices for ecosystem-services assessment. The implementation guidance will outline an assessment framework for integrating consideration of ecosystem services into existing agency decision process and will describe the elements and approaches for sound integration of ecosystem-services concepts, such as: (1) describing the Federal action; (2) identifying and classifying key ecosystem services in the location of interest; (3) assessing the impact of the Federal action on ecosystem services relative to baseline; (4) assessing the effect of the changes in ecosystem services associated with the Federal action; and (5) integrating ecosystem-services analyses into decision making.

Implementation Process and Timelines. This policy guidance is intended to support those agencies already using ecosystem-services approaches and to encourage other agencies to prepare for implementation in a manner consistent with the forthcoming implementation guidance.

All agencies should begin or continue developing their policies. Agencies already deploying ecosystem-services analyses are encouraged to continue their efforts, but should be prepared to demonstrate over time how their approaches relate to the standards of best practice identified in

the implementation guidance, or to make appropriate adjustments going forward. Implementation of this memorandum will follow the timeline below.

1. **Description of current agency practice and work plans** (6 months; Agencies)
   (a) To inform future governance considerations, agencies shall describe how ecosystem services are currently defined, classified, and incorporated in planning, management, and regulatory decisions. This written description should characterize the current state of agency practice and provide a narrative description of current challenges, if any, which could or do impede the consideration of ecosystem services in Federal decision making. To help with this process, agencies are encouraged, but not required, to review or update existing inventories with relevant efforts, using common definitions and a common framework.
   (b) Each agency shall create a work plan, developed in an internally coordinated manner, laying out how it intends to move toward the goals of this policy directive. These work plans should build off agency descriptions of existing efforts developed in (a). They should identify specific examples of policies planned for the future, as well as identify high-priority programs, projects, or analyses appropriate for integrating ecosystem services assessments within existing decision frameworks.
   (c) Written descriptions (a) and work plans (b) should be completed and submitted to CEQ no later than March 30, 2016.
   (d) Following the release of the implementation guidance (timeline below), agencies will be expected to revise and refine their work plans to show that they are consistent with that document. Revised work plans should be submitted to CEQ within 120 days of the release of the final implementation guidance.

2. **Implementation guidance** (14 months; CEQ)
   (a) The implementation guidance will be developed in collaboration with subject-matter experts from relevant Federal departments and agencies and will be informed by the significant body of research published in the peer-reviewed literature. The guidance will be issued as an appendix to this memorandum.
   (b) The implementation guidance will be subject to an external peer review and public comment period, consistent with the requirements of the Office of Management and Budget (OMB)'s Final Information Quality Bulletin for Peer Review.
   (c) Prior to release for external peer review, there shall be an interagency review period of the implementation guidance of not less than 30 days.
   (d) External peer review will commence no later than November 30, 2016. The memo will be finalized and released following the resolution of the peer review and public-comment process.
   (e) The implementation guidance is intended to be a living document and will be updated as needed to incorporate emerging science and new methodological advances.

Governance and Interagency Coordination. Full integration of ecosystem services into agency decisions will be a long-term process, taking place over many years, as agencies modify existing programs and policies in accordance with the practices outlined in the implementation guidance. Ultimately, successful implementation of the concepts in this directive may require Federal

agencies to modify certain practices, policies, or existing regulations to address evolving understandings of the value of ecosystem services.

Moving forward, CEQ, in consultation with OMB, OSTP, and CEA, will facilitate interagency coordination and engagement around ecosystem services, including supporting agencies in their work to incorporate ecosystem-services assessments in decision making. CEQ, in consultation with OMB, OSTP, and CEA, will also coordinate with existing work groups and other governance structures to develop a longer-term strategy for providing sustained leadership and interagency coordination around ecosystem services. Such ongoing coordination is needed to provide support and oversight for agency work plans and to share best practices for integrating ecosystem services into Federal decision making, including policy development and institutionalization, alignment of data and tools, implementation of relevant research priorities, and integrating assessments into program and project analysis.

OFFICE OF THE ASSISTANT SECRETARY OF DEFENSE
3400 DEFENSE PENTAGON
WASHINGTON, DC 20301-3400

ENERGY,
INSTALLATIONS
AND ENVIRONMENT

JUL 20 2015

MEMORANDUM FOR DEPUTY ASSISTANT SECRETARY OF THE ARMY
(ENVIRONMENT, SAFETY AND OCCUPATIONAL HEALTH)
DEPUTY ASSISTANT SECRETARY OF THE NAVY
(ENVIRONMENT)
DEPUTY ASSISTANT SECRETARY OF THE AIR FORCE
(ENVIRONMENT, SAFETY AND INFRASTRUCTURE)

SUBJECT: Guidelines for Streamlined INRMP Review

I am forwarding the attached final *Guidelines for Streamlined INRMP Review* for your dissemination and use. Your representatives have provided valuable comments on earlier versions of this document.

These *Guidelines for Streamlined INRMP Review* are intended to clarify and describe the process for reviewing and concurring on updates to existing Integrated Natural Resource Management Plans (INRMPs), as described in the recent *Memorandum of Understanding between the U.S. Department of Defense and the U.S. Fish and Wildlife Service (USFWS) and the Association of Fish and Wildlife Agencies for a Cooperative Integrated Natural Resource Management Program on Military Installations* (Tripartite MOU, July 2013).

The USFWS finalized its own internal Guidelines on June 15, 2015. Their Guidelines also reflect this new streamlined process for review INMRP updates, as defined in the Tripartite MOU. DoD's new *Guidelines for Streamlined INRMP Review* do not apply to newly developed INRMPs or to INRMPs undergoing major changes (i.e., revisions). The new process established in the MOU and described and clarified in these Guidelines will:

- Facilitate faster review and approval of INRMPs requiring updates;
- Reduce the number of non-complaint INRMPs; and
- Improve coordination and collaboration among installation personnel and USFWS regional reviewers.

My point of contact is Mr. Peter Boice at (571) 372-6905 or l.p.boice.civ@mail.mil.

Maureen Sullivan
Deputy Assistant Secretary of Defense
Environment, Safety and Occupational Health

Enclosures:
As stated

Mutual Department of Defense & U.S. Fish and Wildlife Service Guidelines for Streamlined Review of Integrated Natural Resources Management Plan Updates

PURPOSE: These *Guidelines for Streamlined Review* are intended to clarify and describe the process for reviewing and concurring on updates[1] to existing Integrated Natural Resource Management Plans (INRMPs), as described in the recent *Memorandum of Understanding between the U.S. Department of Defense (DoD) and the U.S. Fish and Wildlife Service (USFWS) and the Association of Fish and Wildlife Agencies for a Cooperative Integrated Natural Resource Management Program on Military Installations* (Tripartite MOU, July 2013). These Guidelines do not apply to newly developed INRMPs or to INRMPs undergoing major changes (i.e., revisions). Changes that are expected to result in significant biological differences from those identified in an existing INRMP typically require revision—rather than an update—of the INRMP as well as appropriate consideration under the National Environmental Policy Act (NEPA). These Guidelines will remain in effect until explicitly rescinded or superseded by mutual agreement of the signatories.

BACKGROUND: It is DoD policy to review INRMPs annually, and a statutory requirement to have INRMPs reviewed by the USFWS and the appropriate state fish and wildlife agency or agencies (hereafter "states") for operation and effect no less often than every five years. To more effectively respond and rapidly adapt to ongoing natural resource activities (e.g., monitoring, recreational fishing) and to changes that are administrative, process-oriented, or minor (e.g., expanding an existing trail, conducting biological surveys), the three partners (USFWS, DoD, and the states as represented by the Association of Fish and Wildlife Agencies) included a provision in the Tripartite MOU to streamline the review process for incorporating minor changes or "updates" to existing and approved INRMPs. INRMP updates are minor changes to an INRMP that do not result in new biophysical effects, do not change the management prescriptions set forth in the INRMP, and do not require analysis under the NEPA nor associated public review.[2] The use of updates is intended to reduce the workload for all involved agencies while maintaining both INRMP currency and mission flexibility.

FORMAT, COORDINATION, AND RESPONSIBILITIES

Format: When installations update an INRMP, the update should be clear and concise, and its format should match or be complementary to the INRMP. The update shall clearly describe the scope and location of all proposed changes in an accompanying text, table, or matrix format, and the changes themselves shall be captured in the INRMP using the track changes function. A transmittal letter to the states and USFWS summarizing the changes should accompany the package, which will include the track changes INRMP and the text, table, or matrix describing the proposed update. All proposed changes should be clear and easy to understand.

[1] See Appendix 1, page 5, for definitions.
[2] Sikes Tripartite MOU: http://denix.osd.mil/nr/upload/Sikes-Tripartite-MOU.pdf.

Coordination: Early coordination among the installation, states, and USFWS is essential to successful review and approval of INRMPs, Annual Reviews, Reviews for Operation and Effect, and INRMP updates. The installation will submit the draft update to the appropriate state and USFWS offices and, when needed, to the USFWS Regional Sikes Act Coordinator (Sikes Coordinator). Once finalized, the installation shall submit the final update to the states and to both the USFWS field office working with the installation and the Sikes Coordinator. The Sikes Coordinator will help marshal USFWS resources and coordinate with all parties when review timelines described below are in question or are unable to be met.[3]

Responsibilities: The assigned USFWS field office will coordinate review of the draft and/or final update with other USFWS programs or field offices (e.g., the Migratory Bird Program or Ecological Services Office) as appropriate. If requested to do so, the installation will provide copies of the update to other USFWS offices. If cross-program or multiple-office review of an update has occurred, the lead USFWS field office will specify any additional time needed to complete the expedited review and will, by the agreed-upon deadline, provide consolidated comments to the installation. When timing allows, INRMP update discussions should occur annually when metrics are discussed[4].

The existing/operational INRMP remains in effect while the update is under review. Once all parties agree to the requested changes, the designated states, USFWS, and DoD representatives will sign the update. The signed update will carry the full effect of the INRMP, and will be considered reviewed for operation and effect and approved as part of the compliant or operational INRMP. While not a signatory to the Tripartite MOU, when proposed changes affect resources managed by the National Oceanic and Atmospheric Administration (NOAA), NOAA will be included in the review process.

These guidelines need not apply to DoD components or installations that have already implemented a successful method for updating INRMPs with their USFWS field offices and state agencies.

DRAFT AND FINAL UPDATE REVIEW AND CONCURRENCE

1) Once the DoD component or installation determines that an INMRP update is appropriate, personnel will notify the USFWS and/or state offices with which they coordinate regarding their INRMP. This notification should be initiated by the DoD component or installation as soon as possible, and no less than 30 days prior to submitting the draft update for review.

2) The installation will submit a **draft update** to the appropriate state and USFWS field offices.

    a) The USFWS staff will review the draft update and respond to the installation within 15 calendar days of receipt.

[3] http://www.fws.gov/fisheries/sikes_act/documents/Regional_Sikes_Coordinators_and_Military_Liaisons.pdf See http://www.fws.gov/fisheries/whatwedo/sikes_act/index.html/Sikes for list of Regional Sikes Act coordinators.
[4] See DoDI 4715.03, Enclosure 5.

b) The USFWS field offices and states will provide comments (if any) on the draft update to the submitting installation a maximum of 60 calendar days, but preferably within 30 days, of receipt, unless the affected parties (i.e., the DoD component or installation and the states and/or USFWS offices) agree to a longer timeline for review.

c) If either state or federal review of a draft INRMP cannot be completed in the timeframe described above, then the USFWS and/or state office will notify the DoD component or installation, and provide an alternate timeline for the INRMP update review. If the parties cannot agree to a review timeline, the field office and/or installation may contact the Regional Sikes Act Coordinator who may help the field office(s) complete its review.

d) If there is disagreement concerning the conservation, protection, and management of fish and wildlife resources proposed in an INRMP update, all efforts will be made by the DoD component or installation, involved agencies, and Regional Sikes Act Coordinator to resolve those issues within the stated review timelines.

e) If USFWS and/or the states do not provide notification that an alternative timeline is needed within 60 days, the installation may, at its discretion, finalize the update.

3) Once complete, the installation shall submit a **final update** to the appropriate USFWS and state field offices, and to the Sikes Coordinator.

a) The states and USFWS field offices will respond and provide signature on the final update within a maximum of 60 calendar days, but preferably within 30 days, of receipt, unless the affected parties (i.e., the DoD component or installation and the states and/or USFWS offices) agree that a longer timeline for review is acceptable.

b) If the states and/or USFWS are unable to provide signature coordination within the applicable timelines, that agency will advise the DoD component or installation and the Regional Sikes Act Coordinator, explaining why the review and signature process cannot be completed within the designated timeframe, and offering an alternate date by which the review and signature can be completed. This notification will be given to the installation and the Regional Sikes Act Coordinator within 10 days of receipt of a final update. The Regional Sikes Act Coordinator will then coordinate with the states and the USFWS field office to ensure review and comment on the final update, discuss comments with the Regional Director, and prepare the Regional Director's response to DoD, if needed.

c) Once finalized, the updated INRMP will be considered reviewed for operation and effect, and will restart the five-year window for being compliant.

4) The USFWS field office will return the original concurrence letter or signature page to the DoD component or installation, and provide a copy of such (by mail, facsimile or electronic mail) to the Regional Sikes Act Coordinator and to the states.

APPENDIX 1: KEY DEFINITIONS

Compliant INRMP: An INRMP that has been both approved in writing, and reviewed, within the past five years, as to operation and effect, by authorized officials of DoD, USFWS, and each appropriate State fish and wildlife agency.

INRMP Revision: Any new natural resources management actions necessitated by changes to the military mission, the condition of the land, or the status of the species present and not previously considered by the parties to the INRMP when the plan was last approved and/or reviewed as to operation and effect. All such revisions require approval by all parties to the INRMP, and will usually call for a new or supplemental NEPA analysis.[5]

INRMP Transmittal Letter: A cover letter to an INRMP Update that summarizes changes to the compliant or operational INRMP.

INRMP Update: Any change to an INRMP that, if implemented, is not expected to result in consequences materially different from those in the existing INRMP and analyzed in an existing NEPA document. Such changes will not result in a significant environmental impact, and installations are not required to invite the public to review or to comment on the decision to continue implementing the updated INRMP.

Operational INRMP: The most recent version of an installation's INRMP that was reviewed for operation and effect. The USFWS will consider that INRMP currently being used to guide natural resource management on a given installation, irrespective of signature date, to be the operational equivalent of a compliant INRMP.

[5] At the request of the Military Services, this definition has been modified from the one developed in collaboration with USFWS. Modifications are intended to add clarity, and do not contradict the premise of the agreed upon definition.

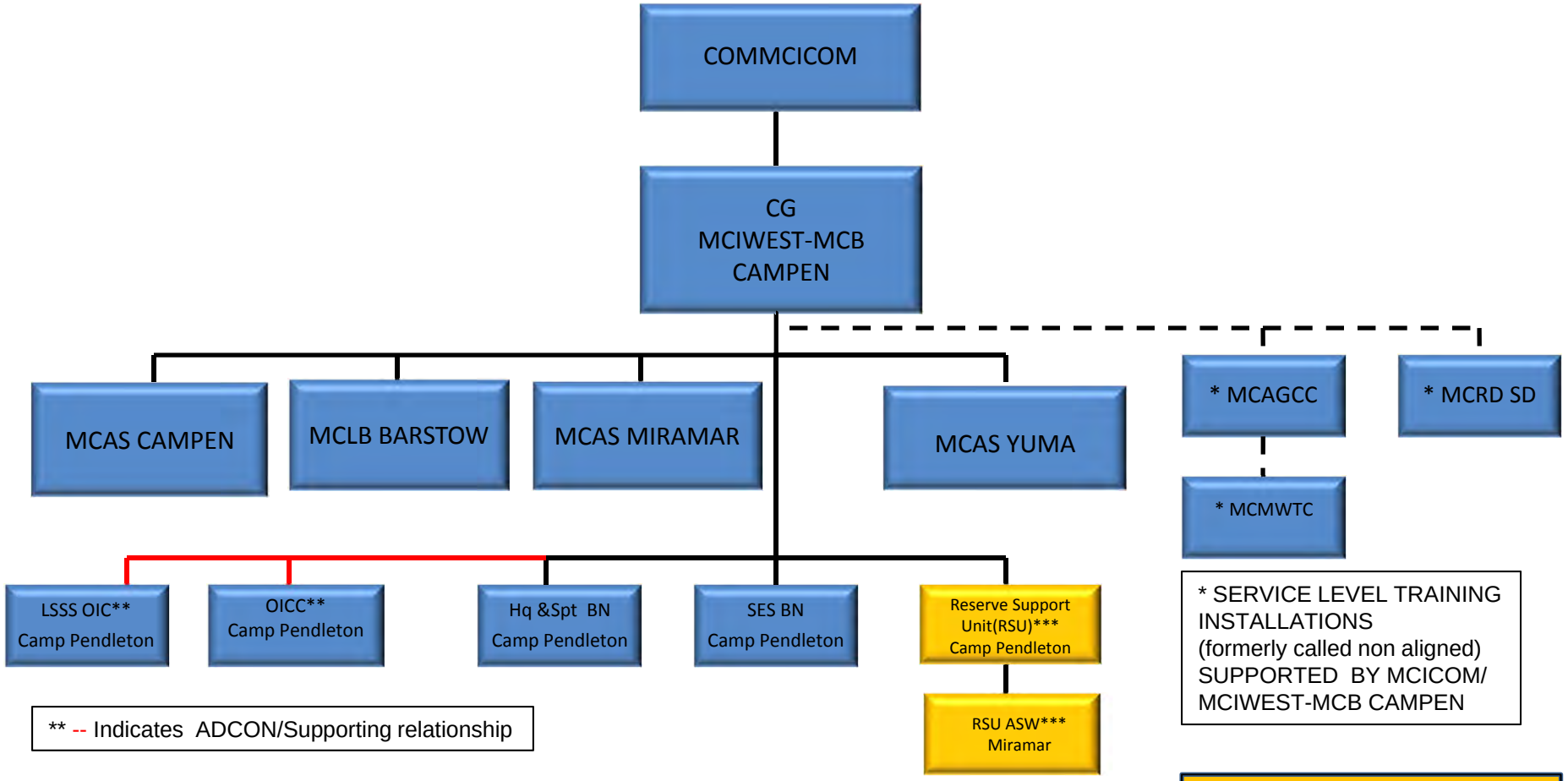
Appendix C

MCB CamPen and MCAS CamPen
Natural Resources Management Structure

This appendix includes the following documents:

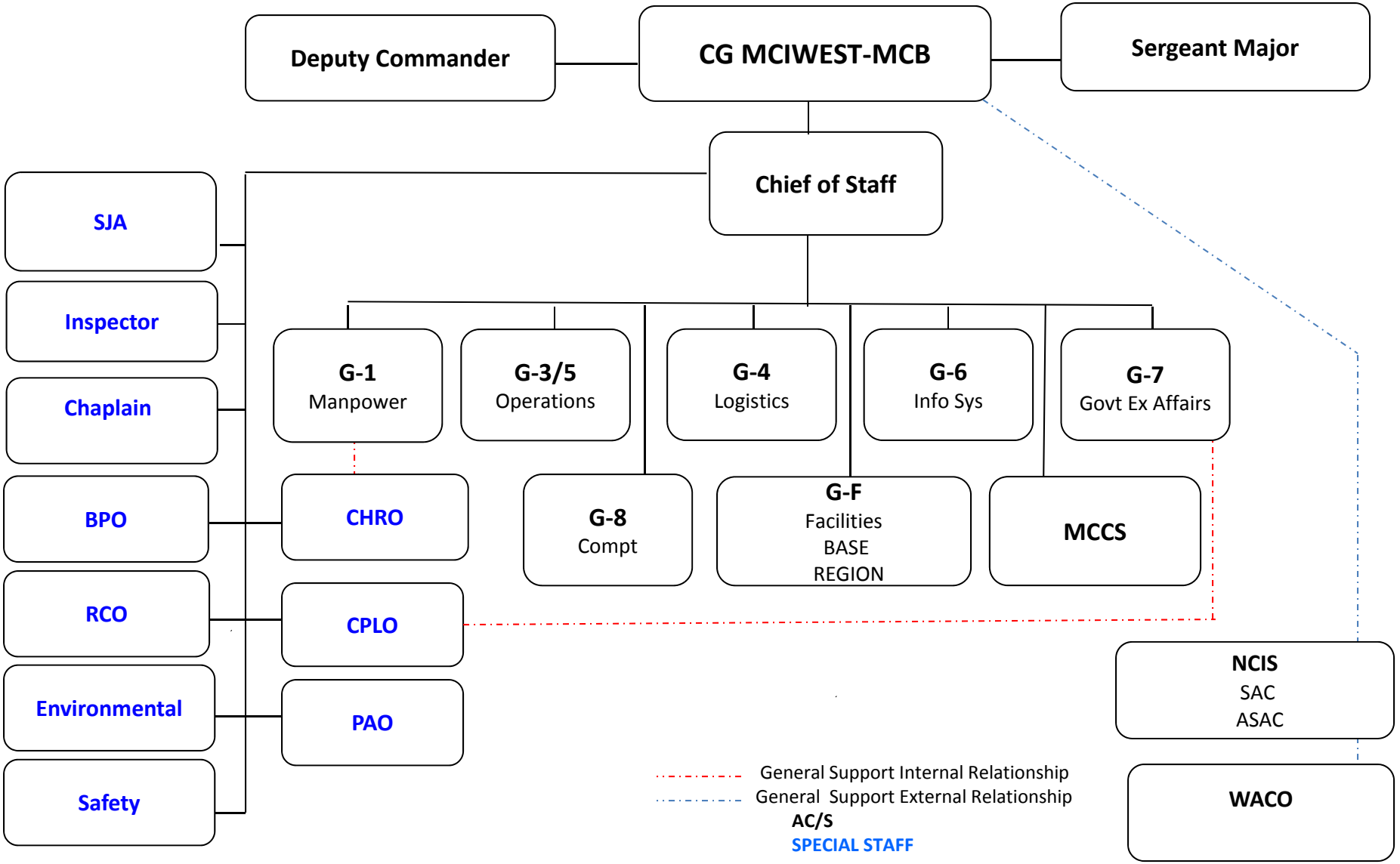
- MCIWEST-MCB CAMPEN Command Organizational Structure
- MCB CamPen Environmental Security Organizational Structure
- MCAS CamPen Environmental Department Organizational Structure

MCIWEST-MCB CAMPEN Command Organization

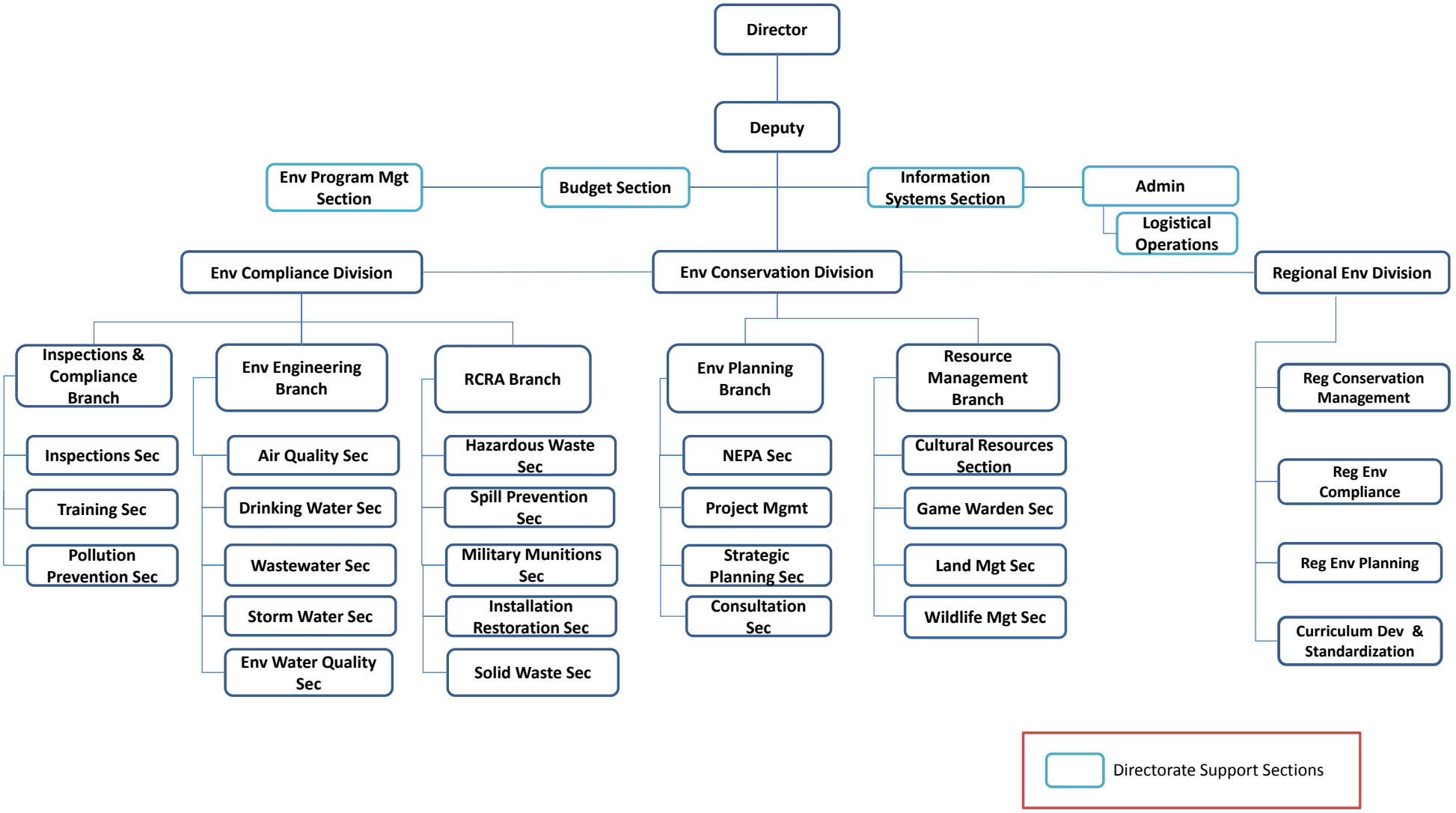


MCIWEST-MCB CAMPEN

Executive, Principal & Special Staff Organization



Environmental Security



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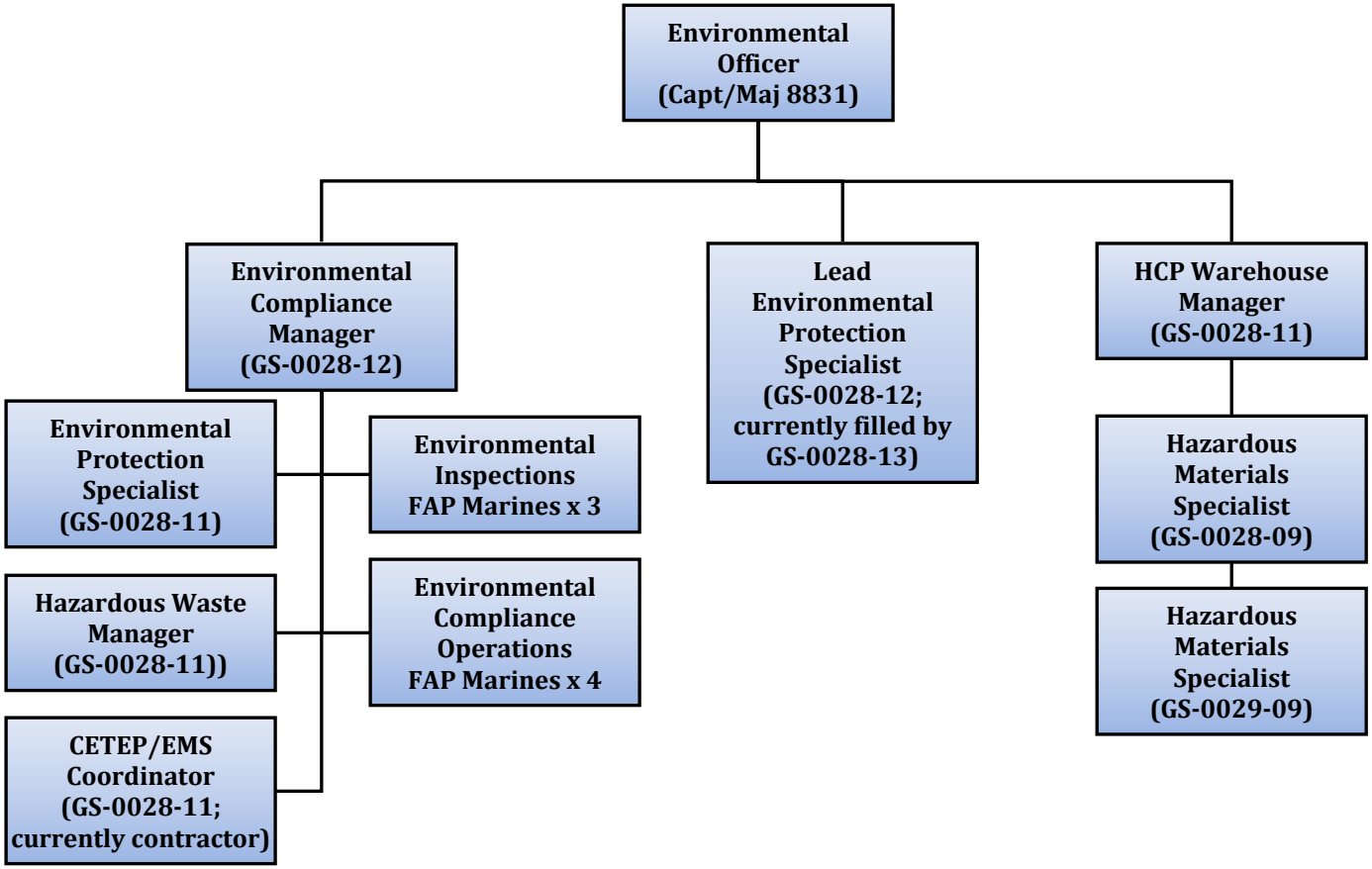
MCAS Camp Pendleton's Environmental Department's Structure



Appendix D

Bird Air Strike Hazard (BASH) Documents

This appendix includes the following documents:

- Station Order 5100.7
- Federal Fish and Wildlife Depredation Permit MB168925-0
- BASH Sightings 2010 – 2015

UNITED STATES MARINE CORPS
MARINE CORPS AIR STATION
BOX 555151
CAMP PENDLETON, CA 92055-5151

StaO 5100.7
20

STATION ORDER 5100.7

02 DEC 2009

From: Commanding Officer
To: Distribution List A and D

Subj: BIRD AND AIRCRAFT STRIKE HAZARD (BASH) PREVENTION PROGRAM

Ref: (a) OPNAVINST 3750.6Q
(b) Marine Corps Order P5090.2A

1. Situation. To reduce the Bird and Aircraft Strike Hazard (BASH) aboard MCAS Camp Pendleton by creating an integrated bird control and hazard abatement program. The program is designed to minimize aircraft exposure to potentially hazardous bird and animal strikes. Bird and animal strike hazards exist at MCAS Camp Pendleton and its vicinity due to resident and migratory bird species as well as proximity to the Santa Margarita River. This order establishes procedures to minimize the hazard at MCAS Camp Pendleton and promulgate the BASH Program. No single solution exists in controlling the bird and animal strike problem.

2. Mission. This order implements the BASH Management Plan, which will:

a. Establish a Bird and Animal Hazard Working Group (BAHWG) and designate responsibilities to the members.

b. Provide technical assistance for the best method of bird and animal control.

c. Establish airfield operating procedures to avoid high hazard situations.

d. Provide for dissemination of information to all assigned tenant and transient aircrews on bird and animal hazards and procedures for avoidance.

e. Provide guidelines to decrease airfield attractiveness to birds while establishing procedures to disperse birds and animals on and around the airfield.

3. Execution

a. Marine Aircraft Group (MAG) 39, Director of Safety and Standardization, NATOPS (DOSS)

(1) Ensure that all squadrons and tenant aviation activities report BASH incidents or hazards to the MCAS Camp Pendleton Airfield Operations Department at (760) 725-8386.

(2) Ensure that all squadrons and tenant aviation activities report any nuisance animals, nesting birds, or wildlife hazards to the MCAS Camp Pendleton Environmental Office at (760) 725-9582.

b. MCAS Camp Pendleton Operations Officer (S-3)

(1) Make operational changes to avoid areas and times of known hazardous bird and/or animal concentrations (mission permitting). Consideration shall be given to the following during periods of increased bird or animal activity.

(a) Discourage multiple touch and go's.

(b) Discourage formation takeoffs and landings.

(c) Encourage stop and go landings.

(d) Encourage the use of external lighting (when possible) in order to discourage birds.

(2) Conduct a daily airfield survey to determine any regular or increased use of the airfield by wildlife. Any activities or dead animals, including birds, will be removed and forwarded to the Environmental Office at (760) 725-9582.

(3) Ensure that all Aircraft Rescue and Fire Fighting (ARFF) personnel report any wildlife within the airfield boundary to including hovering birds. All sightings are to be immediately reported to the MCAS Camp Pendleton Tower.

(4) Ensure that all MCAS Camp Pendleton Air Traffic Control (ATC) personnel report any unusual wildlife activity to the Environmental Office at (760) 725-9582 so that immediate action can be taken to reduce any apparent hazards.

(5) Ensure that the following actions are implemented by the MCAS Camp Pendleton ATC:

(a) Report observed animal, specifically bird, activity as necessary to local area traffic.

(b) Issue bird watch advisories to aircrews as required via Air Terminal Information.

(c) Initiate Dispersal/Abatement procedures when potentially hazardous bird or animal activities are observed.

(d) Report all bird/animal strikes or possible strikes to MCAS Camp Pendleton Environmental Office at (760) 725-9582 and the Safety Officer at 725-8020.

(e) Encourage the maximum use of lighting (when possible) in order to discourage birds.

(f) Ensure that all BASH incidents involving MCAS Camp Pendleton are reported to the Environmental Office at (760) 725-9582.

(g) Ensure that aircrew of affected aircraft retain all animal debris and remains from their aircraft. Remains and debris are to be double bagged and refrigerated. Contact MCAS Environmental (760-725-9582) during normal working hours for removal of animal debris from aircraft and/or airfield. Outside of normal working hours, have Base Operations contact ARFF for removal of animal debris from aircraft and/or airfield.

c. MCAS Camp Pendleton Director of Safety

(1) Ensure station-wide compliance with this instruction and ensure all bird/animal-aircraft hazards and strikes are reported in accordance with reference (a).

(2) Chair BAHWG meetings.

(3) Review, approve, and implement all recommendations of BAHWG.

(4) Issue specific guidance concerning actions required implementing this order.

(5) Establish and maintain a folder with any pertinent BASH data and information to ensure continuity of knowledge with personnel turnover.

(6) Disseminate all findings associated with BASH incidents or the BAHWG to all Aviation Safety Officers.

d. MCAS Camp Pendleton Environmental Officer

(1) Provide an Environmental Office representative to BAHWG to monitor and advise the group on environmental modifications.

(2) When required, develop procedures for removal or control of bird and animal attractants.

(3) When contacted or required, initialize BASH surveys and write the appropriate documentation as required by the National Environmental Policy Act (NEPA) and per reference (b).

(4) Report on BASH and include BAHWG recommendations and reports information to the Safety Officer for dissemination to all resident squadron and tenant aviation activities.

(5) Consolidate annual BASH data summary and provide this data to the BAHWG no later than 15 Jan of the following calendar year.

(6) Provide the BAHWG with the current environmental BASH guidance from higher authority.

(7) Maintain an active bird hazard awareness program to include training, posters, and local bird and animal hazards and reporting procedures.

(8) Maintain an active, scare deterrent program.

(9) Provide any additional information regarding migratory bird activities through contact with the U.S. Fish and Wildlife Service, National Audubon Society, local ornithologists, and other agencies.

(10) Develop procedures, in coordination with ARFF and Operations Departments, in order to collect and store the debris and remains of bird strikes aboard MCAS Camp Pendleton. Ensure the plan covers after-hour procedures.

(11) Continue to renew and maintain the Federal Fish and Wildlife Depredation Permit.

(12) When required, kill migratory birds, by shooting using non-toxic shot shells, for the purpose of assuring safe aircraft operations.

(13) Temporarily possess and stabilize sick and injured migratory birds and transport them to a Federally or State licensed rehabilitator for care.

(14) When required, remove nests from hangars as permitted through the Federal Fish and Wildlife Permit. During bird nesting season normally March - September, inspect hangars for nesting weekly in order to remove nests before eggs are laid.

(15) Salvage migratory birds found dead for Station safety and diagnostic purposes.

(16) Maintain debris and remains for identification and training purposes or donate to San Bernardino County Museum, the San Diego Museum of Natural History, or other appropriate public education institution as specified in the permit.

(17) Maintain all records and file an annual report with the United States Fish and Wildlife Service.

e. MCAS Camp Pendleton Public Works Officer

(1) Act as a liaison between the MCAS Camp Pendleton Operations Department including all squadrons and tenant aviation activities and the Public Works Department.

(2) If contractual obligations are secured to conduct activities supporting the BASH program they are to follow the guidelines set forth in this order. In addition, all mowing and pesticide application shall be approved by the MCAS Camp Pendleton Environmental Office.

(3) Ensure incorporation of the following practices into applicable station Land Use Management and Master Plans.

(a) Any alterations of the airfield which involve natural resources (including birds, their nests, or their eggs) shall be approved and conducted by the MCAS Camp Pendleton Environmental Office.

(b) Mowing operations shall maintain a uniform grass height between 3-9 inches. Mowing will be conducted in order to maintain height average. Flight line mowing shall be conducted in order to maintain uniform grass height and avoid impacts to federally protected endangered or threatened species. Grass must be cut before going to seed to discourage seed-eating birds from utilizing the airfield. Grass normally should not exceed 9 inches since high grass attracts some bird species and rodents, which in turn attract raptors. Assistance in herbicide selection for weed

control, appropriate grass seed selection, fertilization, and erosion control vegetation may be obtained from the Environmental Department at (760) 725-9582.

(c) Broad-leafed weeds shall be kept to height requirements. Mowing and the application of herbicides should be conducted during periods of low flight activity on the airfield. Broad-leafed weeds, which attract a variety of birds, may produce seeds or berries, which may limit grass growth.

(d) Bare areas frequently used as resting sites; should be eliminated on the airfields. Grass will be planted as required and appropriate irrigation maintained.

(e) Edges are highly attractive transition zones between two distinct habitat types (i.e., brush to grassland). The airfield shall be maintained as uniformly as possible to reduce edges.

(f) High spots on the field shall be leveled.

(g) Dead vegetation such as brush piles, grass clippings, etc., shall be removed as soon as possible since they provide a protective cover for birds.

(h) Invertebrates and rodents provide important food sources for many birds. The MCAS Camp Pendleton Public Works Department, along with the Environmental Office shall periodically survey and reduce these pests when required. Control of insect, earthworms, rodents, etc., will also be accomplished with Environmental Protection Agency approved methods. Control should begin early in the spring.

(i) Drainage ditches shall be inspected regularly and kept cleared and obstacle-free. The Environmental Office must be notified before any drainage is cleared. Regulatory permits may be required.

(j) Erosion control vegetation may be planted. Vegetation should be used which is appropriate for the region and supports BASH reduction philosophy.

(k) A variety of birds including pigeons, owls, sparrows, and starlings frequently utilize buildings and hangars for foraging and nesting. The following actions shall be implemented to exclude birds from buildings and hangars:

1. Denying access by screening windows, closing doors, and blocking entry holes. In addition, netting can be

installed on all hangar ceilings to exclude pest birds from roosting areas. No holes or gaps should exist which will allow birds access.

2. Netting or plastic strips suspended over the doors may be used to exclude birds. No tears or holes should exist which will allow birds access.

3. Sharp projections or commercially used products such as Nixalite® Needle Strips are useful in limited areas such as ledges, overhangs, or small places where birds rest.

4. High-pressure air or water may be used at night as harassment in order to make hangars an undesirable roosting site. However, this action must be terminated when eggs or young are present in nests. Contact MCAS Environmental for immediate removal.

(l) Currently, a number of bird species are considered acceptable residents of hangars on MCAS Camp Pendleton. Barn Owls and Great Horned Owls may deter the establishment of other birds and reduce the amount of rodents; however, sometimes their activities might present a hazard to personnel and/or aircraft. If the presence of these birds, their young, or nests present(s) a threat to Station personnel or aircraft; contact the MCAS Camp Pendleton Environmental Office at (760) 725-9582.

(m) Several species of reptiles can also be found on the airfield tarmac and hangar decks due to the heat provided to these cold-blooded animals. If snakes are found, contact the Environmental Office at (760) 725-9582 for immediate removal.

(n) Bees may also be found within airfield structures. If bees are found, contact Airfield Rescue and Fire Fighting Office at (760) 725-4707/8382.

f. MCAS Camp Pendleton Provost Marshal Officer

(1) Ensure PMO and ARFF personnel report any unusual wildlife activity, to include hovering birds, to the MCAS Camp Pendleton Tower.

(2) Act as a liaison between BASH incident on-site personnel, MCAS Camp Pendleton Operations Department, and the Environmental Office.

(3) PMO and Fire Department personnel need to ensure all wildlife remains at the scene of a BASH are secured in a plastic

bag and forwarded to the MCAS Camp Pendleton Environmental Office at (760) 725-9582. Wildlife remains are not to be dumped by PMO or ARFF.

g. All Squadrons and Tenant Activities

(1) Report all bird and animal strikes, or near misses to MCAS Camp Pendleton, Airfield Operations Department at (760) 725-8386 and the Environmental Office at (760) 725-9582. After normal working hours, notify MCAS Camp Pendleton as soon as possible the following working day.

(2) Ensure any aircraft, involved in a BASH incident, are made available to personnel from either MCAS ARFF or MCAS Environmental so animal debris may be properly collected.

(3) Ensure that all assigned personnel are informed of BASH and report any nuisance animals, nesting birds, or wildlife hazards to the appropriate Safety Officer. The Safety Officer should report all hazards or concerns to the MCAS Camp Pendleton, Airfield Operations Department at (760) 725-8386, and the Environmental Office at (760) 725-9582.

(4) All assigned personnel should regularly inspect facilities, aircraft, and stationary equipment to ensure that wildlife, specifically birds, are not residing in these areas.

(5) Ensure aircrews participate in BASH reduction by promptly reporting all bird/animal strikes and hazardous conditions.

(6) Ensure current bird/animal activity data is available.

h. Bird/Animal Strike Hazard Reports

(1) A bird and animal strike is considered to have occurred anytime an aircraft collides with a bird, bat, or animal and the collision does not result in a defined aircraft mishap. Submit Hazard Report in accordance with reference (a). Additionally, MCIW flash report is required for any animal or bird strike.

(2) Local reporting. In addition to the BASH Hazard Report, all squadron and tenant aviation activities shall submit a report of all bird and animal strikes or near misses to the MCAS Camp Pendleton, Flight Clearance Department at (760) 725-8016. The following information shall be included in each report submitted:

(a) Phase of flight (climb, touch and go, approach, etc.).

(b) Altitude (AGL and MSL).

(c) Time of strike or near miss.

(d) Location.

(e) Landing.

(f) Impact point on aircraft including an estimate of total damage.

(g) Species/description of species and number of birds/animals (if known).

(h) Indicate if pilot was warned of bird/animal hazard.

(i) Remarks.

(3) Bird/Animal Remains Identification. Non-fleshy bird/animal strikes remains whether damage occurs or not will be collected by personnel from either the Environmental Office (Bldg. 23171, 725-9582) or MCAS ARFF. The following information is required:

(a) Location (state and installation) where remains are shipped from even if it occurs off the Air Station.

(b) Bird/Animal strike hazard report number will be assigned.

(c) Date of strike.

(d) Type of aircraft involved in strike.

(e) Point of contact including telephone and electronic mail address.

(f) Geographic location and altitude at time of strike.

(4) Aircraft Commander Responsibilities and Procedures. If an aircrew observes or encounters any bird activity while in flight that would constitute a hazard, the aircrew should contact the controlling agency for dissemination to operators in the hazard area. The following information should be included:

(a) Call sign.

(b) Location.

(c) Altitude.

(d) Time of sighting.

(e) Type of bird(s) (if known) and size.

(f) Approximate number of birds.

(g) Behavior of birds (soaring, flying to or from a location, etc.).

4. Administrative and Logistics

a. Reducing the bird strike hazard at MCAS Camp Pendleton requires cooperative efforts between several station organizations. The Office of Primary Responsibility for this plan is the MCAS Camp Pendleton Operations Department.

b. Bird/Animal Hazard Working Group

(1) Function. Collects, compiles, and reviews data on bird and animal strikes. Identifies and recommends actions to reduce hazards. Recommends changes in operational procedures. Prepares informational programs for aircrews.

(2) Authority. The BAHWG submits all recommendations to the Airfield Safety Officer for approval. Implementation is through the chain of command.

(3) Composition. The chairman, as appointed by the Commanding Officer, is the Airfield Safety Officer. At a minimum, the group will consist of representatives from: MAG-39 Director of Safety and Standardization, MCAS Camp Pendleton Operations Department, MCAS Camp Pendleton Environmental Office, MCAS Camp Pendleton Safety Department, MCAS Camp Pendleton Public Works Department, MCAS Camp Pendleton Provost Marshal's Office (PMO), and MCAS Camp Pendleton ARFF. Other organizations shall be tasked as required.

(4) Meetings. The chairman shall schedule BAHWG meetings as required and with the arrival of new members of the BAHWG.

5. Command and Signal. This Order is effective on the date signed.

M. L. LAWRENCE

DISTRIBUTION: A and D

DEPARTMENT OF THE INTERIOR
U.S. FISH AND WILDLIFE SERVICE
Migratory Bird Permit Office
2800 Cottage Way - Room W-2606 - Sacramento, CA 95825
Tel: 916-978-6183 Fax: 916-978-6183
Email: permitsR8MB@fws.gov

FEDERAL FISH AND WILDLIFE PERMIT

1. PERMITTEE

US MARINE CORPS AIR STATION CAMP PENDLETON
MCAS BUILDING 23171
CAMP PENDLETON, CA 92055
U.S.A.

2. AUTHORITY-STATUTES
16 USC 703-712

REGULATIONS
50 CFR Part 13
50 CFR 21.41

3. NUMBER
MB168925-0

4. RENEWABLE
☒ YES
☐ NO

5. MAY COPY
☒ YES
☐ NO

6. EFFECTIVE
05/31/2016

7. EXPIRES
05/31/2017

8. NAME AND TITLE OF PRINCIPAL OFFICER *(If #1 is a business)*
KELSEY DUCKWORTH
ENVIRONMENTAL OFFICER

9. TYPE OF PERMIT
DEPREDATION

10. LOCATION WHERE AUTHORIZED ACTIVITY MAY BE CONDUCTED
BASH control work conducted on and near runways and taxiways
Camp Pendleton, San Diego, California
Records maintained at address indicated in Block 1 above.

11. CONDITIONS AND AUTHORIZATIONS:

A. GENERAL CONDITIONS SET OUT IN SUBPART D OF 50 CFR 13, AND SPECIFIC CONDITIONS CONTAINED IN FEDERAL REGULATIONS CITED IN BLOCK #2 ABOVE, ARE HEREBY MADE A PART OF THIS PERMIT. ALL ACTIVITIES AUTHORIZED HEREIN MUST BE CARRIED OUT IN ACCORD WITH AND FOR THE PURPOSES DESCRIBED IN THE APPLICATION SUBMITTED. CONTINUED VALIDITY, OR RENEWAL, OF THIS PERMIT IS SUBJECT TO COMPLETE AND TIMELY COMPLIANCE WITH ALL APPLICABLE CONDITIONS, INCLUDING THE FILING OF ALL REQUIRED INFORMATION AND REPORTS.

B. THE VALIDITY OF THIS PERMIT IS ALSO CONDITIONED UPON STRICT OBSERVANCE OF ALL APPLICABLE FOREIGN, STATE, LOCAL, TRIBAL, OR OTHER FEDERAL LAW.

C. VALID FOR USE BY PERMITTEE NAMED ABOVE.

D. You are authorized to take the migratory birds specified below to relieve or prevent injurious situations impacting human safety. All take must be done as part of an integrated wildlife damage management program that emphasizes non-lethal management techniques. You may not use this authority for situations in which migratory birds are merely causing a nuisance. *You must ensure that you are in compliance with all applicable laws as stated in Condition B and the attached Standard Conditions for Migratory Bird Depredation Permits.*

This authority excludes Bald eagles, Golden eagles, and threatened/endangered species. *Harassment and/or removal of endangered/threatened species and/or Bald and Golden eagles require additional permits from Migratory Bird Permit Office and/or Ecological Services Office.*

The following may be lethally taken:

2 Common Raven nests

☒ ADDITIONAL CONDITIONS AND AUTHORIZATIONS ALSO APPLY

12. REPORTING REQUIREMENTS
ANNUAL REPORT DUE: 06/10
You must submit a report to your Regional Migratory Bird Permit Office, even if you had no activity. Report form is at: www.fws.gov/forms/3-202-9.pdf.

ISSUED BY	TITLE	DATE
Olivia Baez	Wildlife Biologist, Pacific Southwest Region	05/31/2016

E. **You are authorized in <u>emergency situations only</u> to take, trap, or relocate any migratory birds, nests and eggs, including species that are not listed in Condition D (except b\Bald eagles, Golden eagles, or endangered or threatened species) when the migratory birds, nests, or eggs are posing a direct threat to human safety. A direct threat to human safety is one which involves a threat of serious bodily injury or a risk to human life.**

You shall use the FAA Emergency Procedures when declaring an emergency. Specifically, Title 14 of the Code of Federal Regulations (14 CFR) part 91, section 91.3 allows deviations from regulations during emergencies and allows the pilot in command (PIC) to make the best decision to ensure safety of all personnel during these contingencies.

Anyone who takes migratory birds under the authority of this permit must follow the American Veterinary Medical Association Guidelines on Euthanasia when euthanization of a bird is necessary (<http://www.avma.org/issues/animal_welfare/euthanasia.pdf>).

You must report any emergency take activity to your migratory bird permit issuing office to **916-978-6183** and to **Olivia_baez@fws.gov** within 72 hours after the emergency take action. Your report must include the species and number of birds taken, method, and a complete description of the circumstances warranting the emergency action.

F. You may use the following methods of take in emergency situations: (1) firearms with non-toxic shot; (2) registered animal drugs (excluding nicarbazin), pesticides and repellents; and (3) falconry abatement. Birds caught live may be euthanized or transported and relocated to another site approved by the appropriate State wildlife agency, if required. When using firearms, you may use rifles or air rifles to shoot any bird when you determine that the use of a shotgun is inadequate to resolve the injurious situation.

Anyone who takes migratory birds under the authority of this permit must follow the American Veterinary Medical Association Guidelines on Euthanasia when euthanization of a bird is necessary (<http://www.avma.org/issues/animal_welfare/euthanasia.pdf>).

G. You are authorized to salvage and temporarily possess migratory birds found dead or taken under this permit for (1) disposal, (2) transfer to the U.S. Department of Agriculture, (3) diagnostic purposes, (4) purposes of training airport personnel, (5) donation to a public scientific or educational institution as defined in 50 CFR 10.12, (6) donation to persons authorized by permit or regulation to possess them, or (7) donation of migratory game birds only to a public charity (those suitable for human consumption). Any dead Bald eagles or Golden eagles salvaged must be reported within 48 hours to the National Eagle Repository at (303) 287-2110 and to the migratory bird permit issuing office at 916-978-6183 or permitsr8mb@fws.gov. The Repository will provide directions for shipment of these specimens.

H. You may not salvage and must immediately report to U.S. Fish and Wildlife Service Office of Law Enforcement (USFWS OLE) any dead or injured migratory birds that you encounter that appear to have been poisoned, shot, electrocuted, have collided with industrial power generation equipment, or were otherwise killed or injured as the result of potential criminal activity. See USFWS OLE contact information below.

I. A subpermittee is an individual to whom you have provided written authorization to conduct some or all of the permitted activities in your absence. Subpermittees must be at least 18 years of age.

As the permittee, you are legally responsible for ensuring that your subpermittees are in compliance with the terms and conditions of this permit, are qualified to perform these authorized activities and adhere to the terms of your permit. You are also responsible for maintaining current records of anyone you have designated as a subpermittee, including copies of letters you have provided to the subpermittees authorizing them to conduct the permitted activities on your behalf.

Any person who is
(1) employed by or under contract to you for the activities specified in this permit, or
(2) otherwise designated a subpermittee by you in writing, may exercise the authority of this permit.

J. You and any subpermittee(s) must comply with the attached Standard Conditions for Migratory Bird Depredation Permits. ***These standard conditions are a continuation of your permit conditions and must remain with your permit.***

For suspected illegal activity, immediately contact USFWS Law Enforcement at: 619-557-5063 (San Diego).

Standard Conditions
Migratory Bird Depredation Permits
50 CFR 21.41

All of the provisions and conditions of the governing regulations at 50 CFR part 13 and 50 CFR part 21.41 are conditions of your permit. Failure to comply with the conditions of your permit could be cause for suspension of the permit. The standard conditions below are a continuation of your permit conditions and must remain with your permit. If you have questions regarding these conditions, refer to the regulations or, if necessary, contact your migratory bird permit issuing office. For copies of the regulations and forms, or to obtain contact information for your issuing office, visit: http://www.fws.gov/migratorybirds/mbpermits.html.

1. To minimize the lethal take of migratory birds, you are required to continually apply non-lethal methods of harassment in conjunction with lethal control.
   [*Note: Explosive Pest Control Devices (EPCDs) are regulated by the Bureau of Alcohol, Tobacco, Firearms, and Explosives (ATF). If you plan to use EPCDs, you require a Federal explosives permit, unless you are exempt under 27 CFR 555.141. Information and contacts may be found at www.atf.gov/explosives/how-to/become-an-fel.htm.*]

2. Shotguns used to take migratory birds can be no larger than 10-gauge and must be fired from the shoulder. You must use nontoxic shot listed in 50 CFR 20.21(j).

3. You may not use blinds, pits, or other means of concealment, decoys, duck calls, or other devices to lure or entice migratory birds into gun range.

4. You are not authorized to take, capture, harass, or disturb bald eagles or golden eagles, or species listed as threatened or endangered under the Endangered Species Act found in 50 CFR 17, without additional authorization.

   For a list of threatened and endangered species in your state, visit the U.S. Fish and Wildlife Service's Threatened and Endangered Species System (TESS) at: http://www.fws.gov/endangered.

5. If you encounter a migratory bird with a Federal band issued by the U.S. Geological Survey Bird Banding Laboratory, Laurel, MD, report the band number to 1-800-327-BAND (2263) or http://www.reportband.gov.

6. This permit does not authorize take or release of any migratory birds, nests, or eggs on Federal lands without additional prior written authorization from the applicable Federal agency, or on State lands or other public or private property without prior written permission or permits from the landowner or custodian.

7. Unless otherwise specified on the face of the permit, migratory birds, nests, or eggs taken under this permit must be:
   (a) turned over to the U.S. Department of Agriculture for official purposes, or
   (b) donated to a public educational or scientific institution as defined by 50 CFR 10, or
   (c) completely destroyed by burial or incineration, or
   (d) with prior approval from the permit issuing office, donated to persons authorized by permit or regulation to possess them.

8. A subpermittee is an individual to whom you have provided written authorization to conduct some or all of the permitted activities in your absence. Subpermittees must be at least 18 years of age. As the permittee, you are legally responsible for ensuring that your subpermittees are adequately trained and adhere to the terms of your permit. You are responsible for maintaining current records of who you have designated as a subpermittee, including copies of designation letters you have provided.

9. You and any subpermittees must carry a legible copy of this permit, *including these Standard Conditions,* and display it upon request whenever you are exercising its authority.

10. You must maintain records as required in 50 CFR 13.46 and 50 CFR 21.41. All records relating to the permitted activities must be kept at the location indicated in writing by you to the migratory bird permit issuing office.

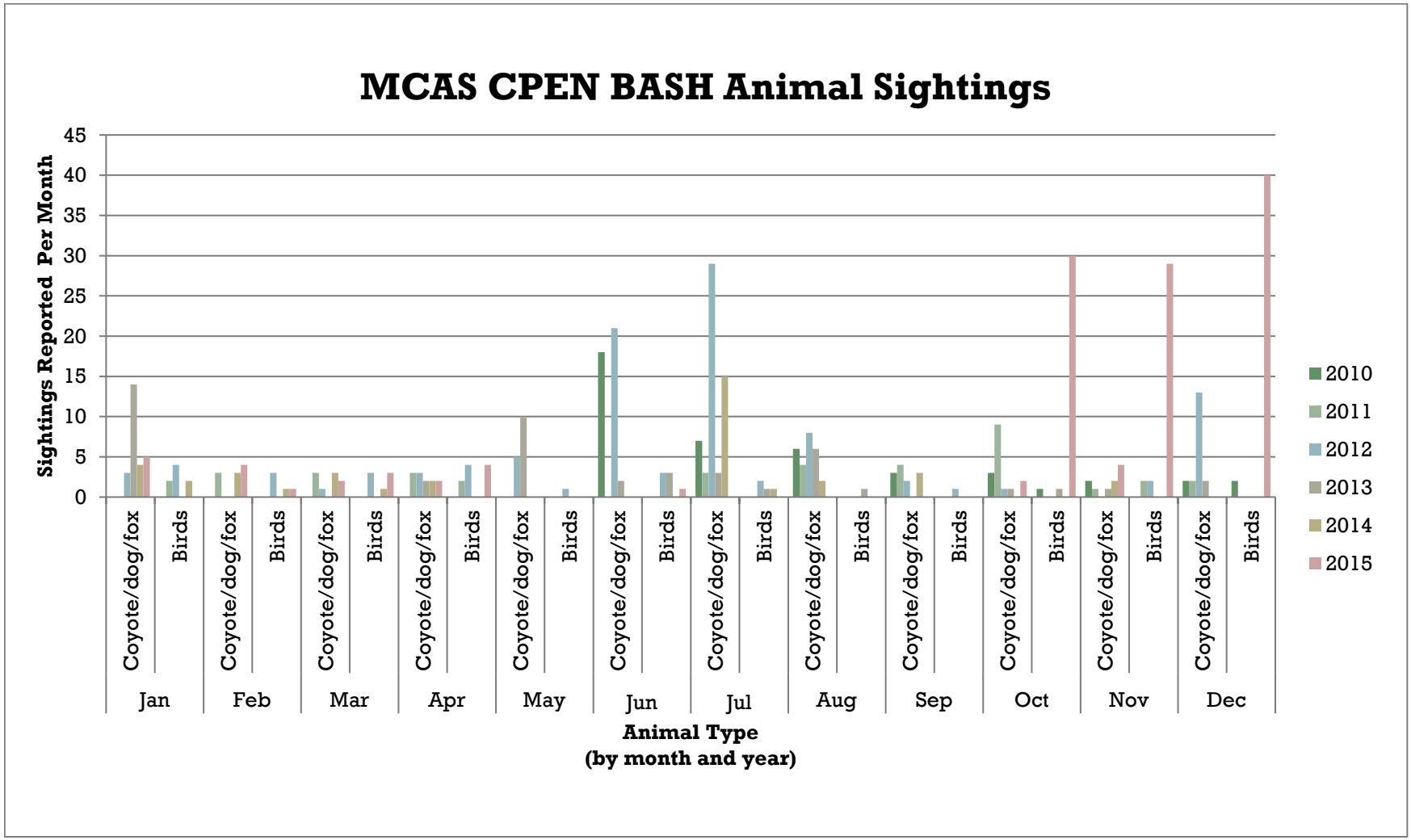
11. Acceptance of this permit authorizes the U.S. Fish and Wildlife Service to inspect any wildlife held, and to audit or copy any permits, books, or records required to be kept by the permit and governing regulations.

12. You may not conduct the activities authorized by this permit if doing so would violate the laws of the applicable State, county, municipal or tribal government or any other applicable law.

(DPRD - 12/3/2011)

BASH Sightings as Reported by MCAS Camp Pendleton Tower

Sum of Counter		Year						
Month	Animal	2010	2011	2012	2013	2014	2015	Grand Total
Jan	Coyote/dog/fox			3	14	4	5	26
	Birds		2	4		2		8
Jan Total			2	7	14	6	5	34
Feb	Coyote/dog/fox		3			3	4	10
	Birds			3		1	1	5
Feb Total			3	3		4	5	15
Mar	Coyote/dog/fox		3	1		3	2	9
	Birds			3		1	3	7
Mar Total			3	4		4	5	16
Apr	Coyote/dog/fox		3	3	2	2	2	12
	Birds		2	4			4	10
Apr Total			5	7	2	2	6	22
May	Coyote/dog/fox			5	10			15
	Birds			1				1
May Total				6	10			16
Jun	Coyote/dog/fox	18		21	2			41
	Birds			3	3		1	7
Jun Total		18		24	5		1	48
Jul	Coyote/dog/fox	7	3	29	3	15		57
	Birds			2	1	1		4
Jul Total		7	3	31	4	16		61
Aug	Coyote/dog/fox	6	4	8	6	2		26
	Birds				1			1
Aug Total		6	4	8	7	2		27
Sep	Coyote/dog/fox	3	4	2		3		12
	Birds			1				1
Sep Total		3	4	3		3		13
Oct	Coyote/dog/fox	3	9	1	1		2	16
	Birds	1			1		30	32
Oct Total		4	9	1	2		32	48
Nov	Coyote/dog/fox	2	1		1	2	4	10
	Birds		2	2			29	33
Nov Total		2	3	2	1	2	33	43
Dec	Coyote/dog/fox	2	2	13	2			19
	Birds	2					40	42
Dec Total		4	2	13	2		40	61
Grand Total		44	38	109	47	39	127	404


MCAS CPEN BASH Animal Sightings
Sightings Reported Per Month
45
40
35
30
25
20
15
10
5
0
Coyote/dog/fox
Birds
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec
Animal Type
(by month and year)
2010
2011
2012
2013
2014
2015

Appendix E

Camp Pendleton Soils

APPENDIX E

CAMP PENDLETON SOILS: CODES, ACREAGES, AND ERODIBILITY

Soil Code, Description, Acreage, and Erodibility of Camp Pendleton Soils

Soil Code	Description	Acreage	Erodibility[1]
	Undefined	2	
AcG	Acid igneous rock land	90	Severe 1
AtC	Altamont clay, 5-9% slopes	1095.2	Slight
AtD	Altamont clay, 9-15% slopes	1314.2	Slight
AtE	Altamont clay, 15-30% slopes	1151.3	Moderate 1
AtF	Altamont clay, 30-50% slopes	3404.0	Severe 1
BlC	Bonsall sandy loam, 2-9% slopes	524	Severe 9
BlC2	Bonsall sandy loam, 2-9% slopes, eroded	105	Severe 9
BlD2	Bonsall sandy loam, 9-15% slopes, eroded	118	Severe 9
BeE	Blasingame loam, 9-30% slopes	780	Severe 16
BgF	Blasingame loam, 30-50% slopes	103.8	Severe 1
BsC	Bosanko clay, 2-9% slopes	8	Moderate 16
ClD2	Cieneba coarse sandy loam, 5-15% slopes, eroded	104.0	Severe 16
ClE2	Cieneba coarse sandy loam, 15-30% slopes, eroded	82.2	Severe 16
ClG2	Cieneba coarse sandy loam, 30-65% slopes, eroded	4137.9	Severe 1
CbB	Carlsbad gravelly loamy sand, 2-5% slopes	272.5	Severe 2
CbC	Carlsbad gravelly loamy sand, 5-9% slopes	1173.0	Severe 2
CbD	Carlsbad gravelly loamy sand, 9-15% slopes	45.1	Severe 2
CbE	Carlsbad gravelly loamy sand, 15-30% slopes	116.4	Severe 2
CcC	Carlsbad-Urban land complex, 2-9% slopes	80.3	
CfB	Chesterton fine sandy loam, 2-5% slopes	343.3	Severe 9
CfC	Chesterton fine sandy loam, 5-9% slopes	212.2	Severe 9
CmE2	Cieneba rocky coarse sandy loam, 9-30% slopes, eroded	335.3	Severe 16
CmRG	Cieneba very rocky coarse sandy loam, 30-75% slopes	17360	Severe 1
CnE2	Cieneba-Fallbrook rocky sandy loams, 9-30% slopes, eroded	470	Severe 16
CnG2	Cieneba-Fallbrook rocky sandy loams, 35-65% slopes, eroded	86	Severe 1
Cr	Coastal beaches	181.4	Severe 2
DaC	Diablo clay, 2-9% slopes	340.2	Slight
DaD	Diablo clay, 9-15%slopes	479.4	Slight
DaE	Diablo clay, 15-30% slopes	886.0	Moderate
DaE2	Diablo clay, 15-30% slopes, eroded	302.3	Moderate 1
DaF	Diablo clay, 30-50% slopes	976.7	Severe 1
DoE	Diablo-Olivenhain complex, 9-30% slopes	254.9	Moderate 1
EdC	Elder shaly fine sandy loam, 2-9%slopes	2543.3	Moderate 2
EsC	Escondido very fine sandy loam, 5-9% slopes	67.6	Severe 16
EsD2	Escondido very fine sandy loam, 9-15% slopes, eroded	77.2	Severe 16
EsE2	Escondido very fine sandy loam, 15-30% slopes, eroded	64.1	Severe 16
ExG	Exchequer rocky silt loam, 30-70% slopes	718.8	Severe 1
FaB	Fallbrook sandy loam, 2-5% slopes	88.3	Severe 16
FaC	Fallbrook sandy loam, 5-9% slopes	1011.9	Severe 16
FaC2	Fallbrook sandy loam, 5-9% slopes, eroded	904.5	Severe 16
FaD2	Fallbrook sandy loam, 9-15% slopes, eroded	1570.6	Severe 16
FaE2	Fallbrook sandy loam, 15-30% slopes, eroded	1064.2	Severe 16
FeC	Fallbrook rocky sandy loam, 5-9% slopes	19.8	Severe 16
FeE	Fallbrook rocky sandy loam, 9-30% slopes	337.9	Severe 16

Soil Code	Description	Acreage	Erodibility[1]
FeE2	Fallbrook rocky sandy loam, 9-30% slopes, eroded	859.4	Severe 16
FvD	Fallbrook-Vista sandy loam, 9-15% slopes	13.1	Severe 16
FxE	Friant rocky fine sandy loam, 9-30% slopes	34.0	Severe 9
FxG	Friant rocky fine sandy loam, 30-70% slopes	27.8	Severe 1
GaE	Gaviota fine sandy loam, 9-30% slopes	427.2	Severe 9
GaF	Gaviota fine sandy loam, 30-50% slopes	5917.5	Severe 1
GoA	Grangeville fine sandy loam, 0-2% slopes	297.4	Severe 16
GrA	Greenfield sandy loam, 0-2% slopes	411.0	Severe 16
GrB	Greenfield sandy loam, 2-5% slopes	625.4	Severe 16
GrC	Greenfield sandy loam, 5-9% slopes	130.3	Severe 16
HaG	Hambright gravelly clay loam, 30-75% slopes	5553.4	Severe 1
HrC	Huerhuero loam, 2-9% slopes	3165.2	Severe 9
HrD	Huerhuero loam, 9-15% slopes	1405.4	Severe 9
HrD2	Huerhuero loam, 9-15% slopes, eroded	46.0	Severe 9
HrE2	Huerhuero loam, 15-30% slopes, eroded	2024.6	Severe 9
HuC	Huerhuero-Urban land complex, 2-9% slopes	70.9	
HuE	Huerhuero-Urban land complex, 9-30% slopes	34.9	
LeC	Las Flores loamy fine sand, 2-9% slopes	2666.5	Severe 2
LeC2	Las Flores loamy fine sand, 5-9% slopes, eroded	39.1	Severe 2
LeD	Las Flores loamy fine sand, 9-15% slopes	3388.6	Severe 2
LeD2	Las Flores loamy fine sand, 9-15% slopes, eroded	1952.8	Severe 2
LeE	Las Flores loamy fine sand, 15-30% slopes	4288.6	Severe 2
LeE2	Las Flores loamy fine sand, 15-30% slopes, eroded	1355.0	Severe 2
LeE3	Las Flores loamy fine sand, 9-30% slopes, severely eroded	482.2	Severe 2
LfC	Las Flores-Urban land complex, 2-9% slopes	83.2	
LpC	Las Posas fine sandy loam, 5-9% slopes	127.1	Moderate 2
LpD2	Las Posas fine sandy loam, 9-15% slopes, eroded	6.2	Moderate 2
LpE2	Las Posas fine sandy loam, 15-30% slopes, eroded	77.8	Moderate 1
LrE	Las Posas fine sandy loam, 9-30% slopes	315.5	Moderate 1
LrG	Las Posas stony fine sandy loam, 30-65% slopes	490.4	Severe 1
LsE	Linne clay loam, 9-30% slopes	145.5	Moderate 2
LsF	Linne clay loam, 30-50% slopes	1679.6	Severe 1
LvF3	Loamy alluvial land-Huerhuero complex, 9-50% slopes, severely eroded	66.3	Severe 1
MlC	Marina loamy coarse sand, 2-9% slopes	550.3	Severe 2
MlE	Marina loamy coarse sand, 9-30% slopes	804.4	Severe 2
Md	Made land	5.3	
OhC	Olivenhain cobbly loam, 2-9% slopes	6761.6	Severe 16
OhE	Olivenhain cobbly loam, 9-30% slopes	2978.1	Severe 16
OhF	Olivenhain cobbly loam, 30-50% slopes	7373.6	Severe 1
OkC	Olivenhain-Urban complex, 2-9% slopes	308.9	
PeC	Placentia sandy loam, 2-9% slopes	22.5	Severe 9
PeC2	Placentia sandy loam, 5-9% slopes, eroded	20.5	Severe 9
PfC	Placentia sandy loam, thick surface, 2-9% slopes	186.1	Severe 16
RaB	Ramona sandy loam, 2-5% slopes	20.9	Severe 16
RaC	Ramona sandy loam, 5-9% slopes	2.7	Severe 16
RaC2	Ramona sandy loam, 5-9% slopes, eroded	92.5	Severe 16
RaD2	Ramona sandy loam, 9-15% slopes, eroded	8.0	Severe 16
RcD	Ramona gravelly sandy loam, 9-15% slopes	122.1	Severe 16
RcE	Ramona gravelly sandy loam, 15-30% slopes	112.5	Severe 16
RkB	Reiff fine sandy loam, 2-5% slopes	2922.9	Severe 16
RkC	Reiff fine sandy loam, 5-9% slopes	11666.7	Severe 16
Rm	Riverwash	1998.8	Severe 2
RuG	Rough broken land	13662.5	Severe 1
SbA	Salinas clay loam, 0-2% slopes	116.6	Moderate 2

Soil Code	Description	Acreage	Erodibility[1]
SbC	Salinas clay loam, 2-9% slopes	2831.7	Moderate 2
ScA	Salinas clay, 0-2% slopes	269.0	Slight
ScB	Salinas clay, 2-5% slopes	1336.7	Slight
StG	Steep gullied land	1467.6	Severe 1
SvE	Stony land	4300.9	Severe 1
TeF	Terrace escarpments	6120.6	Severe 1
Tf	Tidal flats	363.2	Severe 2
TuB	Tujunga sand, 0-5% slopes	810.0	Severe 2
VaA	Visalia sandy loam, 0-2% slopes	1726.0	Severe 16
VaB	Visalia sandy loam, 2-5% slopes	857.8	Severe 16
VaC	Visalia sandy loam, 5-9% slopes	1289.7	Severe 16
VaD	Visalia sandy loam, 9-15% slopes	77.9	Severe 16
VbB	Visalia gravelly sandy loam, 2-5% slopes	127.9	Severe 16
VbC	Visalia gravelly sandy loam, 5-9% slopes	852.3	Severe 16
VsC	Vista coarse sandy loam, 5-9% slopes	403.2	Moderate 2
VsD	Vista coarse sandy loam, 9-15% slopes	23.1	Moderate 2
VsD2	Vista coarse sandy loam, 9-15% slopes, eroded	49.8	Moderate 2
VsE	Vista coarse sandy loam, 15-30% slopes	458.4	Moderate 2
VsE2	Vista coarse sandy loam, 15-30% slopes, eroded	463.7	Moderate 2
VvD	Vista rocky coarse sandy loam, 5-15% slopes	33.6	Moderate 2
VvE	Vista rocky coarse sandy loam, 15-30% slopes	414.4	Moderate 2
WtR	Water	237.3	

[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) indicates surface layer texture; (9) refers to depth to hard rock, or a hardpan, or any layer that restricts permeability; (16) refers to grade of structure in the surface layer. Absence of rating means no valid interpretations can be made.

Appendix F

Hydrologic Records for Gauging Stations on or near Camp Pendleton

APPENDIX F

HYDROLOGIC RECORDS FOR GAUGING STATIONS ON OR NEAR CAMP PENDLETON

Stream Gage Station and Gage Station Number	Period of Record (water year [c] or month/year)	Minimum Daily Runoff (acre-feet)	Maximum Daily Runoff (acre-feet)	Average Daily Runoff (acre-feet)	Annual Total (acre-feet)
San Mateo Creek near San Clemente 11046300	1953 – 1976; 1990 – 1993	13 [d] (Min. for grouped years)	62,699 (Max. for grouped years)	8,230 [f]	
	1993 – 94	0	454	8.81	3,210
	94 – 95	0	4,284	117.43	42,880
	95 – 96	0	63	7.72	2,820
	96 – 97	0	883	14.42	5,270
	97 – 98	0	6,248	130.3	47,570
	98 – 99	0	16	4.7	1,710
	99 – 00	0	218	6.55	2,400
	2000 – 01 [e]	0	460	8.76	3,200
	01 – 02	0	1	0.26	93
	02 – 03	0	1,618	19.26	7,030
Cristianitos Creek above San Mateo Creek, near San Clemente 11046360	1993 – 94 [e]	0	12	0.13	48
	94 – 95 [e]	0	1637	32.08	11750
	95 – 96 [e]	0	46	0.34	124
	96 – 97 [e]	0	437	3.5	1280
	97 – 98 [e]	0	2772	49.9	18270
	98 – 99 [g]	0	0	0	0
	99 – 00	0	61	0.4	144
	2000 – 01	0	143	1.72	627
	01 – 02	0	13	0.07	27
	02 – 03	0	542	2.6	947
Santa Margarita River near Fallbrook [b] 11044300	10/1924 – 1/80; 09/89 – 09/93	1,410 (Min. for grouped years)	159,000 (Max. for grouped years)	19,940 [f]	
	1993 – 94	3.17	1,444	32.73	11,950
	94 – 95 [e]	6.54	7,101	155.92	56,910
	95 – 96	4.17	823	21.42	7,870
	96 – 97 [e]	2.38	1,543	32.93	12,040
	97 – 98 [e]	3.17	9,521	176.16	64,270
	98 – 99 [e]	5.36	158	16.62	6,070
	99 – 00	1.94	1,275	20.43	7,460
	2000 – 01	2.77	860	29.95	10,950
	01 – 02	1.96	317	10.38	3,790
	02 – 03	4.17	4959	75.98	27,700

Stream Gage Station and Gage Station Number	Period of Record (water year [c] or month/year)	Minimum Daily Runoff (acre-feet)	Maximum Daily Runoff (acre-feet)	Average Daily Runoff (acre-feet)	Annual Total (acre-feet)
Santa Margarita River at Ysidora [b] 11046000 until 1998 Resumed 2001 to present	03/1923 – 09/93	0 (Min. for grouped years)	244,400 (Max. for grouped years)		25,012 [f]
	1993 – 94	0	1,448	51.97	18,950
	94 – 95	0	11,208	365	133,000
	95 – 96	0	1,085	30.55	11,180
	96 – 97	0	3,491	72.41	26,450
	97 – 98	0	12,736	301	110,200
Santa Margarita River near Ysidora[i] 11045050 1999 to 2001	1998 – 99	Incomplete data, see notes *			
	99 – 00	0	857	12.83	4,700
	2000 – 01	0	1,297	28.37	10,350
	01 – 02	0	125	12.28	4,480
	02 – 03 [e]	0	6,030	106	38,650
De Luz Creek near Fallbrook [a, b] 11044900 02/2003 discontinued	02/1951 – 09/65; 10/89 – 09/90; 04/02 – 02/03	0 (Min. for grouped years)	252 (Max. for grouped years)	9 [f]	
Fallbrook Creek near Lake O'Neill [a] 11045300	10/1964 – 09/76; 10/89 – 09/93	32 (Min. for grouped years)	6,247 (Max. for grouped years)	1,491 [f]	
	1993 – 94	0	65	2.24	818
	94 – 95	0	507	9.13	3,330
	95 – 96	0	40	1.92	702
	96 – 97 [e]	0.02	192	3.59	1,310
	97 – 98 [e]	0.04	361	9.46	3,460
	98 – 99	0.02	18	1.29	470
	99 – 00	0	46	1.11	406
	2000 – 01	0	95	1.73	627
	01 – 02	0	1	0.35	127
	02 – 03	0	171	2.66	967
Las Flores Creek near Oceanside 11046100	1993 – 94	0	7	0.23	81
	94 – 95	0	1,343	23.61	8,630
	95 – 96	0.12	17	1.01	372
	96 – 97	0.2	444	4.88	1,780
	97 – 98	0.1	2,083	32.14	11,730
	98 – 99	0.75	4	1.59	577
	99 – 00	0.08	17	1.05	382
	2000 – 01	0.04	24	0.75	276
	01 – 02 [e]	0	1	0.21	76
	02 – 03 [e]	0	304	2.04	744

Stream Gage Station and Gage Station Number	Period of Record (water year [c] or month/year)	Minimum Daily Runoff (acre-feet)	Maximum Daily Runoff (acre-feet)	Average Daily Runoff (acre-feet)	Annual Total (acre-feet)
Las Flores Creek at Las Pulgas Canyon, near Oceanside 11046090	1998 – 99	0.14	8	2.7	988
	99 – 00	0	13	0.87	318
	2000 – 01	0	15	0.81	299
	01 – 02	0	1	0.2	74
	02 – 03 [e]	0	125	2.04	746
San Onofre Creek at San Onofre [a, b] 11046250	1952 – 1976	0 (Min. for grouped years)	14,684 (Max. for grouped years)	1,581 [f]	
	1998 – 99	0	0	0	0
	99 – 00	0	99	1.03	379
	2000 – 01	0	105	0.46	169
	01 – 02	0	0.04	0	0.04
	02 – 03 [e]	0	677	3.33	1,210

[a] Source: pre 1993 data (AC/S ES records, Camp Pendleton), 1994– 2003 stream gage data (U.S. Geological Survey (USGS 2003) Water Resources of California web site. http//ca.water.usgs.gov).

[b] U.S. Geological Survey records. (Several of the active gage stations were temporarily out of commission as a result of the January 1993 flood and flows were estimated in the interim.)

[c] Water year runs from 1 October to 30 September of the succeeding year.

[d] Minimum runoff for grouped years shown.

[e] Estimated data.

[f] Average runoff for grouped years.

[g] Gage damaged, estimated no flow for entire 1999 water year.

[h] Gage out of operation from November to April, not complete data set.

[i] Gage temporarily out of operation as of Feb. 26, 1999, due to channel work and replacement of Basilone Road Bridge. New gage station number (11045050), stream gage station name “Santa Margarita River near Ysidora” and location.

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Appendix G

Plant Communities and Unvegetated Habitats of Camp Pendleton

APPENDIX G
PLANT COMMUNITIES AND UNVEGETATED HABITATS OF CAMP PENDLETON

The two primary ecosystems on Camp Pendleton—the Terrestrial Upland Ecosystem and the Wetland, Aquatic and Marine Ecosystem—are composed of the primary plant communities and unvegetated habitats summarized in the table below.

Ecosystems and Associated Plant Communities and Unvegetated Habitats

Terrestrial Upland Ecosystem	Wetland, Aquatic and Marine Ecosystem
Coastal Sage Scrub	Nearshore
Chaparral	Intertidal
Oak Woodlands	Dune and Strand
Grasslands	Dune Wetland
	Estuary
	Stream
	Alkali Marsh
	Freshwater Marsh
	Riparian
	Waterbodies
	Vernal Pools

Numerous subtypes of these broad plant communities are recognized on Camp Pendleton and the following table lists the plant communities and unvegetated habitats (aquatic and marine, and terrestrial) that have been mapped on Camp Pendleton, with the exception of dune wetlands. Dune wetlands have not been mapped on-Base but are recognized as unique and valuable communities that support several plant and wildlife species specifically adapted for that particular environment. Dune wetlands are formed when water seeps from the hardpan subsoil at the coastal bluffs and forms small wetlands on the strand and dunes and are classified as Palustrine Emergent Wetlands in the Cowardin system (Cowardin et al. 1979). Plants observed in these wetlands are cattail (*Typha* spp.), salty Susan (*Jaumea carnosa*), and salt marsh fleabane (*Pluchea odorata*).

The vegetation classification codes correspond to Oberbauer et al. 2008, and the descriptions that follow are excerpted from Oberbauer et al. 2008. Scientific nomenclature follows that of Rebman and Simpson (2014).

Ecosystem and Plant Community Subtypes	Vegetation Classification Code
Wetland, Aquatic and Marine Ecosystem	
Arundo	65100
Alkaline Marsh	52310
Beach	64400
Coastal Salt Marsh	52100
Disturbed Wetland	11200
Freshwater Marsh	52410
Mixed Willow Exotic	65000
Open Water	64110
Riparian Forest	61300
Riparian Scrub	63000
Riparian Woodland	62500
Southern Foredune	21230
Southern Riparian Scrub	63300
Southern Sycamore-Alder Riparian Woodland	62400
Tamarisk	63810
Vernal Pools	44000
Terrestrial Upland Ecosystem	
Agriculture	18310/18320
Chamise Chaparral	37200
Chaparral	37000
Coast Live Oak Woodland - Dense	71162
Coast Live Oak Woodland - Open	71161
Coastal Bluff Scrub	31200
Coastal Sage Scrub	32500
Coastal Sage Scrub - Chaparral Scrub Mix	37G00
Disturbed Habitat	11300
Disturbed/Developed Lands	12000
Engelmann Oak Woodland - Dense	71182
Engelmann Oak Woodland - Open	71181
Exotics-Fennel	11300
Grass-forb Mix	42210
Grassland	42000
Mixed Woodland	78000
Native Grassland	42100
Non-Native Grassland	42200
Non-Native Woodland	79000
Scrub Oak Chaparral	37900
Southern Mixed Chaparral	37120
Urban/Developed	12000

The following vegetation descriptions are arranged numerically following Oberbauer et al (2008). Exceptions to the Oberbauer et al. (2008) descriptions are for the generic plant communities: Chaparral (37000) and Valley and Foothill Grassland (42000) for which there are no Oberbauer descriptions**.**

11200 Disturbed Wetland

Description: Areas permanently or periodically inundated by water, which have been significantly modified by human activity.

Site Factors: This includes portions of wetlands with obvious artificial structures such as concrete lining, barricades, rip-rap, piers, or gates. Often unvegetated, but may contain scattered native or nonnative vegetation. Examples include lined channels, Arizona crossings, detention basins, culverts, and ditches.

Characteristic Species: *Arundo donax*, *Tamarix* spp., *Eucalyptus* spp., *Phoenix* spp., *Washingtonia* spp., *Cortaderia* spp., *Cynodon dactylon*, but may also contain *Salix* spp., *Typha* spp., and a variety of other wetland plants.

Distribution: Throughout San Diego County.

11300 Disturbed Habitat

Description: Areas that have been physically disturbed (by previous legal human activity) and are no longer recognizable as a native or naturalized vegetation association, but continue to retain a soil substrate. Typically, vegetation, if present, is nearly exclusively composed of nonnative plant species such as ornamentals or ruderal exotic species that take advantage of disturbance, or shows signs of past or present animal usage that removes any capability of providing viable natural habitat for uses other than dispersal. Examples of disturbed land include areas that have been graded, repeatedly cleared for fuel management purposes and/or experienced repeated use that prevents natural revegetation (e.g. dirt parking lots, trails that have been present for several decades), recently graded firebreaks, graded construction pads, construction staging areas, off-road vehicle trails, and old homesites.

Characteristic Species: Invasive, nonnative forb species, such as, thistles (*Centaurea*, *Carduus*, and *Cynara* spp.), *Sonchus* spp., *Salsola tragus*, *Heterotheca grandiflora*, *Marrubium vulgare*, *Sisymbrium irio*, *Raphanus* spp., *Carpobrotus edulis*, *Chrysanthemum* spp., and *Foeniculum vulgare*. A limited number of grass species: Pampas grass (*Cortaderia* spp.) and fountain grass (*Cenchrus* spp.); most annual grass species are more typical of Non-Native Grassland (42200) and do not dominate vegetative cover in Disturbed Habitat.

Distribution: Throughout San Diego County, especially in highly populated areas and regions with increased off-road vehicle activities.

12000 Urban/Developed

Description: Areas that have been constructed upon or otherwise physically altered to an extent that native vegetation is no longer supported. Developed land is characterized by permanent or semipermanent structures, pavement or hardscape, and landscaped areas that often require irrigation. Areas where no natural land is evident due to a large amount of debris or other materials being placed upon it may also be considered Urban/Developed (e.g., car recycling plant, quarry).

Characteristic Species: Unvegetated or landscaped with a variety of ornamental (usually nonnative) plants.

Distribution: Throughout San Diego County.

18310 Field/Pasture

Description: This forms a dense habitat with nearly 100% cover. Planted fields are usually monoculture crops that are irrigated and usually artificially seeded and maintained.

Characteristic Species: Grass species from *Avena*, *Cynodon*, *Hordeum*, *Sorghum*, as well as *Medicago* spp.

18320 Row Crops

Description: Composed of annual and perennial crops grown in rows with open space between the rows. Species composition frequently changes by season and year. Row crops often occur in floodplains or upland areas with high soil quality. Row crops are nearly always artificially irrigated.

21230 Southern Foredunes

Description: Dominated by succulent, perennial herbs and subshrubs; lacks perennial grasses, but has a higher proportion of suffrutescent plants (to 11.8 inches [30 centimeters] tall). Coverage varies from nearly complete to scattered. The species typically are zoned as in the Northern Foredunes, with *Abronia maritima*, *Ambrosia*, and *Cakile* usually occurring in the exposed sites and *Abronia umbellata*, *Calystegia*, and *Camissoniopsis* in less exposed sites. Growth and flowering occur in early to mid-spring.

Site Factors: Usually foredunes, but integrades with upper beaches. Similar to Active Coastal Dunes (21100), but with less wind and/or a smaller supply of sand and/or more available groundwater but drier, a little warmer, and less strong or persistent onshore wind.

Characteristic Species: *Abronia maritima, Abronia umbellata, Ambrosia chamissonis, Atriplex leucophylla, Cakile maritima, Calystegia soldanella, Camissoniopsis cheiranthifolia* subsp. *suffruticosa, Distichlis spicata, Isocoma menziesii, Carpobrotus edulis.*

Distribution: Areas of sand accumulation along the coast between Point Conception and the Mexican border. No areas remain that are as extensive as those found north of Point Conception. Small areas occur near Point Conception and Coal Oil Point/ Santa Barbara County; Point Mugu, Ventura County; El Segundo, Los Angeles County; and Coronado, San Diego County. Now much reduced by urban and other development.

31200 Southern Coastal Bluff Scrub

Description: A low scrub up to 6.5 feet (2 meters) tall, forming continuous mats or more scattered. Dwarf shrubs, herbaceous perennials, and annuals are represented; varying degrees of succulence are shown. Most plants woody and/or succulent. Most growth and flowering occur from late winter through spring.

Site Factors: Exposed to varying, moisture-laden winds with high salt content. Soil usually rocky and poorly developed.

Characteristic Species: *Atriplex* spp., *Calystegia macrostegia, Castilleja affinis, Chorizanthe orcuttiana, Leptosyne gigantea, L. maritima, Dudleya* spp., *Encelia californica, Erigeron glaucus, Eriophyllum staechadifolium, Isocoma* spp., *Malacothrix saxatilis, Marah macrocarpus, Carpobrotus chilensis Mesembryanthemum crystallinum, Opuntia littoralis, Rhus integrifolia.*

Distribution: At localized sites along the coast, south of Point Conception; Point Mugu, Point Dune, Point Vicente, Dana Point. In San Diego County: Torrey Pines State Reserve, Point Loma, etc. several sites on the off-shore islands.

32500 Diegan Coastal Sage Scrub

Description: Low, soft-woody subshrubs (to ca. 3 feet (1 meter) high) that are most active in winter and early spring. Many taxa are facultatively drought-deciduous. Dominated by *Artemisia californica* and *Eriogonum fasciculatum* together with *Malosma laurina, Salvia apiana* and

Salvia mellifera. Stem- and leaf-succulents, while present, are not nearly as conspicuous as in Maritime Succulent Scrub (32400).

Site Factors: Typically on low moisture-availability sites: steep, xeric slopes or clay-rich soils that are slow to release stored water. Intergrades at higher elevations with several chaparrals (37000).

Characteristic Species: *Acmispon glaber* var. *glaber, Artemisia californica, Eriogonum fasciculatum, Galvesia speciosa, Isocoma menziesii, Malva assurgentiflora, Malacothamnus fasciculatus, Malosma laurina, Rhus integrifolia, Salvia apiana, Salvia mellifera, Stipa lepida*.

Distribution: This is the widespread coastal sage scrub in coastal southern California from Los Angeles into Baja California.

37000 Chaparral

Description: Broad-leaved sclerophyll shrubs typically on north-facing slopes. Species composition variable depending on a host of site characteristics such as slope, aspect, and soil. Chaparral can be further differentiated into a number of subtypes depending on species composition. Subtypes that occur on the Base and are described below include Southern Mixed Chaparral (37120), Chamise Chaparral (37200), and Scrub Oak Chaparral (37900)

Site Factors: Dry, rocky, often steep slopes with little soil and moderate temperatures. Slopes are typically south-facing in southern California. Can occur on a variety of soils including sandstone, granitic, gabbro, and metavolcanic.

Characteristic species: *Adenostoma fasciculatum, Arctostaphylos* spp., *Cercocarpus* spp., *Ceanothus* spp., *Quercus* spp., *Salvia* spp., *Yucca* spp.

Distribution: In San Diego County, chaparral occurs on the coastal mesas and slopes, and inland foothill and montane slopes.

37120 Southern Mixed Chaparral

Description: Broad-leaved sclerophyll shrubs, 4.9 - 9.8 feet (1.5–3 meters) tall. Occasionally with patches of bare soil or forming a mosaic with Venturan Coastal Sage Scrub (32300) or Riversidean Sage Scrub (32700). Divisible into Granitic (37121) and Mafic (37122) subtypes based on substrate, but floristic distinctions between these two subtypes remain unknown. In San Diego County, this is dominated by blue-colored lilacs, especially Ramona lilac (*Ceanothus*

tomentosus) as well as *C. leucodermis, C. oliganthus*; other Ceanothus spp. generally indicate other chaparral types.

Site Factors: Dry, rocky, often steep slopes with little soil and moderate temperatures. Slopes are typically south-facing in northern California but north-facing in the south. Often adjacent to and on moister sites than Chamise Chaparral (37200). Transitional from the chaparral habitats of California to the coastal semi-desert of Baja California Norte. In San Diego County, it generally occurs east of Southern Maritime Chaparral and west of Montane Chaparral.

Characteristic Species*: Adenostoma fasciculatum, Arctostaphylos glandulosa, A. rainbowensis, Calochortus albus, Ceanothus tomentosus, C. verrucosus, Cercocarpus minutiflorus, Cneoridium dumosum, Fritillaria biflora var. biflora, Hesperoyucca whipplei, Heteromeles arbutifolia, Lonicera subspicata* var. *denudata, Quercus dumosa, Malosma laurina, Rhamnus crocea, Rhus ovata, Ribes indecorum, Xylcoccus bicolor, Yucca schidigera.*

Distribution: Coastal foothills of San Diego County and northern Baja California, usually below 3,000 feet (910 meters). Occurs in Jamul, Dulzura, Lakeside, Ramona, Fallbrook, Valley Center, Rainbow, and Pala, with a few significant stands outside San Diego County.

37200 Chamise Chaparral

Description: A 3 – 10-foot (1- to –3-meter)-tall chaparral overwhelmingly dominated by chamise. Associated species contribute little to cover. Adapted to repeated fires by stump sprouting. Mature stands are densely interwoven with very little herbaceous understory or litter.

Site Factors: Similar to Upper Sonoran Mixed Chaparrals (37100), but on shallower, drier soils or at somewhat lower elevations. Often on xeric slopes and ridges, with adjacent more mesic sites mantled by Upper Sonoran Mixed Chaparrals.

Characteristic Species: *Acmispon glaber* var. *glaber, Adenostoma fasciculatum, Arctostaphylos glauca, A. tomentosa, A. viscida, Ceanothus cuneatus, C. papillosus, Cercocarpus betuloides* var. *betuloides, Dendromecon rigida, Eriogonum fasciculatum, Eriodictyon califomicum, Hesperoyucca whipplei, Prunus ilicifolia, Quercus dumosa, Rhus ovata, Malosma laurina, Salvia apiana, S. mellifera, Selaginella cinerascens, Yucca schidigera.*

Distribution: General distribution similar to Northern Mixed Chaparral (37110) but relatively infrequent in the north compared to its abundance in the south. The predominant chaparral type in Ventura, Los Angeles, San Bernardino, Riverside, and San Diego Counties.

37900 Scrub Oak Chaparral

Description: A dense, evergreen chaparral to 20 feet (6.1 meters) tall, dominated by *Quercus dumosa* with considerable *Cercocarpus betuloides*. In San Diego County, *Quercus berberidifolia* is often the dominant (over 50% cover) and usually occurs in small patches within a variety of other vegetation communities.

Site Factors: Somewhat more mesic than many chaparrals, and often occurs at slightly higher elevations (to ~ 5,000 feet [1,524 meters]). These more favorable sites recover from fire more quickly than other chaparrals. Substantial leaf litter accumulates. In San Diego County, usually found on north-facing or otherwise mesic slopes and can occur at various elevations.

Characteristic Species: *Arctostaphylos glandulosa, Ceanothus integerrimus, C. leucodermis, C. thrysiflorus, Cercocarpus betuloides, Fraxinus dipetala, Galium angustifolium, Garrya veatchii, Heteromeles arbutifolia, Lonicera* spp., *Pickeringia montana, Prunus ilicifolia, Quercus berberidifolia, Q. dumosa, Q. wizlizenii* var. *frutescens, Rhamnus californica, R. ilicifolia, Toxicodendron diversilobum*.

Distribution: Western Sierran foothills and North Coast ranges from Tehama County south through the southern California mountains to Baja California. In San Diego County, most often on Cleveland National Forest, ridges on the east end of Henshaw Valley, McCain Valley.

37G00 Coastal Sage-Chaparral Transition

Description: A mix of sclerophyllous, woody chaparral species and drought-deciduous, malacophyllous sage scrub species. *Adenostoma fasciculata* and *Artemesia californica* are dominant and equal in cover. Generally *Malosma laurina*, *Salvia mellifera* and *Rhus integrifolia* are more common in coastal sage scrub, while *Ceanothus* spp. and *Xylococcus bicolor* are more common in chaparrals.

Site Factors: Apparently a post-fire successional community (but not in all situations). Site factors need clarification. A catch-all type intermediate between Coastal Scrubs (32000) and Chaparrals (37000).

Characteristic Species: *Adenostoma* spp., *Artemisia californica, Ceanothus* spp., *Salvia mellifera, Toxicodendron diversilobum*.

Distribution: Outer Coast Ranges and Peninsular Range from the Big Sur Coast south to Baja. An infrequent mixture, these usually are separate plant associations, occurring in specific climatic regions.

42000 Valley and Foothill Grassland

Description: Dominated by perennial and/or annual members of the Poaceae. Species can be either native or nonnative. Many grasslands have a high component on native and nonnative broadleaved forb species also. Valley and foothill grasslands can be differentiated into several subtypes. Subtypes that occur on the Base and are described below are Native Grassland (42100), Non-Native Grassland (42200), and Grassland-Forb Mix (42210)

Site Factors: Can occur on a variety of landforms, e.g., valleys with deep soils and slopes with shallow soil. Disturbances, e.g., fire and grazing are important factors determining species composition and reducing encroachment by shrub species.

Characteristic Species: *Avena* spp., *Bromus* spp., *Festuca* spp., *Hordeum* spp., *Stipa* spp.

Distribution: Throughout California and San Diego County

42110 Valley Needlegrass Grassland

Description: A mid-height (to 2 feet [0.6 meter]) grassland dominated by perennial, tussock-forming *Stipa pulchra*. Native and introduced annuals occur between the perennials, often actually exceeding the bunchgrasses in cover. In San Diego County, native perennial herbs such as *Sanicula*, *Sidalcea*, *Sisirynchium*, *Eschscholzia* or *Lasthenia* are present. The percentage cover of native species at any one time may be quite low, but is considered native grassland if 20% aerial cover of native species is present.

Site Factors: Usually on fine-textured (often clay) soils, moist or even waterlogged during winter, but very dry in summer. Often interdigitates with Oak Woodlands (71100) on moister, better-drained sites. In San Diego County, this becomes Montane Perennial grassland above approximately 2,000 feet (609 meters) in elevation.

Characteristic Species: *Achillea borealis, Achyrachaena mollis, Agoseris heterophylla, Avena fatua, Bloomeria crocea, Brodiaea lutea, Bromus diandrus, B. horedaceus, B. madriatensis* ssp. *rubens, Chlorogalum pomeridianum* var. *pomeridianum, Clarkia purpurea, Dodecatheon jefferyi, Eschscholzia* spp., *Lasthenia* spp., *Melica californica, M. imperfecta, Plantago erecta, Poa scabrella, Sanicula* spp., *Sidalcea* spp., *Sisyrinchium* spp., *Nasella* spp.

Distribution: Formerly extensive around the Sacramento, San Joaquin, and Salinas Valleys, as well as the Los Angeles Basin, but now much reduced. The relationship of this type to the Potrero Grasslands of the Peninsular Ranges needs clarification. In San Diego County: Alpine (Wright's Field), Ramona, Olivenhain, San Marcos, Camp Pendleton, Rincon, and Otay Mesa.

42100 Non-Native Grassland

Description: A dense to sparse cover of annual grasses with flowering culms 0.6 – 1.6 feet (0.2–0.5 meters) high. Often associated with numerous species of showy-flowered, native annual forbs ("wildflowers"), especially in years of favorable rainfall. In San Diego County, the presence of *Avena*, *Bromus*, *Erodium*, and *Brassica* are common indicators. In some areas, depending on past disturbance and annual rainfall, annual forbs may be the dominant species; however, it is presumed that grasses will soon dominate. Germination occurs with the onset of the late fall rains; growth, flowering, and seed-set occur from winter through spring. With a few exceptions, the plants are dead through the summer-fall dry season, persisting as seeds. Remnant native species are variable. This can include grazed and even dry-farmed (i.e., disked) areas where irrigation is not present.

Site Factors: On fine-textured, often clay soils, moist or even waterlogged during the winter rainy season and very dry during the summer and fall.

Characteristic Species: *Avena barbata*, *A. fatua*, *Brassica* spp., *Brachypodium distachyon*, *Bromus hordeaceus*, *B. diandrus*, *B. madritensis rubens*, *Centaurea melitensis*, *Erodium botrys*, *E. cicutarium*, *Eschscholtzia californica*, *Festuca spp.*, *Gilia* spp., *Dienandra* spp., *Lasthenia* spp., *Layia* spp., *Hirschfeldia incana*, *Lupinus* spp., *Lepidium dictyotum*, *Medicago polymorpha*, *Nemophila menziesii*, *Castelleja* spp., *Phacelia* spp., *Plantago* spp., *Schismus arabica*.

Distribution: Valleys and foothills of most of California except for the north coastal and desert regions. Usually below 3,000 feet (914 meters), but reaching 4,000 feet (1,219 meters) in the Tehachapi Mountains and interior San Diego County. Intergrades with Coastal Prairie (41000) along the central coast. Formerly occupied large portions of the Sacramento, San Joaquin, and Salinas Valleys as well as the Los Angeles Basin, areas that are now agricultural or urban. Throughout San Diego County, some notable areas include Otay Mesa, Barona, parts of Henshaw Valley, Borrego Springs, Love Valley, Santa Maria Valley and Rancho Guejito.

42210 Non-Native Grassland: Broadleaf-dominated

Description: Subset of Non-Native Grasslands (42200), which is dominated by one or several nonnative, invasive broadleaf species. This designation should only be applied where nonnative broadleaf species account for more than 50% of the total vegetative cover.

Site Factors: Disturbance and/or a nearby seed source have resulted in the establishment of extensive and persistently dominant broadleaf species.

Characteristic Species: *Brassica nigra, Hirschfeldia incana, Foenicularium vulgare, Centaurea* spp., and other nonnative, invasive broadleaf species. Other species as above in Non-Native Grasslands (42200).

Distribution: In San Diego County, this has become increasingly common in coastal areas such as Camp Pendleton, Carlsbad Highlands, Oceanside, and Otay Mesa.

44000 Vernal Pool

Description: Vernal pools are seasonally flooded depressions that support a distinctive living community adapted to extreme variability in hydrologic conditions (seasonally very dry and very wet conditions). Although vernal pools are often associated with hummocks or mima-mounds, this feature is not always present. In San Diego County, vernal pools often retain pooled water for about 2 weeks after significant rain events; for vernal pools in swale systems water usually remains at least 2 weeks after surface flows cease. Vernal pools can be differentiated from other temporary wetlands by the following criteria: (1) the basin is at least partially vegetated during the normal growing season or is unvegetated due to heavy clay or hardpan soils that do not support plant growth; and (2) the basin contains at least one vernal pool indicator species (e.g., *Psilocarphus* spp., *Downingia cuspidta, Eryngium aristulatum* var. *parishii*, or crustaceans – *Branchinecta* spp., *Streptocephalus* spp., and others).

52120 Southern Coastal Salt Marsh

Description: Similar to Northern Coastal Salt Marsh (52110) but with a longer growing season and a greater abundance of suffrutescent species in the higher, drier sites. Southern "specialties" include *Atriplex watsonii, Batis maritima, Limonium californicum, Distichlis littoralis, Sueda taxifolia,* and *Arthrocnemum subterminale*.

Site Factors: Very similar to Northern Coastal Salt Marsh but with warmer water and air temperatures. *Frankenia, Suaeda,* and/or *Arthrocnemum subterminale* often occur along the upper, landward edges of the marshes; *Salicornia bigelovii, S. pacifica,* and *Batis maritima* at middle elevations; and *Spartina* closest to open water.

Characteristic Species: *Amblyopappus pussilus, Atriplex watsonii, Batis maritima, Cressa truxiliensis, Cuscuta salina, Distichlis spicata* var. *spicata, D. littoralis Frankenia grandifolia, Heliotropium* curassavicun, *Jaumea carnosa, Juncus acutus* subsp. *leopoldii, Limonium californicum, Carpobrotus chilensis, Mesembryanthemum crystalinum, M. nodiflorum, Salicornia bigelovii, Salicornia* spp., *Spartina foliosa, Suaeda taxifolia*.

Distribution: Bays, lagoons, and estuaries along the coast from about Point Conception to the Mexican border. Integrades broadly with Northern Coastal Salt Marsh (52110) along the south central coast. Nowhere as extensive as the larger northern marshes, and now considerably reduced by land development activities. Good to fair examples occur at Goleta Slough and near Carpinteria, Santa Barbara County; Point Mugu, Ventura County; Upper Newport Bay, Orange County; and several small areas in San Diego County.

52310 Cismontane Alkali Marsh

Description: Very similar to Coastal Brackish Marsh (52200) with many of the same species. Most growth and flowering occur in summer.

Site Factors: Standing water or saturated soil present during most or all of year. High evaporation and low input of fresh water render these marshes somewhat salty, especially during the summer. Probably similar to Coastal Brackish Marsh in quantitative range of saltiness, but more alkaline and usually with salts other than sodium chloride. Marshes that become mostly dry during the summer are Vernal Marshes (52500); those with a more constant input of fresh water are Coastal and Valley Freshwater Marshes (52410). Chenopod Scrubs (36000) occur in areas with moist, highly alkaline soil that usually lack water at the surface. All of the above habitats may intergrade with Alkali Marshes.

Characteristic Species: *Anemopsis californica, Carex* spp., *Distichlis spicata, Elymus triticoides, Frankenia salina, Juncus mexicanus, Juncus* spp., *Pluchea odorata* var. *odorata, Salicornia pacifica, Typha angustifolia, Typha domingensis*.

Distribution: Lake beds and other areas on the floodplains of the Sacramento and San Joaquin Rivers. Also in low-lying areas of Kings and Kern Counties in the southwestern San Joaquin Valley and occasionally near the Colorado River in eastern Riverside and Imperial Counties. Elevation below 1,000 feet (300 meters). Now much reduced in area by drainage and cultivation.

52410 Coastal and Valley Freshwater Marsh

Description: Dominated by perennial, emergent monocots to 13 – 16 feet (4–5 meters) tall. Often forming completely closed canopies. *Schoenoplectus* and *Typha* dominated types and their environmental and floristic distinctions require clarification.

Site Factors: Quiet sites (lacking significant current) permanently flooded by fresh water (rather than brackish, alkaline, or variable). Prolonged saturation permits accumulation of deep, peaty soils.

Characteristic Species: *Carex senta, Cyperus esculentus, C. eragrostis, Eleocharis* spp., *Hydrocotyl verticillata, Limosella acaulis, Phragmites australis, Schoenoplectus acutus, S. americanus, S. californicus, Bolboschoenus robustus, Sparganiun eurycarpum, Typha angustifolia, T. domingensis, T. latifolia*.

Distribution: Occasional along the coast and in coastal valleys near river mouths and around the margins of lakes and springs. Most extensive in the upper portion of the Sacramento-San Joaquin River Delta. Common in the Sacramento and San Joaquin Valleys in river oxbows and other areas on the floodplain. Occasional along the Colorado River on the California-Arizona border. Now much reduced in area through its entire range.

61300 Southern Riparian Forest

Description: Dense riparian forests that cannot be differentiated to categories below.

Site Factors: Found along streams and rivers.

Characteristic Species: *Platanus racemosa, Populus* spp., and many other wetland plants.

Distribution: San Luis Rey River Valley, Pamo Valley, San Diego River, Cottonwood Creek, upper San Diego River, lower Peñasquitos Creek, Poway Creek.

62400 Southern Sycamore-Alder Riparian Woodland

Description: A tall, open, broadleaf, winter-deciduous streamside woodland dominated by *Platanus racemosa* (and often also *Alnus rhombirolia*). These stands seldom form closed canopy forests, and even may appear as trees scattered in a shrubby thicket of sclerophyllous and deciduous species. Lianas include *Rubus ursinus* and *Toxicodendron diversilobum.*

Site Factors: Very rocky streambeds subject to seasonally high-intensity flooding. *Alnus* increases in abundance on more perennial streams, while *Platanus* favors more intermittent hydrographs.

Characteristic Species: *Acer macrophyllum, Alnus rhombifolla, Artemisia douglasiana, Aralia californica, Equisetum hyemale, Stipa miliacea, Quercus agrifolia, Rubus ursinus, Sambucus nigra, Toxicodendron diversilobum, Umbellularia californica, Urtica dioica* subsp. *holosericea.*

Distribution: Transverse and Peninsular ranges from Point Conception south into Baja California Norte. In San Diego County: Pauma and Pala areas.

62500 Southern Riparian Woodland

Description: Moderate-density riparian woodlands dominated by small trees or shrubs, with scattered taller riparian trees.

Site Factors: Major river systems where flood scour occurs and smaller major tributaries.

Characteristic Species: *Baccharis sarothroides, Platanus racemosa, Populus* spp., *Salix* spp., *Sambucus* spp.

Distribution: Throughout San Diego County.

63000 Riparian Scrub

Description: Shrub-dominated riparian habitats generally lacking a tree canopy. Riparian scrub can be further differentiated into subtypes. Subtypes that occur on the Base and are described below are Southern Riparian Scrub (63300) and Tamarisk Scrub (63810).

Site Factors: Along perennial and intermittent drainages.

Characteristic Species: *Salix lasiolepis*, *Baccharis salicifolia*, *Tamarix* spp.

Distribution: Throughout southern California and San Diego County.

63300 Southern Riparian Scrub

Description: Riparian zones dominated by small trees or shrubs, lacking taller riparian trees. Encroaching into some Coastal Saltmarsh habitats.

Site Factors: Mostly in major river systems where flood scour occurs. Expanded from increased urban and agricultural runoff.

Characteristic Species: *Salix lasiolepis*, *Salix* spp., *Baccharis sarothroides*.

Distribution: Throughout San Diego County.

63810 Tamarisk Scrub

Description: A weedy, virtual monoculture of any of several *Tamarix* species, usually supplanting native vegetation following major disturbance.

Site Factors: Sandy or gravelly braided washes or intermittent streams, often in areas where high evaporation increases the stream's saltiness. Tamarisk is a strong phreatophyte and a prolific seeder, attributes that predispose the species to be aggressive competitors in disturbed riparian corridors.

Characteristic Species: *Atriplex lentiformis, Tiquilia palmeri, Distichlis spicata, Pleuchea sericea, Salix exiqua, Tamarix chinensis, T. ramosissima*.

Distribution: Widely scattered and increasing its range, throughout the drier parts of California from the rainshadow east of the Inner North Coast Ranges south through the Great Valley to southern California and across the deserts to Nevada, Arizona, and beyond.

64110 Marine Ocean

Description: Marine habitats extend from the upper limit of the unvegetated shore to the ocean.

Characteristic Species: Phytoplankton (diatoms and microalgae) and macroalgae.

Distribution: Along the Pacific Ocean Coast.

65000 Non-Native Riparian

Description: Densely vegetated riparian thickets dominated by nonnative, invasive species. This designation should only be used where nonnative, invasive species account for greater than 50% of the total vegetative cover within a mapping unit. If dominated by *Tamarix* spp., see also Tamarisk Scrub (63810).

Site Factors: Found in a variety of wetland habitats, often where disturbance has occurred.

Characteristic Species: *Arundo donax, Tamarix* spp., *Eucalyptus* spp., *Phoenix* spp., *Washingtonia* spp., *Cynodon dactylon, Ricinus communis, Cortaderia* spp. along with natives such as *Pluchea sericea, Populus fremontii, Salix* spp.

Distribution: Extensive along the major rivers of coastal southern California. In San Diego County, this is common in major river channels such as Otay River, Sweetwater River, San Diego River, San Dieguito River, San Luis Rey River.

65100 Arundo-Dominated Riparian

Description: Densely vegetated riparian thickets dominated almost exclusively by giant reed (*Arundo donax*). This designation should only be used where *Arundo* accounts for greater than 50% of the total vegetative cover within a mapping unit.

Site Factors: Loose, sandy or fine gravelly alluvium deposited near stream channels during flood flows.

Characteristic Species: *Arundo donax*.

Distribution: Extensive along the major rivers of coastal southern California. In San Diego County, this is common in major river channels such as Otay River, Sweetwater River, San Diego River, San Dieguito River, San Luis Rey River.

64400 Beach

Description: Sandy and/or cobbly habitat on coastal strands, lagoons, or lakes. Ocean beaches are a shoreline feature of deposited sand formed by waves and tides off the coast. Beaches on lakes may be a result of waves, disturbance, or geological formations. These are mainly unvegetated areas; however, upper portions may be thinly populated with herbaceous species.

Characteristic Species: In oceans: seagrasses from Posidoniaceae, Zosteraceae, Hydrocharitaceae and Cymodoceaceae. Other areas vary widely.

71161 Open Coast Live Oak Woodland

Description: Generally similar to the Coast Live Oak Woodland (71160) but with a canopy cover less than 50%. *Quercus agrifolia* present to a limited extent, but often co-dominant with other riparian, chaparral, or woodland types. This is a subtype occurring on the ecological margin of denser woodlands.

Site Factors: Along drainages at desert margin on north-facing slopes or mixed with *Quercus engelmannii*.

71162 Dense Coast Live Oak Woodland

Description: Generally similar to the Coast Live Oak Woodland (71160) but with a canopy cover between 50% and 75%. This resembles San Diego County's riparian woodlands more closely than Coast Live Oak Forest (81310).

Site Factors: Mostly occurs at the narrowing of valley floodplains. Valleys with deep alluvium and high perennial groundwater, mostly in riparian habitats.

Distribution: Throughout the foothill and mountain regions of San Diego County.

71181 Open Engelmann Oak Woodland

Description: An evergreen woodland dominated by *Quercus engelmannii* with an understory of typical "grassland" species, Inland Sage Scrub (32520), Valley "Stipa" Grassland, Chaparral or combined with *Q. agrifolia* at mesic sites.

Site Factors: Relatively moist sites on fine-textured soils of gentle slopes and valley bottoms. Intergrades with Venturan (32300) or Riversidian (32700) Sage Scrubs on drier, rockier sites, and with Dense Engelmann Oak Woodland (71182) on more mesic sites. Often surrounds grassland potreros, occupying the ecotone between the grassland (on fine-textured, deep soils) and surrounding shrub fields (on rockier, drier sites).

Characteristic Species: *Quercus engelmannii, Juglans californica, Quercus agrifolia, Rhus ovata, R. aromatica*.

Distribution: Mainly in the Santa Ana Mountains of San Diego and adjacent Riverside Counties, usually below about 4,000 feet (1,219 meters). Same distribution as the Engelmann oak itself with a density phase as a function of local soil and hydrology, not climate driven.

71182 Dense Engelmann Oak Woodland

Description: Very similar to Open Englemann Oak Woodland (71181), but has *Quercus agrifolia* as an additional significant constituent. Canopy cover is very similar to that observed in Open Englemann Oak Woodland, but stem densities are much greater due to *Q. agrifolia* being superimposed on the *Q. engelmannii*. In San Diego County, it is less associated with scrub types than the open phase.

Site Factors: On slightly more mesic sites (especially in steep canyons) than Open Englemann Oak Woodland (71181). Intergrades also with Coast Live Oak Woodland (71160) at slightly higher elevations on even more mesic sites.

Characteristic Species: *Quercus agrifolia, Q. engelmannii, Toxicodendron diversilobum*.

Distribution: Mainly in the Santa Ana and other Peninsular ranges. Throughout the range of Engelmann oaks.

77000 Mixed Oak Woodland

Description: Dominated by oaks. Often yields to pine-dominated types.

Site Factors: At high elevations where several oak tree species share dominance.

Characteristic Species: *Quercus agrifolia, Q. chrysolepis, Q. kelloggii, Q. engelmannii.*

Distribution: In San Diego County, found on the north end of Guejito Ranch, Mesa Grande, Wynola, North Peak, and Julian.

78000 Undifferentiated Open Woodland

Description: Catch-all category when species composition is unknown but the structural characteristics of the vegetation is known. Canopy is fairly open.

Characteristic Species: *Quercus* spp., etc.

79000 Non-Native Woodland

Description: Woodland of exotic trees, usually intentionally planted, that are not maintained or artificially irrigated. Does not usually apply where these trees have naturalized or in riparian woodlands.

Characteristic Species: Usually *Eucalyptus* spp. or *Tamarix* spp., but other nonnative species may occur.

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Appendix H

Plant Species on Camp Pendleton

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Plant Species on Camp Pendleton

FAMILY	Genus	SpEp	Rank	Infra# Name	Common Name	Origin*
ADOXACEAE	Sambucus	nigra	ssp.	caerulea	BLUE ELDERBERRY	N
AGAVACEAE	Agave	Americana			AMERICAN AGAVE	E
AGAVACEAE	Chlorogalum	parviflorum			SMALL-FLOWER SOAP-PLANT; AMOLE	N
AGAVACEAE	Chlorogalum	pomeridianum	var.	pomeridianum	WAVY-LEAF SOAP-PLANT	N
AGAVACEAE	Hesperoyucca	whipplei			CHAPARRAL CANDLE	N
AGAVACEAE	Yucca	schidigera			MOHAVE YUCCA	N
AIZOACEAE	Aptenia	cordifolia			BABY SUN ROSE; SHRUBBY DEWPLANT	E
AIZOACEAE	Carpobrotus	chilensis			SEA-FIG	E
AIZOACEAE	Carpobrotus	edulis			HOTTENTOT-FIG	E
AIZOACEAE	Malephora	crocea	var.	crocea	CROCEA ICEPLANT	E
AIZOACEAE	Mesembryanthemum	crystallinum			CRYSTALLINE ICEPLANT	E
AIZOACEAE	Mesembryanthemum	nodiflorum			SLENDER-LEAF ICEPLANT	E
AIZOACEAE	Sesuvium	verrucosum			WESTERN SEA-PURSLANE	N
AIZOACEAE	Tetragonia	tetragonioides			NEW ZEALAND-SPINACH	E
ALISMATACEAE	Alisma	triviale			WATER-PLANTAIN	N
ALLIACEAE	Allium	haematochiton			RED-SKIN ONION	N
ALLIACEAE	Allium	peninsulare	var.	peninsulare	RED-FLOWER ONION	N
ALLIACEAE	Allium	Praecox			EARLY ONION	N
AMARANTHACEAE	Alternanthera	caracasana			MEXICAN ALTERNANTHERA	E
AMARANTHACEAE	Amaranthus	Albus			WHITE TUMBLEWEED	E
AMARANTHACEAE	Amaranthus	Blitoides			PROSTRATE AMARANTH	N
AMARANTHACEAE	Amaranthus	Hybridus			SLENDER PIGWEED	E
AMARANTHACEAE	Amaranthus	Retroflexus			ROUGH PIGWEED	E
ANACARDIACEAE	Malosma	laurina			LAUREL SUMAC	N
ANACARDIACEAE	Rhus	aromatica	var.	aromatica	SKUNKBRUSH	N
ANACARDIACEAE	Rhus	integrifolia			LEMONADEBERRY	N
ANACARDIACEAE	Rhus	integrifolia x R. ovata			HYBRID SUGARBERRY	N
ANACARDIACEAE	Rhus	ovata			SUGAR BUSH	N
ANACARDIACEAE	Schinus	molle			PERUVIAN PEPPER TREE	E

FAMILY	Genus	SpEp	Rank	Infra# Name	Common Name	Origin*
ANACARDIACEAE	Schinus	terebinthifolius			BRAZILIAN PEPPER TREE	E
ANACARDIACEAE	Toxicodendron	diversilobum			WESTERN POISON-OAK	N
APIACEAE	Anthriscus	caucalis			BUR CHERVIL	E
APIACEAE	Apiastrum	angustifolium			MOCK-PARSLEY	N
APIACEAE	Apium	graveolens			COMMON CELERY	E
APIACEAE	Berula	erecta			CUT-LEAF WATER-PARSNIP	N
APIACEAE	Bowlesia	incana			AMERICAN BOWLESIA	N
APIACEAE	Conium	maculatum			COMMON POISON HEMLOCK	E
APIACEAE	Daucus	carota			CARROT, QUEEN ANNE'S LACE	E
APIACEAE	Daucus	pusillus			RATTLESNAKE WEED	N
APIACEAE	Eryngium	aristulatum	var.	parishii	SAN DIEGO BUTTON-CELERY	N
APIACEAE	Eryngium	pendletonense			PENDLETON BUTTON-CELERY	N
APIACEAE	Foeniculum	vulgare			SWEET FENNEL	E
APIACEAE	Lomatium	dasycarpum	ssp.	dasycarpum	WOOLLY-FRUIT LOMATIUM	N
APIACEAE	Osmorhiza	brachypoda			CALIFORNIA SWEET-CICELY	N
APIACEAE	Sanicula	arguta			SHARP-TOOTH SANICLE	N
APIACEAE	Sanicula	crassicaulis			PACIFIC SANICLE	N
APIACEAE	Sanicula	tuberosa			TURKEY PEA SANICLE	N
APIACEAE	Tauschia	arguta			SOUTHERN TAUSCHIA	N
APIACEAE	Torilis	arvensis			JAPANESE HEDGE-PARSLEY	E
APIACEAE	Torilis	nodosa			KNOT HEDGE-PARSLEY	E
APIACEAE	Yabea	microcarpa			CALIFORNIA HEDGE-PARSLEY	N
APOCYNACEAE	Apocynum	cannabinum			INDIAN-HEMP	N
APOCYNACEAE	Araujia	sericifera			BLADDER FLOWER	E
APOCYNACEAE	Asclepias	eriocarpa			KOTOLO, INDIAN MILKWEED	N
APOCYNACEAE	Asclepias	fascicularis			NARROW-LEAF MILKWEED	N
APOCYNACEAE	Funastrum	cynanchoides	var.	hartwegii	CLIMBING MILKWEED	N
APOCYNACEAE	Nerium	oleander			OLEANDER	E
APOCYNACEAE	Vinca	major			GREATER PERIWINKLE	E
ARACEAE	Lemna	sp.			DUCKWEED	N
ARALIACEAE	Hydrocotyle	umbellata			MANY-FLOWER MARSH-PENNYWORT	N
ARALIACEAE	Hydrocotyle	verticillata			WHORLED MARSH-PENNYWORT	N
ARECACEAE	Phoenix	canariensis			CANARY ISLAND DATE PALM	E

FAMILY	Genus	SpEp	Rank	Infra# Name	Common Name	Origin*
ARECACEAE	Washingtonia	robusta			MEXICAN FAN PALM	E
ASPARAGACEAE	Asparagus	asparagoides			FLORIST'S-SMILAX	E
ASPHODELACEAE	Asphodelus	fistulosus			HOLLOW-STEM ASPHODEL	E
ASPLENIACEAE	Asplenium	vespertinum			WESTERN SPLEENWORT	N
ASTERACEAE	Achillea	millefolium			YARROW	N
ASTERACEAE	Acourtia	microcephala			SACAPELLOTE	N
ASTERACEAE	Ageratina	adenophora			STICKY EUPATORIUM	E
ASTERACEAE	Agoseris	grandiflora	var.	grandiflora	LARGE-FLOWER AGOSERIS	N
ASTERACEAE	Aldama	purisimae			LA PURISIMA SUNFLOWER	N
ASTERACEAE	Amblyopappus	pusillus			PINEAPPLE-WEED	N
ASTERACEAE	Ambrosia	acanthicarpa			ANNUAL BUR-SAGE	N
ASTERACEAE	Ambrosia	chamissonis			BEACH-BUR	N
ASTERACEAE	Ambrosia	confertiflora			WEAK-LEAF BUR-SAGE	N
ASTERACEAE	Ambrosia	psilostachya			WESTERN RAGWEED	N
ASTERACEAE	Anthemis	cotula			MAYWEED; STINKWEED; DOG-FENNEL	E
ASTERACEAE	Artemisia	californica			COASTAL SAGEBRUSH	N
ASTERACEAE	Artemisia	douglasiana			DOUGLAS MUGWORT	N
ASTERACEAE	Artemisia	dracunculus			TARRAGON; DRAGON SAGEWORT	N
ASTERACEAE	Artemisia	palmeri			PALMER'S SAGEWORT	N
ASTERACEAE	Artemisia	tridentata	ssp.	tridentata	BIG SAGEBRUSH	N
ASTERACEAE	Baccharis	pilularis	ssp.	consanguinea	COYOTE BRUSH	N
ASTERACEAE	Baccharis	salicifolia			MULE-FAT; SEEP-WILLOW	N
ASTERACEAE	Baccharis	salicina			WILLOW BACCHARIS	N
ASTERACEAE	Baccharis	sarothroides			BROOM BACCHARIS	N
ASTERACEAE	Baccharis	vanessae			ENCINITAS BACCHARIS	N
ASTERACEAE	Bahiopsis	laciniata			SAN DIEGO SUNFLOWER	N
ASTERACEAE	Bebbia	juncea	var.	aspera	RUSH SWEETBUSH	N
ASTERACEAE	Bidens	laevis			SMOOTH BEGGAR'S TICK	N
ASTERACEAE	Brickellia	californica			CALIFORNIA BRICKELLBUSH	N
ASTERACEAE	Carduus	pycnocephalus	ssp.	pycnocephalus	ITALIAN THISTLE	E
ASTERACEAE	Carduus	tenuiflorus			SLENDER THISTLE	E
ASTERACEAE	Centaurea	benedicta			BLESSED THISTLE	E
ASTERACEAE	Centaurea	melitensis			TOCALOTE	E
ASTERACEAE	Centromadia	pungens	ssp.	laevis	SMOOTH TARPLANT	N

FAMILY	Genus	SpEp	Rank	Infra# Name	Common Name	Origin*
ASTERACEAE	Chaenactis	artemisiifolia			WHITE PINCUSHION	N
ASTERACEAE	Chaenactis	glabriuscula	var.	glabriuscula	YELLOW PINCUSION	N
ASTERACEAE	Cirsium	occidentale	var.	californicum	CALIFORNIA THISTLE	N
ASTERACEAE	Cirsium	occidentale	var.	occidentale	COBWEBBY THISTLE	N
ASTERACEAE	Cirsium	vulgare			BULL THISTLE	E
ASTERACEAE	Corethrogyne	filaginifolia	var.	filaginifolia	COMMON SAND-ASTER	N
ASTERACEAE	Cotula	australis			AUSTRALIAN BRASS-BUTTONS	E
ASTERACEAE	Cotula	coronopifolia			AFRICAN BRASS-BUTTONS	E
ASTERACEAE	Cynara	cardunculus	ssp.	flavescens	ARTICHOKE THISTLE	E
ASTERACEAE	Deinandra	fasciculata			FASCICLED TARWEED	N
ASTERACEAE	Deinandra	kelloggii			KELLOGG TARPLANT	N
ASTERACEAE	Deinandra	paniculata			SAN DIEGO TARPLANT	N
ASTERACEAE	Dimorphotheca	fruticosa			TRAILING AFRICAN DAISY	E
ASTERACEAE	Dimorphotheca	sinuata			BLUE-EYE CAPE-MARIGOLD	E
ASTERACEAE	Dittrichia	graveolens			STINKWORT	E
ASTERACEAE	Encelia	californica			CALIFORNIA ENCELIA	N
ASTERACEAE	Encelia	farinosa	var.	farinosa	BRITTLEBUSH, INCIENSO	E
ASTERACEAE	Ericameria	brachylepis			BOUNDARY GOLDENBUSH	N
ASTERACEAE	Ericameria	palmeri	var.	pachylepis	THICKBRACTED GOLDENBUSH	N
ASTERACEAE	Erigeron	bonariensis			FLAX-LEAF FLEABANE	E
ASTERACEAE	Erigeron	canadensis			HORSEWEED	N
ASTERACEAE	Erigeron	foliosus	var.	foliosus	LEAFY DAISY	N
ASTERACEAE	Erigeron	sumatrensis			ASTHMAWEED	E
ASTERACEAE	Eriophyllum	confertiflorum	var.	confertiflorum	LONG-STEM GOLDEN-YARROW	N
ASTERACEAE	Euthamia	occidentalis			WESTERN GOLDENROD	N
ASTERACEAE	Galinsoga	parviflora	var.	parviflora	SMALL-FLOWER GALINSOGA	E
ASTERACEAE	Gamochaeta	stagnalis			DESERT CUDWEED	N
ASTERACEAE	Gamochaeta	ustulata			PACIFIC CUDWEED	N
ASTERACEAE	Gazania	linearis			TREASURE FLOWER	E
ASTERACEAE	Glebionis	coronaria			CROWN DAISY; GARLAND	E
ASTERACEAE	Gnaphalium	palustre			LOWLAND CUDWEED	N
ASTERACEAE	Grindelia	camporum			HAIRY GUMPLANT	N
ASTERACEAE	Gutierrezia	sarothrae			BROOM MATCHWEED	N
ASTERACEAE	Hazardia	squarrosa	var.	grindelioides	SOUTHERN SAWTOOTH GOLDENBUSH	N

FAMILY	Genus	SpEp	Rank	Infra# Name	Common Name	Origin*
ASTERACEAE	Hedypnois	cretica			CRETE HEDYPNOIS	E
ASTERACEAE	Helianthus	annuus			WESTERN SUNFLOWER	N
ASTERACEAE	Helianthus	gracilentus			SLENDER SUNFLOWER	N
ASTERACEAE	Helminthotheca	echioides			BRISTLY OX-TONGUE	E
ASTERACEAE	Heterotheca	grandiflora			TELEGRAPH WEED	N
ASTERACEAE	Heterotheca	sessiflora	ssp.	echioides	BRISTLY GOLDENASTER	N
ASTERACEAE	Holocarpha	virgata	ssp.	elongata	GRACEFUL TARPLANT	N
ASTERACEAE	Hypochaeris	glabra			SMOOTH CAT'S EAR	E
ASTERACEAE	Hypochaeris	radicata			HAIRY CAT'S EAR	E
ASTERACEAE	Isocoma	menziesii	var.	decumbens	DECUMBENT GOLDENBUSH	N
ASTERACEAE	Isocoma	menziesii	var.	menziesii	SPREADING GOLDENBUSH	N
ASTERACEAE	Isocoma	menziesii	var.	vernonioides	COASTAL GOLDENBUSH	N
ASTERACEAE	Iva	axillaris			POVERTY WEED	N
ASTERACEAE	Iva	hayesiana			SAN DIEGO MARSH-ELDER	N
ASTERACEAE	Jaumea	carnosa			SALTY SUSAN; FLESHY JAUMEA	N
ASTERACEAE	Lactuca	serriola			PRICKLY LETTUCE	E
ASTERACEAE	Laennecia	coulteri			COULTER'S HORSEWEED	N
ASTERACEAE	Lagophylla	ramosissima			COMMON HARELEAF	N
ASTERACEAE	Lasthenia	glabrata	ssp.	coulteri	COULTER'S SALT-MARSH DAISY	N
ASTERACEAE	Lasthenia	gracilis			COMMON GOLDFIELDS	N
ASTERACEAE	Layia	platyglossa			TIDY TIPS	N
ASTERACEAE	Lepidospartum	squamatum			SCALE-BROOM	N
ASTERACEAE	Leptosyne	maritima			SAN DIEGO SEA-DAHLIA	N
ASTERACEAE	Logfia	arizonica			ARIZONA COTTONROSE	N
ASTERACEAE	Logfia	filaginoides			CALIFORNIA COTTONROSE	N
ASTERACEAE	Logfia	gallica			NARROW-LEAF COTTONROSE	E
ASTERACEAE	Madia	exigua			PYGMY/THREAD-STEM MADIA	N
ASTERACEAE	Madia	gracilis			SLENDER MADIA	N
ASTERACEAE	Madia	sativa			COAST MADIA	N
ASTERACEAE	Malacothrix	saxatilis	var.	tenuifolia	CLIFF MALACOTHRIX	N
ASTERACEAE	Matricaria	discoidea			COMMON PINEAPPLE-WEED	E
ASTERACEAE	Micropus	californicus	var.	californicus	SLENDER COTTONWEED	N
ASTERACEAE	Microseris	douglasii	ssp.	platycarpha	SMALL-FLOWER MICROSERIS	N

FAMILY	Genus	SpEp	Rank	Infra# Name	Common Name	Origin*
ASTERACEAE	Microseris	elegans			ELEGANT MICROSERIS	N
ASTERACEAE	Oncosiphon	piluliferum			STINKNET	E
ASTERACEAE	Osmadenia	tenella			OSMADENIA	N
ASTERACEAE	Pentachaeta	aurea	ssp.	aurea	GOLDEN-RAYED PENTACHAETA	N
ASTERACEAE	Perityle	emoryi			EMORY'S ROCK DAISY	N
ASTERACEAE	Pluchea	odorata	var.	odorata	SALT MARSH FLEABANE	N
ASTERACEAE	Pluchea	sericea			ARROWWEED	N
ASTERACEAE	Porophyllum	gracile			ODORA	N
ASTERACEAE	Pseudognaphalium	beneolens			FRAGRANT EVERLASTING	N
ASTERACEAE	Pseudognaphalium	biolettii			BICOLOR CUDWEED	N
ASTERACEAE	Pseudognaphalium	californicum			CALIFORNIA EVERLASTING	N
ASTERACEAE	Pseudognaphalium	canescens			EVERLASTING CUDWEED	N
ASTERACEAE	Pseudognaphalium	leucocephalum			WHITE-HEAD CUDWEED	N
ASTERACEAE	Pseudognaphalium	luteoalbum			FRAGRANT EVERLASTING CUDWEED	E
ASTERACEAE	Pseudognaphalium	microcephalum			WHITE EVERLASTING	N
ASTERACEAE	Pseudognaphalium	ramosissimum			PINK EVERLASTING	N
ASTERACEAE	Pseudognaphalium	stramineum			COTTON-BATTING PLANT	N
ASTERACEAE	Psilocarphus	brevissimus	var.	brevissimus	DWARF WOOLLY-MARBLES	N
ASTERACEAE	Psilocarphus	tenellus			SLENDER WOOLLY-MARBLES	N
ASTERACEAE	Pulicaria	paludosa			SPANISH FALSE-FLEABANE	E
ASTERACEAE	Rafinesquia	californica			CALIFORNIA CHICORY	N
ASTERACEAE	Senecio	aphanactis			CALIFORNIA GROUNDSEL	N
ASTERACEAE	Senecio	californicus			CALIFORNIA BUTTERWEED	N
ASTERACEAE	Senecio	flaccidus	var.	douglasii	SAND-WASH BUTTERWEED	N
ASTERACEAE	Senecio	quadridentatus			COTTON FIREWEED	E
ASTERACEAE	Senecio	vulgaris			COMMON GROUNDSEL	E
ASTERACEAE	Silybum	marianum			MILK THISTLE	E
ASTERACEAE	Solidago	velutina	ssp.	californica	CALIFORNIA GOLDENROD	N
ASTERACEAE	Sonchus	asper	ssp.	asper	PRICKLY SOW-THISTLE	E
ASTERACEAE	Sonchus	oleraceus			COMMON SOW-THISTLE	E
ASTERACEAE	Stebbinsoseris	heterocarpa			GRASSLAND STEBBINSOSERIS	N
ASTERACEAE	Stephanomeria	cichoriacea			CHICORY-LEAF WIRELETTUCE	N
ASTERACEAE	Stephanomeria	diegensis			SAN DIEGO WREATH-PLANT	N

FAMILY	Genus	SpEp	Rank	Infra# Name	Common Name	Origin*
ASTERACEAE	Stephanomeria	exigua	ssp.	deanei	DEANE'S SMALL WREATH-PLANT	N
ASTERACEAE	Stephanomeria	virgata			TALL WREATH-PLANT	N
ASTERACEAE	Stylocline	gnaphaloides			EVERLASTING NEST-STRAW	N
ASTERACEAE	Symphyotrichum	subulatum	var.	parviflorum	SOUTHWESTERN ANNUAL SALTMARSH ASTER	N
ASTERACEAE	Tagetes	erecta			MARIGOLD	E
ASTERACEAE	Taraxacum	officinale			COMMON DANDELION	E
ASTERACEAE	Uropappus	lindleyi			SILVER PUFFS	N
ASTERACEAE	Venegasia	carpesioides			JESUIT FLOWER	N
ASTERACEAE	Xanthium	spinosum			SPINY COCKLEBUR	N
ASTERACEAE	Xanthium	strumarium			COCKLEBUR	N
AZOLLACEAE	Azolla	filiculoides			PACIFIC MOSQUITO FERN	N
BASELLACEAE	Anredera	cordifolia			MIGNONETTE VINE	E
BETULACEAE	Alnus	rhombifolia			WHITE ALDER	N
BLECHNACEAE	Woodwardia	fimbriata			GIANT CHAIN FERN	N
BORAGINACEAE	Amsinckia	intermedia			RANCHER'S FIDDLENECK	N
BORAGINACEAE	Amsinckia	menziesii			RIGID FIDDLENECK	N
BORAGINACEAE	Cryptantha	clevelandii	var.	clevelandii	CLEVELAND'S CRYPTANTHA	N
BORAGINACEAE	Cryptantha	clevelandii	var.	florosa	LARGE-FLOWER CLEVELAND'S CRYPTANTHA	N
BORAGINACEAE	Cryptantha	intermedia	var.	intermedia	NIEVITAS CRYPTANTHA	N
BORAGINACEAE	Cryptantha	intermedia	var.	johnstonii	JOHNSTON'S NIEVITAS CRYPTANTHA	N
BORAGINACEAE	Cryptantha	microstachys			TEJON CRYPTANTHA	N
BORAGINACEAE	Cryptantha	muricata	var.	jonesii	JONES' PRICKLY CRYPTANTHA	N
BORAGINACEAE	Echium	candicans			PRIDE OF MADEIRA	E
BORAGINACEAE	Emmenanthe	penduliflora	var.	penduliflora	WHISPERING BELLS	N
BORAGINACEAE	Eriodictyon	crassifolium	var.	crassifolium	FELT-LEAF YERBA SANTA	N
BORAGINACEAE	Eucrypta	chrysanthemifolia	var.	chrysanthemifolia	COMMON EUCRYPTA	N
BORAGINACEAE	Harpagonella	palmeri			PALMER'S GRAPPLING-HOOK	N
BORAGINACEAE	Heliotropium	curassavicum	var.	oculatum	SALT HELIOTROPE	N
BORAGINACEAE	Johnstonella	micromeres			MINUTE-FLOWER CRYPTANTHA	N
BORAGINACEAE	Nemophila	menziesii	var.	integrifolia	SMALL-FLOWER BABY BLUE EYES	N
BORAGINACEAE	Nemophila	pedunculata			MEADOW NEMOPHILA	N

FAMILY	Genus	SpEp	Rank	Infra# Name	Common Name	Origin*
BORAGINACEAE	Pectocarya	linearis	ssp.	ferocula	SLENDER PECTOCARYA	N
BORAGINACEAE	Pectocarya	penicillata			WINGED COMBSEED	N
BORAGINACEAE	Phacelia	aff. cicutaria			CATERPILLAR PHACELIA	N
BORAGINACEAE	Phacelia	brachyloba			SHORT-LOBE PHACELIA	N
BORAGINACEAE	Phacelia	cicutaria	var.	hispida	CATERPILLAR PHACELIA	N
BORAGINACEAE	Phacelia	distans			WILD-HELIOTROPE	N
BORAGINACEAE	Phacelia	grandiflora			GIANT-FLOWER PHACELIA	N
BORAGINACEAE	Phacelia	imbricata	var.	imbricata	IMBRICATE PHACELIA	N
BORAGINACEAE	Phacelia	imbricata	var.	patula	ROCK PHACELIA	N
BORAGINACEAE	Phacelia	lyonii			LYON'S PHACELIA	N
BORAGINACEAE	Phacelia	minor			WILD CANTERBURY-BELL	N
BORAGINACEAE	Phacelia	minor × P. parryi			HYBRID CANTERBURY-BELL	N
BORAGINACEAE	Phacelia	parryi			PARRY'S PHACELIA	N
BORAGINACEAE	Phacelia	ramosissima	var.	latifolia	BRANCHING PHACELIA	N
BORAGINACEAE	Phacelia	stellaris			BRAND'S PHACELIA	N
BORAGINACEAE	Pholistoma	auritum	var.	auritum	FIESTA FLOWER	N
BORAGINACEAE	Pholistoma	racemosum			SAN DIEGO FIESTA FLOWER	N
BORAGINACEAE	Plagiobothrys	acanthocarpus			ADOBE POPCORNFLOWER	N
BORAGINACEAE	Plagiobothrys	arizonicus			ARIZONA POPCORNFLOWER	N
BORAGINACEAE	Plagiobothrys	canescens			VALLEY POPCORNFLOWER	N
BORAGINACEAE	Plagiobothrys	collinus	var.	californicus	CALIFORNIA POPCORNFLOWER	N
BORAGINACEAE	Plagiobothrys	collinus	var.	fulvescens	ROUGH POPCORNFLOWER	N
BORAGINACEAE	Plagiobothrys	collinus	var.	gracilis	SAN DIEGO POPCORNFLOWER	N
BORAGINACEAE	Plagiobothrys	nothofulvus			RUSTY POPCORNFLOWER	N
BRASSICACEAE	Athysanus	pusillus			DWARF AHTYSANUS	N
BRASSICACEAE	Barbarea	orthoceras			ERECT-POD WINTER-CRESS	N
BRASSICACEAE	Brassica	napus			SWEDE RAPE; RAPESEED	E
BRASSICACEAE	Brassica	nigra			BLACK MUSTARD	E
BRASSICACEAE	Brassica	rapa			TURNIP; FIELD MUSTARD	E
BRASSICACEAE	Brassica	tournefortii			SAHARA MUSTARD	E
BRASSICACEAE	Cakile	edentula			AMERICAN SEAROCKET	E
BRASSICACEAE	Cakile	maritima			EUROPEAN SEAROCKET	E
BRASSICACEAE	Capsella	bursa-pastoris			SHEPHERD'S PURSE	E
BRASSICACEAE	Cardamine	californica			MILKMAIDS; TOOTHWORT	N

FAMILY	Genus	SpEp	Rank	Infra# Name	Common Name	Origin*
BRASSICACEAE	Carrichtera	annua			WARD'S WEED	E
BRASSICACEAE	Caulanthus	heterophyllus			SAN DIEGO JEWELFLOWER	N
BRASSICACEAE	Caulanthus	lasiophyllus			CALIFORNIA MUSTARD	N
BRASSICACEAE	Caulanthus	simulans			PAYSON'S CAULANTHUS	N
BRASSICACEAE	Descurainia	pinnata	ssp.	brachycarpa	WESTERN TANSY-MUSTARD	N
BRASSICACEAE	Draba	cuneifolia	var.	integrifolia	DESERT WHITLOW-GRASS	N
BRASSICACEAE	Erysimum	aff. ammophilum			COAST WALLFLOWER	N
BRASSICACEAE	Erysimum	capitatum	ssp.	capitatum	WESTERN WALLFLOWER	N
BRASSICACEAE	Hirschfeldia	incana			SHORT-POD MUSTARD	E
BRASSICACEAE	Lepidium	densiflorum			COMMON PEPPERGRASS	N
BRASSICACEAE	Lepidium	didymum			LESSER WART-CRESS	E
BRASSICACEAE	Lepidium	draba			HEART-POD HOARY-CRESS	E
BRASSICACEAE	Lepidium	lasiocarpum	var.	lasiocarpum	SAND PEPPERGRASS	N
BRASSICACEAE	Lepidium	latifolium			BROAD-LEAF PEPPERGRASS	E
BRASSICACEAE	Lepidium	latipes			DWARF PEPPERGRASS	N
BRASSICACEAE	Lepidium	nitidum			SHINING PEPPERGRASS	N
BRASSICACEAE	Lepidium	oblongum	var.	insulare	VEINY PEPPERGRASS	N
BRASSICACEAE	Lepidium	oblongum	var.	oblongum	WAYSIDE PEPPERGRASS	N
BRASSICACEAE	Lepidium	ramosissimum			BRANCHED PEPPERGRASS	N
BRASSICACEAE	Lepidium	strictum			UPRIGHT PEPPERGRASS	N
BRASSICACEAE	Lepidium	virginicum	ssp.	menziesii	MENZIES'S PEPPERGRASS	N
BRASSICACEAE	Lepidium	virginicum	var.	robinsonii	ROBINSON'S PEPPERGRASS	N
BRASSICACEAE	Lobularia	maritima			SWEET ALYSSUM	E
BRASSICACEAE	Nasturtium	officinale			WATER-CRESS	N
BRASSICACEAE	Planodes	virginicum			VIRGINIA ROCK-CRESS	N
BRASSICACEAE	Raphanus	raphanistrum			JOINTED CHARLOCK	E
BRASSICACEAE	Raphanus	sativus			WILD RADISH	E
BRASSICACEAE	Rapistrum	rugosum			ANNUAL BASTARD-CABBAGE	E
BRASSICACEAE	Rorippa	palustris	ssp.	palustris	BOG YELLOWCRESS	N
BRASSICACEAE	Sisymbrium	altissimum			TUMBLE MUSTARD	E
BRASSICACEAE	Sisymbrium	irio			LONDON ROCKET	E
BRASSICACEAE	Sisymbrium	officinale			HEDGE MUSTARD	E
BRASSICACEAE	Sisymbrium	orientale			HARE'S-EAR CABBAGE	E
BRASSICACEAE	Thysanocarpus	curvipes	ssp.	curvipes	LACEPOD; FRINGEPOD	N
BRASSICACEAE	Thysanocarpus	laciniatus			NOTCH FRINGEPOD	N

FAMILY	Genus	SpEp	Rank	Infra# Name	Common Name	Origin*
BRASSICACEAE	Tropidocarpum	gracile			SLENDERDOBIE-POD	N
BRASSICACEAE	Turritis	glabra			TOWER MUSTARD	N
CACTACEAE	Cylindropuntia	prolifera			COAST CHOLLA	N
CACTACEAE	Mammillaria	dioica			FISH-HOOK CACTUS	N
CACTACEAE	Opuntia	×occidentalis			WESTERN PRICKLY-PEAR	N
CACTACEAE	Opuntia	×vaseyi			MESA PRICKLY-PEAR	N
CACTACEAE	Opuntia	ficus-indica			MISSION PRICKLY-PEAR, INDIAN-FIG	E
CACTACEAE	Opuntia	littoralis			COAST PRICKLY-PEAR	N
CACTACEAE	Opuntia	oricola			CHAPARRAL PRICKLY-PEAR	N
CACTACEAE	Opuntia	phaeacantha			DESERT PRICKLY-PEAR	N
CAMPANULACEAE	Githopsis	diffusa	ssp.	candida	SAN GABRIEL BLUECUP	N
CAMPANULACEAE	Heterocodon	rariflorum			HETEROCODON	N
CAMPANULACEAE	Triodanis	biflora			SMALL VENUS LOOKING-GLASS	N
CAPRIFOLIACEAE	Lonicera	subspicata	var.	denudata	JOHNSTON'S HONEYSUCKLE	N
CAPRIFOLIACEAE	Symphoricarpos	mollis			CREEPING SNOWBERRY; TRIP VINE	N
CARYOPHYLLACEAE	Cardionema	ramosissimum			TREAD LIGHTLY	N
CARYOPHYLLACEAE	Cerastium	glomeratum			MOUSE-EARED CHICKWEED	E
CARYOPHYLLACEAE	Gypsophila	paniculata			BABY'S-BREATH	E
CARYOPHYLLACEAE	Petrorhagia	dubia			HAIRY PINK	E
CARYOPHYLLACEAE	Polycarpon	depressum			CALIFORNIA POLYCARP	N
CARYOPHYLLACEAE	Polycarpon	tetraphyllum	ssp.	tetraphyllum	FOUR-LEAF ALLSEED	E
CARYOPHYLLACEAE	Silene	antirrhina			SNAPDRAGON CATCHFLY	N
CARYOPHYLLACEAE	Silene	gallica			COMMON CATCHFLY	E
CARYOPHYLLACEAE	Silene	laciniata	ssp.	laciniata	SOUTHERN PINK	N
CARYOPHYLLACEAE	Spergula	arvensis			STICKWORT; STARWORT	E
CARYOPHYLLACEAE	Spergularia	bocconi			BUCCONE'S SAND-SPURRY	E
CARYOPHYLLACEAE	Spergularia	macrotheca	var.	macrotheca	STICKY SAND-SPURRY	N
CARYOPHYLLACEAE	Spergularia	marina			SALT MARSH SAND-SPURRY	N
CARYOPHYLLACEAE	Spergularia	rubra			RUBY SAND-SPURRY	E
CARYOPHYLLACEAE	Spergularia	villosa			VILLOUS SAND-SPURRY	E
CARYOPHYLLACEAE	Stellaria	media			COMMON CHICKWEED	E
CARYOPHYLLACEAE	Stellaria	neglecta			GREATER CHICKWEED	E

FAMILY	Genus	SpEp	Rank	Infra# Name	Common Name	Origin*
CARYOPHYLLACEAE	Stellaria	nitens			SHINING CHICKWEED	N
CARYOPHYLLACEAE	Stellaria	pallida			PALE STARWORT	E
CASUARINACEAE	Casuarina	equisetifolia			HORSETAIL TREE	E
CHENOPODIACEAE	Aphanisma	blitoides			APHANISMA	N
CHENOPODIACEAE	Arthrocnemum	subterminale			PARISH'S PICKLEWEED	N
CHENOPODIACEAE	Atriplex	amnicola			SWAMP SALTBUSH	E
CHENOPODIACEAE	Atriplex	canescens	var.	canescens	FOUR-WING SALTBUSH; SHAD SCALE	N
CHENOPODIACEAE	Atriplex	cf. crassipes			THICK-STALKED SALTBUSH	E
CHENOPODIACEAE	Atriplex	coulteri			COULTER'S SALTBUSH	N
CHENOPODIACEAE	Atriplex	glauca			WAXY SALTBUSH	E
CHENOPODIACEAE	Atriplex	lentiformis			BIG SALTBUSH	N
CHENOPODIACEAE	Atriplex	leucophylla			SEASCALE, BEACH SALTBUSH	N
CHENOPODIACEAE	Atriplex	pacifica			SOUTH COAST SALTBUSH	N
CHENOPODIACEAE	Atriplex	prostrata			SPEARSCALE	E
CHENOPODIACEAE	Atriplex	semibaccata			AUSTRALIAN SALTBUSH	E
CHENOPODIACEAE	Atriplex	serenana	var.	serenana	BRACTSCALE	N
CHENOPODIACEAE	Atriplex	suberecta			PEREGRINE SALTBUSH	E
CHENOPODIACEAE	Bassia	hyssopifolia			FIVE-HOOK BASSIA	E
CHENOPODIACEAE	Beta	vulgaris	ssp.	maritima	SEA BEET	E
CHENOPODIACEAE	Chenopodium	album			LAMB'S QUARTERS	E
CHENOPODIACEAE	Chenopodium	berlandieri	var.	sinuatum	PIT-SEED GOOSEFOOT	N
CHENOPODIACEAE	Chenopodium	berlandieri	var.	zschackei	ZSCHACKEI'S PIT-SEED GOOSEFOOT	N
CHENOPODIACEAE	Chenopodium	californicum			CALIFORNIA GOOSEFOOT	N
CHENOPODIACEAE	Chenopodium	glaucum	var.	salinum	OAK-LEAF GOOSEFOOT	N
CHENOPODIACEAE	Chenopodium	hians			HIANS GOOSEFOOT	N
CHENOPODIACEAE	Chenopodium	murale			NETTLE-LEAF GOOSEFOOT	E
CHENOPODIACEAE	Chenopodium	strictum	var.	glaucophyllum	WHITE-LEAF GOOSEFOOT	E
CHENOPODIACEAE	Dysphania	ambrosioides			MEXICAN TEA	E
CHENOPODIACEAE	Dysphania	multifida			CUT-LEAF GOOSEFOOT	E
CHENOPODIACEAE	Dysphania	pumilio			TASMANIAN GOOSEFOOT	E
CHENOPODIACEAE	Extriplex	californica			CALIFORNIA ORACH	N
CHENOPODIACEAE	Salicornia	pacifica			PACIFIC PICKLEWEED	N

FAMILY	Genus	SpEp	Rank	Infra# Name	Common Name	Origin*
CHENOPODIACEAE	Salsola	australis			AUSTRALIAN TUMBLEWEED	E
CHENOPODIACEAE	Salsola	tragus			PRICKLY RUSSIAN-THISTLE, TUMBLEWEED	E
CHENOPODIACEAE	Suaeda	calceoliformis			HORNED SEA-BLITE	N
CHENOPODIACEAE	Suaeda	taxifolia			WOOLLY SEA-BLITE	N
CISTACEAE	Crocanthemum	aldersonii			ALDERSON'S RUSH-ROSE	N
CISTACEAE	Crocanthemum	scoparium	var.	scoparium	PEAK RUSH-ROSE	N
CISTACEAE	Crocanthemum	scoparium	var.	vulgare	COAST PEAK RUSH-ROSE	N
CLEOMACEAE	Peritoma	arborea	var.	arborea	COAST BLADDERPOD	N
CLEOMACEAE	Peritoma	arborea	var.	globosa	LARGE BLADDERPOD	N
CONVOLVULACEAE	Calystegia	macrostegia	ssp.	arida	SOUTHERN CALIFORNIA MORNING-GLORY	N
CONVOLVULACEAE	Calystegia	macrostegia	ssp.	cyclostegia	COAST MORNING-GLORY	N
CONVOLVULACEAE	Calystegia	macrostegia	ssp.	intermedia	SOUTH COAST MORNING-GLORY	N
CONVOLVULACEAE	Calystegia	macrostegia	ssp.	tenuifolia	SAN DIEGO MORNING-GLORY	N
CONVOLVULACEAE	Calystegia	soldanella			SEA SHORE MORNING-GLORY	N
CONVOLVULACEAE	Convolvulus	arvensis			FIELD BINDWEED	E
CONVOLVULACEAE	Convolvulus	simulans			SMALL-FLOWER BINDWEED	N
CONVOLVULACEAE	Cressa	truxillensis			ALKALI WEED	N
CONVOLVULACEAE	Cuscuta	californica	var.	californica	CHAPARRAL DODDER	N
CONVOLVULACEAE	Cuscuta	campestris			FIELD DODDER	N
CONVOLVULACEAE	Cuscuta	indecora	var.	indecora	BIG-SEED ALFALFA DODDER	N
CONVOLVULACEAE	Cuscuta	pacifica	var.	pacifica	LARGE-FLOWER SALTMARSH DODDER	N
CONVOLVULACEAE	Cuscuta	subinclusa			CANYON DODDER	N
CONVOLVULACEAE	Dichondra	micrantha			ASIAN PONYFOOT	E
CONVOLVULACEAE	Dichondra	occidentalis			WESTERN DICHONDRA; WESTERN PONYFOOT	N
CONVOLVULACEAE	Ipomoea	cairica			IVY-LEAF MORNING-GLORY	E
CRASSULACEAE	Crassula	aquatica			WATER PYGMYWEED	N
CRASSULACEAE	Crassula	connata			PYGMYWEED	N
CRASSULACEAE	Crassula	ovata			JADE PLANT	E
CRASSULACEAE	Crassula	solieri			SMOOTH-SEED PYGMYWEED	N
CRASSULACEAE	Crassula	tillaea			MOSSY STONECROP	E
CRASSULACEAE	Dudleya	blochmaniae	ssp.	blochmaniae	BLOCHMAN'S DUDLEYA	N
CRASSULACEAE	Dudleya	edulis			LADIES' FINGERS	N

FAMILY	Genus	SpEp	Rank	Infra# Name	Common Name	Origin*
CRASSULACEAE	Dudleya	lanceolata			LANCE-LEAF DUDLEYA	N
CRASSULACEAE	Dudleya	multicaulis			MANY-STEMMED DUDLEYA	N
CRASSULACEAE	Dudleya	pulverulenta			CHALK DUDLEYA	N
CRASSULACEAE	Dudleya	viscida			STICKY DUDLEYA	N
CUCURBITACEAE	Cucurbita	foetidissima			CALABAZILLA	N
CUCURBITACEAE	Lagenaria	siceraria			BOTTLE GOURD	E
CUCURBITACEAE	Marah	macrocarpa			MANROOT; WILD-CUCUMBER	N
CYPERACEAE	Bolboschoenus	maritimus	ssp.	paludosus	PRAIRIE BULRUSH	N
CYPERACEAE	Bolboschoenus	robustus			SEACOAST BULRUSH	N
CYPERACEAE	Carex	alma			STURDY SEDGE	N
CYPERACEAE	Carex	barbarae			BARBARA'S SEDGE	N
CYPERACEAE	Carex	schottii			SCHOTT'S SEDGE	N
CYPERACEAE	Carex	senta			ROUGH CAREX	N
CYPERACEAE	Carex	spissa			SAN DIEGO SEDGE	N
CYPERACEAE	Carex	triquetra			TRIANGULAR-FRUIT SEDGE	N
CYPERACEAE	Cyperus	eragrostis			TALL FLATSEDGE	N
CYPERACEAE	Cyperus	erythrorhizos			RED-ROOT FLATSEDGE	N
CYPERACEAE	Cyperus	esculentus	var.	heermannii	HEERMAN'S YELLOW NUTSEDGE	N
CYPERACEAE	Cyperus	esculentus	var.	leptostachyus	YELLOW NUTSEDGE	N
CYPERACEAE	Cyperus	involucratus			AFRICAN UMBRELLA PLANT	E
CYPERACEAE	Cyperus	odoratus			FRAGRANT FLATSEDGE	N
CYPERACEAE	Cyperus	strigosus			FALSE NUTSEDGE	N
CYPERACEAE	Eleocharis	erythropoda			BALD SPIKE-RUSH	N
CYPERACEAE	Eleocharis	macrostachya			PALE SPIKE-RUSH	N
CYPERACEAE	Eleocharis	montevidensis			DOMBEY'S SPIKE-RUSH	N
CYPERACEAE	Eleocharis	parishii			PARISH'S SPIKE-RUSH	N
CYPERACEAE	Isolepis	cernua			LOW BULRUSH	N
CYPERACEAE	Schoenoplectus	acutus	var.	occidentalis	VISCID BULRUSH	N
CYPERACEAE	Schoenoplectus	americanus			OLNEY'S BULRUSH	N
CYPERACEAE	Schoenoplectus	californicus			CALIFORNIA BULRUSH	N
CYPERACEAE	Schoenoplectus	pungens	var.	longispicatus	COMMON THREESQUARE	N
CYPERACEAE	Scirpus	microcarpus			SMALL-FRUIT BULRUSH	N
DATISCACEAE	Datisca	glomerata			DURANGO ROOT	N
DENNSTAEDTIACEAE	Pteridium	aquilinum	var.	pubescens	WESTERN BRACKEN	N

FAMILY	Genus	SpEp	Rank	Infra# Name	Common Name	Origin*
DIDIEREACEAE	Portulacaria	afra			ELEPHANT FOOD, DWARF JADE	E
DRYOPTERIDACEAE	Dryopteris	arguta			COASTAL WOOD FERN	N
ELATINACEAE	Elatine	brachysperma			SHORT-SEED WATERWORT	N
EQUISETACEAE	Equisetum	×ferrissii			FERRIS'S SCOURING-RUSH	N
EQUISETACEAE	Equisetum	arvense			COMMON HORSETAIL	N
EQUISETACEAE	Equisetum	hyemale	ssp.	affine	COMMON SCOURING-RUSH	N
EQUISETACEAE	Equisetum	laevigatum			SMOOTH SCOURING-RUSH	N
EQUISETACEAE	Equisetum	telmateia	ssp.	braunii	GIANT HORSETAIL	N
ERICACEAE	Arctostaphylos	glandulosa	ssp.	adamsii	LAGUNA MOUNTAIN MANZANITA	N
ERICACEAE	Arctostaphylos	glandulosa	ssp.	cushingiana	CUSHING'S MANZANITA	N
ERICACEAE	Arctostaphylos	glandulosa	ssp.	glandulosa	EASTWOOD'S MANZANITA	N
ERICACEAE	Arctostaphylos	glauca			BIG-BERRY MANZANITA	N
ERICACEAE	Arctostaphylos	rainbowensis			RAINBOW MANZANITA	N
ERICACEAE	Comarostaphylis	diversifolia	ssp.	aff. planifolia	FLAT-LEAF SUMMER-HOLLY	N
ERICACEAE	Comarostaphylis	diversifolia	ssp.	diversifolia	SUMMER-HOLLY	N
ERICACEAE	Xylococcus	bicolor			MISSION MANZANITA	N
EUPHORBIACEAE	Croton	californicus			CALIFORNIA CROTON	N
EUPHORBIACEAE	Croton	setiger			DOVEWEED	N
EUPHORBIACEAE	Euphorbia	lathyris			CAPER SPURGE; GOPHER PLANT	E
EUPHORBIACEAE	Euphorbia	maculata			SPOTTED SPURGE	E
EUPHORBIACEAE	Euphorbia	peplus			PETTY SPURGE	E
EUPHORBIACEAE	Euphorbia	polycarpa			SMALL-SEED SANDMAT	N
EUPHORBIACEAE	Euphorbia	serpens			CREEPING SPURGE	E
EUPHORBIACEAE	Euphorbia	spathulata			RETICULATE-SEED SPURGE	N
EUPHORBIACEAE	Ricinus	communis			CASTOR BEAN	E
EUPHORBIACEAE	Stillingia	linearifolia			LINEAR-LEAF STILLINGIA	N
FABACEAE	Acacia	baileyana			COOTAMUNDRA WATTLE	E
FABACEAE	Acacia	cyclops			WESTERN COASTAL WATTLE	E
FABACEAE	Acacia	dealbata			SILVER WATTLE	E
FABACEAE	Acacia	longifolia			SYDNEY GOLDEN WATTLE	E
FABACEAE	Acacia	melanoxylon			BLACKWOOD ACACIA	E
FABACEAE	Acacia	retinodes			EVERBLOOMING ACACIA	E
FABACEAE	Acacia	saligna			GOLDEN WREATH WATTLE	E

FAMILY	Genus	SpEp	Rank	Infra# Name	Common Name	Origin*
FABACEAE	Acmispon	americanus	var.	americanus	SPANISH-CLOVER	N
FABACEAE	Acmispon	brachycarpus			HILL LOTUS	N
FABACEAE	Acmispon	glaber	var.	brevialatus	SHORT-WING DEERWEED	N
FABACEAE	Acmispon	glaber	var.	glaber	COASTAL DEERWEED	N
FABACEAE	Acmispon	heermannii	var.	heermannii	HEERMAN'S LOTUS	N
FABACEAE	Acmispon	maritimus	var.	maritimus	ALKALI LOTUS	N
FABACEAE	Acmispon	micranthus			GRAB LOTUS	N
FABACEAE	Acmispon	prostratus			PROSTRATE/NUTTALL'S LOTUS	N
FABACEAE	Acmispon	strigosus			BISHOP'S/STRIGOSE LOTUS	N
FABACEAE	Acmispon	wrangelianus			CALF LOTUS	N
FABACEAE	Amorpha	fruticosa			FALSE INDIGO	N
FABACEAE	Astragalus	didymocarpus	var.	didymocarpus	WHITE DWARF LOCOWEED	N
FABACEAE	Astragalus	gambelianus			GAMBEL'S LOCOWEED	N
FABACEAE	Astragalus	pomonensis			POMONA LOCOWEED	N
FABACEAE	Astragalus	trichopodus	var.	lonchus	OCEAN LOCOWEED	N
FABACEAE	Caesalpinia	spinosa			TARA	E
FABACEAE	Genista	monosperma			BRIDAL VEIL BROOM	E
FABACEAE	Gleditsia	triacanthos			HONEYLOCUST	E
FABACEAE	Glycyrrhiza	lepidota			WILD-LICORICE	N
FABACEAE	Hoita	macrostachya			LEATHER ROOT	N
FABACEAE	Lathyrus	vestitus	var.	alefeldii	SAN DIEGO SWEET PEA	N
FABACEAE	Lathyrus	vestitus	var.	vestitus	CANYON SWEET PEA	N
FABACEAE	Lotus	corniculatus			BIRDFOOT TREFOIL	E
FABACEAE	Lupinus	albifrons	var.	albifrons	SILVER BUSH LUPINE	N
FABACEAE	Lupinus	bicolor			MINIATURE LUPINE	N
FABACEAE	Lupinus	concinnus			BAJADA LUPINE	N
FABACEAE	Lupinus	excubitus	var.	austromontanus	GRAPE SODA LUPINE	N
FABACEAE	Lupinus	excubitus	var.	hallii	HALL'S BUSH LUPINE	N
FABACEAE	Lupinus	hirsutissimus			STINGING LUPINE	N
FABACEAE	Lupinus	latifolius	var.	parishii	PARISH'S STREAM LUPINE	N
FABACEAE	Lupinus	longifolius			PAUMA LUPINE	N
FABACEAE	Lupinus	microcarpus	var.	densiflorus	CHICK LUPINE	N
FABACEAE	Lupinus	microcarpus	var.	microcarpus	RED-FLOWER LUPINE	N
FABACEAE	Lupinus	sparsiflorus			COULTER'S LUPINE	N

FAMILY	Genus	SpEp	Rank	Infra# Name	Common Name	Origin*
FABACEAE	Lupinus	succulentus			ARROYO LUPINE	N
FABACEAE	Lupinus	truncatus			COLLAR LUPINE	N
FABACEAE	Medicago	lupulina			BLACK MEDICK, YELLOW TREFOIL	E
FABACEAE	Medicago	polymorpha			CALIFORNIA BURCLOVER	E
FABACEAE	Medicago	sativa			ALFALFA; LUCERNE	E
FABACEAE	Melilotus	albus			WHITE SWEETCLOVER	E
FABACEAE	Melilotus	indicus			INDIAN SWEET CLOVER	E
FABACEAE	Pickeringia	montana	var.	tomentosa	HAIRY CHAPARRAL-PEA	N
FABACEAE	Robinia	pseudoacacia			BLACK LOCUST	E
FABACEAE	Senna	didymobotrya			AFRICAN SENNA	E
FABACEAE	Spartium	junceum			SPANISH BROOM	E
FABACEAE	Trifolium	ciliolatum			TREE CLOVER	N
FABACEAE	Trifolium	depauperatum	var.	truncatum	DWARF-SACK CLOVER	N
FABACEAE	Trifolium	gracilentum			PIN-POINT CLOVER	N
FABACEAE	Trifolium	hirtum			ROSE CLOVER	E
FABACEAE	Trifolium	microcephalum			MAIDEN CLOVER	N
FABACEAE	Trifolium	obtusiflorum			CREEK CLOVER	N
FABACEAE	Trifolium	subterraneum			SUBTERRANEUM CLOVER	E
FABACEAE	Trifolium	willdenovii			VALLEY CLOVER	N
FABACEAE	Trifolium	wormskioldii			COW CLOVER	N
FABACEAE	Vicia	americana	var.	americana	AMERICAN VETCH	N
FABACEAE	Vicia	benghalensis			PURPLE VETCH	E
FABACEAE	Vicia	hassei			SLENDER VETCH	N
FABACEAE	Vicia	ludoviciana	var.	ludoviciana	DEER PEA VETCH	N
FABACEAE	Vicia	sativa	ssp.	nigra	NARROW-LEAF VETCH; COMMON VETCH	E
FABACEAE	Vicia	sativa	ssp.	sativa	SPRING VETCH	E
FABACEAE	Vicia	villosa	ssp.	villosa	WINTER VETCH	E
FAGACEAE	Quercus	×acutidens			TORREY'S SCRUB OAK	N
FAGACEAE	Quercus	×engelmannii			HYBRID ENGELMANN OAK	N
FAGACEAE	Quercus	agrifolia	var.	agrifolia	COAST LIVE OAK	N
FAGACEAE	Quercus	berberidifolia			SCRUB OAK	N
FAGACEAE	Quercus	berberidifolia × engelmannii			HYBRID SCRUB OAK	N
FAGACEAE	Quercus	dumosa			NUTTALL'S SCRUB OAK	N

FAMILY	Genus	SpEp	Rank	Infra# Name	Common Name	Origin*
FAGACEAE	Quercus	engelmannii			MESA BLUE OAK; ENGELMANN OAK	N
FAGACEAE	Quercus	ilex			HOLLY OAK	E
FAGACEAE	Quercus	wislizeni	var.	frutescens	INTERIOR LIVE OAK; SCRUB LIVE OAK	N
FRANKENIACEAE	Frankenia	salina			ALKALI-HEATH	N
GENTIANACEAE	Centaurium	pulchellum			LESSER CENTUARY	E
GENTIANACEAE	Eustoma	exaltatum			ALKALI CHALICE	N
GENTIANACEAE	Frasera	parryi			DEER'S EARS	N
GENTIANACEAE	Zeltnera	venusta			CANCHALAGUA	N
GERANIACEAE	Erodium	botrys			LONG-BEAK FILAREE/STORKSBILL	E
GERANIACEAE	Erodium	brachycarpum			SHORT-BEAK FILAREE/STORKSBILL	E
GERANIACEAE	Erodium	cicutarium			RED-STEM FILAREE/STORKSBILL	E
GERANIACEAE	Erodium	moschatum			WHITE-STEM FILAREE/STORKSBILL	E
GERANIACEAE	Geranium	carolinianum			CAROLINA GERANIUM	N
GERANIACEAE	Geranium	dissectum			CUT-LEAF GERANIUM	E
GERANIACEAE	Pelargonium	×hortorum			ZONAL GERANIUM	E
GERANIACEAE	Pelargonium	grossularioides			COCONUT-SCENT GERANIUM	E
GERANIACEAE	Pelargonium	peltatum hybrid			IVY GERANIUM	E
GROSSULARIACEAE	Ribes	indecorum			WHITE-FLOWER CURRANT	N
GROSSULARIACEAE	Ribes	malvaceum	var.	viridifolium	CHAPARRAL CURRANT	N
GROSSULARIACEAE	Ribes	speciosum			FUCHSIA-FLOWER GOOSEBERRY	N
HYPERICACEAE	Hypericum	anagalloides			TINKER'S PENNY	N
HYPERICACEAE	Hypericum	scouleri			SCOULER'S SAINT JOHN'S WORT	N
IRIDACEAE	Iris	cf. pallida			SWEET IRIS	E
IRIDACEAE	Sisyrinchium	bellum			BLUE-EYED-GRASS	N
ISOETACEAE	Isoetes	orcuttii			ORCUTT'S QUILLWORT	N
JUGLANDACEAE	Carya	illinoinensis			PECAN	E
JUGLANDACEAE	Juglans	nigra			BLACK WALNUT	E
JUNCACEAE	Juncus	acutus	ssp.	leopoldii	SOUTHWESTERN SPINY RUSH	N
JUNCACEAE	Juncus	ambiguus			FASCICULATE TOAD RUSH	N
JUNCACEAE	Juncus	balticus	ssp.	ater	WIRE RUSH	N

FAMILY	Genus	SpEp	Rank	Infra# Name	Common Name	Origin*
JUNCACEAE	Juncus	bufonius	var.	bufonius	TOAD RUSH	N
JUNCACEAE	Juncus	bufonius	var.	congestus	CLUSTERED TOAD RUSH	E
JUNCACEAE	Juncus	dubius			MARIPOSA RUSH	N
JUNCACEAE	Juncus	effusus	var.	austrocalifornicus	PACIFIC RUSH	N
JUNCACEAE	Juncus	macrophyllus			LONG-LEAF RUSH	N
JUNCACEAE	Juncus	mexicanus			MEXICAN RUSH	N
JUNCACEAE	Juncus	oxymeris			POINTED RUSH	N
JUNCACEAE	Juncus	patens			SPREADING RUSH	N
JUNCACEAE	Juncus	phaeocephalus	var.	paniculatus	BROWN-HEAD RUSH	N
JUNCACEAE	Juncus	rugulosus			WRINKLED RUSH	N
JUNCACEAE	Juncus	textilis			BASKET RUSH	N
JUNCACEAE	Juncus	torreyi			TORREY'S RUSH	N
JUNCACEAE	Juncus	xiphioides			IRIS-LEAF RUSH	N
LAMIACEAE	Lamium	amplexicaule			HENBIT	E
LAMIACEAE	Marrubium	vulgare			HOREHOUND	E
LAMIACEAE	Mentha	×smithiana			RED-STEM MINT	E
LAMIACEAE	Mentha	spicata			SPEARMINT	E
LAMIACEAE	Monardella	hypoleuca	ssp.	intermedia	BICOLOR MONARDELLA	N
LAMIACEAE	Salvia	apiana			WHITE SAGE	N
LAMIACEAE	Salvia	apiana × S. mellifera			HYBRID WHITE SAGE	N
LAMIACEAE	Salvia	clevelandii			FRAGRANT SAGE	N
LAMIACEAE	Salvia	columbariae			CHIA	N
LAMIACEAE	Salvia	leucophylla			SAN LUIS PURPLE SAGE	N
LAMIACEAE	Salvia	mellifera			BLACK SAGE	N
LAMIACEAE	Salvia	spathacea			HUMMINGBIRD SAGE	N
LAMIACEAE	Scutellaria	tuberosa			DANNY'S SKULLCAP	N
LAMIACEAE	Stachys	ajugoides			AJUGA HEDGE-NETTLE	N
LAMIACEAE	Stachys	bullata			CALIFORNIA HEDGE-NETTLE	N
LAMIACEAE	Stachys	stebbinsii			STEBBINS'S HEDGE-NETTLE	N
LAMIACEAE	Trichostema	lanceolatum			VINEGAR WEED	N
LAMIACEAE	Westringia	fruticosa			COAST ROSEMARY	E
LAURACEAE	Umbellularia	californica			CALIFORNIA BAY	N
LILIACEAE	Calochortus	albus			WHITE GLOBE LILY; FAIRY-LANTERN	N
LILIACEAE	Calochortus	catalinae			CATALINA MARIPOSA LILY	N

FAMILY	Genus	SpEp	Rank	Infra# Name	Common Name	Origin*
LILIACEAE	Calochortus	splendens			SPLENDID MARIPOSA	N
LILIACEAE	Calochortus	weedii	var.	weedii	WEED'S MARIPOSA LILY	N
LILIACEAE	Fritillaria	biflora	var.	biflora	CHOCOLATE LILY	N
LILIACEAE	Lilium	humboldtii	ssp.	ocellatum	OCELATED LILY	N
LINACEAE	Hesperolinon	micranthum			THREAD-STEM DWARF-FLAX	N
LOASACEAE	Mentzelia	micrantha			SMALL-FLOWER STICK-LEAF	N
LOMARIOPSIDACEAE	Nephrolepis	cordifolia			NARROW SWORD FERN	E
LYTHRACEAE	Lythrum	californicum			CALIFORNIA LOOSESTRIFE	N
LYTHRACEAE	Lythrum	hyssopifolia			GRASS POLY	E
MALVACEAE	Abutilon	theophrasti			VELVET-LEAF	E
MALVACEAE	Lagunaria	patersonia			COW ITCH TREE	E
MALVACEAE	Malacothamnus	fasciculatus			CHAPARRAL BUSHMALLOW	N
MALVACEAE	Malva	parviflora			CHEESEWEED	E
MALVACEAE	Malvella	leprosa			ALKALI MALLOW	N
MALVACEAE	Sidalcea	sparsifolia			SOUTHERN CHECKER-BLOOM	N
MARSILEACEAE	Marsilea	vestita	ssp.	vestita	HAIRY CLOVER FERN	N
MARSILEACEAE	Pilularia	americana			AMERICAN PILLWORT	N
MELANTHIACEAE	Toxicoscordion	fremontii			FREMONT'S CAMUS	N
MELIACEAE	Melia	azedarach			CHINA BERRY, PERSIAN-LILAC	E
MOLLUGINACEAE	Glinus	lotoides			LOTUS SWEETJUICE	E
MONTIACEAE	Calandrinia	breweri			BREWER'S CALANDRINIA	N
MONTIACEAE	Calandrinia	menziesii			RED MAIDS	N
MONTIACEAE	Calyptridium	monandrum			COMMON CALYPTRIDIUM	N
MONTIACEAE	Cistanthe	maritima			SEASIDE CALANDRINIA; SEA KISSES	N
MONTIACEAE	Claytonia	parviflora	ssp.	parviflora	NARROW-LEAF MINER'S-LETTUCE	N
MONTIACEAE	Claytonia	perfoliata	ssp.	mexicana	MEXICAN MINER'S-LETTUCE	N
MONTIACEAE	Claytonia	perfoliata	ssp.	perfoliata	MINER'S-LETTUCE	N
MORACEAE	Morus	alba			WHITE MULBERRY	E
MYRSINACEAE	Anagallis	arvensis			SCARLET PIMPERNEL; POOR MAN'S WEATHERGLASS	E
MYRSINACEAE	Anagallis	minima			COMMON CHAFFWEED	N
MYRTACEAE	Eucalyptus	camaldulensis			RIVER RED GUM	E
MYRTACEAE	Eucalyptus	citriodora			LEMON-SCENT GUM	E
MYRTACEAE	Eucalyptus	cladocalyx			SUGAR GUM	E

FAMILY	Genus	SpEp	Rank	Infra# Name	Common Name	Origin*
MYRTACEAE	Eucalyptus	cornuta			YATE	E
MYRTACEAE	Eucalyptus	globulus			BLUE GUM	E
MYRTACEAE	Eucalyptus	leucoxylon			YELLOW GUM, WHITE IRON BARK	E
MYRTACEAE	Eucalyptus	polyanthemos			SILVER DOLLAR GUM; RED BOX	E
MYRTACEAE	Eucalyptus	rudis			AUSTRALIAN FLOODED GUM	E
MYRTACEAE	Melaleuca	nesophila			SHOWY HONEY-MYRTLE; PINK MELALEUCA	E
NYCTAGINACEAE	Abronia	maritima			RED SAND-VERBENA	N
NYCTAGINACEAE	Abronia	maritima × A. umbellata			BEACH SAND-VERBENA	N
NYCTAGINACEAE	Abronia	umbellata	var.	umbellata	BEACH SAND-VERBENA	N
NYCTAGINACEAE	Abronia	villosa	var.	aurita	CHAPARRAL SAND-VERBENA	N
NYCTAGINACEAE	Mirabilis	laevis	var.	crassifolia	COASTAL WISHBONE PLANT	N
NYMPHAEACEAE	Nymphaea	cf. odorata			FRAGRANT WATERLILY	E
OLEACEAE	Fraxinus	dipetala			CALIFORNIA ASH	N
OLEACEAE	Fraxinus	latifolia			OREGON ASH	N
OLEACEAE	Fraxinus	uhdei			SHAMEL ASH	E
OLEACEAE	Fraxinus	velutina			VELVET ASH	N
OLEACEAE	Olea	europaea			OLIVE	E
ONAGRACEAE	Camissonia	strigulosa			SANDYSOIL SUN CUP	N
ONAGRACEAE	Camissoniopsis	bistorta			CALIFORNIA SUN CUP	N
ONAGRACEAE	Camissoniopsis	bistorta × C. cheiranthifolia subsp. suffruticosa			HYBRID BEACH EVENING-PRIMROSE	N
ONAGRACEAE	Camissoniopsis	cheiranthifolia	ssp.	suffruticosa	BEACH EVENING-PRIMROSE	N
ONAGRACEAE	Camissoniopsis	hirtella			FIELD SUN CUP	N
ONAGRACEAE	Camissoniopsis	ignota			JURUPA HILLS SUN CUP	N
ONAGRACEAE	Camissoniopsis	intermedia			INTERMEDIATE SUN CUP	N
ONAGRACEAE	Camissoniopsis	lewisii			LEWIS' EVENING-PRIMROSE	N
ONAGRACEAE	Camissoniopsis	micrantha			MINIATURE SUN CUP	N
ONAGRACEAE	Camissoniopsis	robusta			ROBUST SUN CUP	N
ONAGRACEAE	Clarkia	bottae			PUNCHBOWL GODETIA	N
ONAGRACEAE	Clarkia	epilobioides			CANYON GODETIA	N
ONAGRACEAE	Clarkia	purpurea	ssp.	quadrivulnera	FOUR-SPOT CLARKIA	N
ONAGRACEAE	Clarkia	similis			CANYON CLARKIA	N

FAMILY	Genus	SpEp	Rank	Infra# Name	Common Name	Origin*
ONAGRACEAE	Epilobium	campestre			SMOOTH BOISDUVALIA	N
ONAGRACEAE	Epilobium	canum	ssp.	canum	CALIFORNIA FUCHSIA	N
ONAGRACEAE	Epilobium	canum	ssp.	latifolium	BROAD-LEAF CALIFORNIA FUCHSIA	N
ONAGRACEAE	Epilobium	ciliatum	ssp.	ciliatum	WILLOW HERB	N
ONAGRACEAE	Eulobus	californicus			FALSE-MUSTARD	N
ONAGRACEAE	Ludwigia	grandiflora			LARGE-FLOWER PRIMROSE-WILLOW	E
ONAGRACEAE	Ludwigia	hexapetala			URUGUAYAN PRIMROSE-WILLOW; URUGUAYAN MARSH-PURSLANE	E
ONAGRACEAE	Ludwigia	peploides	ssp.	peploides	WATER-PRIMROSE ~~WILLOW WATER WEED~~[t1]	N
ONAGRACEAE	Oenothera	californica	ssp.	californica	CALIFORNIA EVENING-PRIMROSE	N
ONAGRACEAE	Oenothera	elata	ssp.	hirsutissima	HAIRY EVENING-PRIMROSE	N
ONAGRACEAE	Oenothera	elata	ssp.	hookeri	HOOKER'S EVENING-PRIMROSE	N
ONAGRACEAE	Oenothera	speciosa			BEAUTIFUL EVENING-PRIMROSE	E
OPHIOGLOSSACEAE	Ophioglossum	californicum			CALIFORNIA ADDER'S TONGUE	N
ORCHIDACEAE	Epipactis	gigantea			STREAM ORCHID	N
ORCHIDACEAE	Piperia	cooperi			COOPER'S REIN ORCHID	N
OROBANCHACEAE	Castilleja	affinis	ssp.	affinis	COAST PAINTBRUSH	N
OROBANCHACEAE	Castilleja	densiflora	ssp.	gracilis	PARISH'S OWL'S-CLOVER	N
OROBANCHACEAE	Castilleja	exserta	ssp.	exserta	PURPLE OWL'S-CLOVER	N
OROBANCHACEAE	Castilleja	foliolosa			WOOLLY INDIAN PAINTBRUSH	N
OROBANCHACEAE	Castilleja	minor	ssp.	spiralis	CALIFORNIA THREAD-TORCH	N
OROBANCHACEAE	Cordylanthus	rigidus	ssp.	setigerus	DARK-TIP BIRD'S BEAK	N
OROBANCHACEAE	Orobanche	bulbosa			CHAPARRAL BROOM-RAPE	N
OROBANCHACEAE	Orobanche	parishii	ssp.	brachyloba	BEACH/SHORT-LOBE BROOM-RAPE	N
OROBANCHACEAE	Pedicularis	densiflora			INDIAN WARRIOR	N
OXALIDACEAE	Oxalis	californica			CALIFORNIA WOOD-SORREL	N
OXALIDACEAE	Oxalis	corniculata			CREEPING WOODSORREL	E
OXALIDACEAE	Oxalis	pes-caprae			BERMUDA-BUTTERCUP	E
OXALIDACEAE	Oxalis	pilosa			HAIRY WOOD-SORREL	N
PAEONIACEAE	Paeonia	californica			CALIFORNIA PEONY	N

FAMILY	Genus	SpEp	Rank	Infra# Name	Common Name	Origin*
PAPAVERACEAE	Argemone	munita			CHICALOTE, PRICKLY POPPY	N
PAPAVERACEAE	Dendromecon	rigida			BUSH POPPY	N
PAPAVERACEAE	Ehrendorferia	chrysantha			GOLDEN EAR-DROPS	N
PAPAVERACEAE	Eschscholzia	californica			CALIFORNIA POPPY	N
PAPAVERACEAE	Meconella	denticulata			SMALL-FLOWER MECONELLA	N
PAPAVERACEAE	Papaver	californicum			FIRE POPPY	N
PAPAVERACEAE	Papaver	heterophyllum			WIND POPPY	N
PAPAVERACEAE	Romneya	coulteri			COULTER'S MATILIJA POPPY	N
PAPAVERACEAE	Romneya	trichocalyx			HAIRY MATILIJA POPPY	N
PHRYMACEAE	Diplacus	×australis			SAN DIEGO MONKEY FLOWER	N
PHRYMACEAE	Diplacus	brevipes			SLOPE SEMIPHORE	N
PHRYMACEAE	Diplacus	puniceus			COAST MONKEY FLOWER	N
PHRYMACEAE	Erythranthe	cardinalis			SCARLET MONKEY FLOWER	N
PHRYMACEAE	Erythranthe	floribunda			SHOWY MONKEY FLOWER	N
PHRYMACEAE	Erythranthe	guttata			SEEP MONKEY FLOWER	N
PHRYMACEAE	Mimetanthe	pilosa			DOWNY MONKEY FLOWER	N
PINACEAE	Pinus	halepensis			ALEPPO PINE	E
PLANTAGINACEAE	Antirrhinum	coulterianum			COULTER'S SNAPDRAGON	N
PLANTAGINACEAE	Antirrhinum	kelloggii			CLIMBING SNAPDRAGON	N
PLANTAGINACEAE	Antirrhinum	nuttallianum	ssp.	nuttallianum	NUTTALL'S SNAPDRAGON	N
PLANTAGINACEAE	Antirrhinum	nuttallianum	ssp.	subsessile	BIG-GLAND NUTTALL'S SNAPDRAGON	N
PLANTAGINACEAE	Callitriche	marginata			WINGED WATER-STARWORT	N
PLANTAGINACEAE	Collinsia	heterophylla	var.	heterophylla	CHINESE HOUSES	N
PLANTAGINACEAE	Keckiella	antirrhinoides	var.	antirrhinoides	YELLOW BUSH PENSTEMON	N
PLANTAGINACEAE	Keckiella	cordifolia			CLIMBING BUSH PENSTEMON	N
PLANTAGINACEAE	Nuttallanthus	texanus			LARGE BLUE TOADFLAX	N
PLANTAGINACEAE	Penstemon	centranthifolius			SCARLET BUGLER	N
PLANTAGINACEAE	Penstemon	heterophyllus	var.	australis	CHAPARRAL PENSTEMON	N
PLANTAGINACEAE	Penstemon	spectabilis	var.	spectabilis	SHOWY PENSTEMON	N
PLANTAGINACEAE	Plantago	coronopus			CUT-LEAF PLANTAIN	E
PLANTAGINACEAE	Plantago	elongata			PRAIRIE PLANTAIN	N
PLANTAGINACEAE	Plantago	erecta			DOT-SEED PLANTAIN	N
PLANTAGINACEAE	Plantago	lanceolata			ENGLISH PLANTAIN; RIB-	E

FAMILY	Genus	SpEp	Rank	Infra# Name	Common Name	Origin*
					GRASS	
PLANTAGINACEAE	Plantago	major			COMMON PLANTAIN	E
PLANTAGINACEAE	Plantago	rhodosperma			RED-SEED PLANTAIN	N
PLANTAGINACEAE	Veronica	anagallis-aquatica			WATER SPEEDWELL	E
PLANTAGINACEAE	Veronica	catenata			BROAD-FRUIT/CHAIN SPEEDWELL	E
PLANTAGINACEAE	Veronica	peregrina	ssp.	xalapensis	MEXICAN/PURSLANE SPEEDWELL	N
PLATANACEAE	Platanus	racemosa			WESTERN SYCAMORE	N
PLUMBAGINACEAE	Limonium	perezii			PEREZ'S SEA LAVENDER	E
PLUMBAGINACEAE	Limonium	ramosissimum			ALGERIAN SEA-LAVENDER	E
PLUMBAGINACEAE	Limonium	sinuatum			NOTCH-LEAF MARSH-ROSEMARY	E
PLUMBAGINACEAE	Plumbago	auriculata			CAPE LEADWORT	E
POACEAE	Aegilops	triuncialis			BARBED GOAT GRASS	E
POACEAE	Agrostis	avenacea			PACIFIC BENTGRASS	E
POACEAE	Agrostis	exarata			SPIKE REDTOP	N
POACEAE	Agrostis	pallens			SEASHORE BENTGRASS	N
POACEAE	Aira	caryophyllea			SILVER EUROPEAN HAIRGRASS	E
POACEAE	Aristida	adscensionis			SIX-WEEKS THREE-AWN	N
POACEAE	Aristida	purpurea	var.	nealleyi	BLUE THREEAWN	N
POACEAE	Aristida	purpurea	var.	parishii	PARISH THREE-AWN	N
POACEAE	Aristida	purpurea	var.	purpurea	PURPLE THREE-AWN	N
POACEAE	Aristida	ternipes	var.	gentilis	HOOK THREE-AWN	N
POACEAE	Arundo	donax			GIANT REED	E
POACEAE	Avena	barbata			SLENDER WILD OAT	E
POACEAE	Avena	fatua			WILD OAT	E
POACEAE	Avena	occidentalis			WESTERN OAT	E
POACEAE	Avena	sterilis			ANIMATED OAT	E
POACEAE	Bothriochloa	barbinodis			CANE BLUESTEM	N
POACEAE	Brachypodium	distachyon			PURPLE FALSEBROME	E
POACEAE	Briza	minor			QUAKING GRASS	E
POACEAE	Bromus	arizonicus			ARIZONA CHESS	N
POACEAE	Bromus	carinatus	var.	carinatus	CALIFORNIA BROME	N
POACEAE	Bromus	catharticus	var.	catharticus	RESCUE GRASS	E
POACEAE	Bromus	cf. sitchensis			SITKA BROME, ALASKA	N

FAMILY	Genus	SpEp	Rank	Infra# Name	Common Name	Origin*
					BROME	
POACEAE	Bromus	diandrus			RIPGUT GRASS	E
POACEAE	Bromus	grandis			TALL BROME	N
POACEAE	Bromus	hordeaceus			SOFT CHESS	E
POACEAE	Bromus	madritensis	ssp.	madritensis	COMPACT BROME	E
POACEAE	Bromus	madritensis	ssp.	rubens	RED BROME	E
POACEAE	Bromus	pseudolaevipes			COAST RANGE BROME	N
POACEAE	Bromus	sterilis			POVERTY BROME	E
POACEAE	Bromus	tectorum			CHEAT GRASS; DOWNY BROME	E
POACEAE	Cenchrus	clandestinus			KIKUYA GRASS	E
POACEAE	Cenchrus	setaceus			KIKUYU GRASS	E
POACEAE	Cenchrus	spinifex			COAST SANDBUR	E
POACEAE	Chloris	gayana			RHODES GRASS	E
POACEAE	Cortaderia	jubata			PURPLE PAMPAS GRASS	E
POACEAE	Cortaderia	selloana			SELLOA PAMPAS GRASS	E
POACEAE	Crypsis	schoenoides			PRICKLE GRASS	E
POACEAE	Crypsis	vaginiflora			SWAMP GRASS	E
POACEAE	Cynodon	dactylon			BERMUDA GRASS	E
POACEAE	Deschampsia	danthonioides			ANNUAL HAIRGRASS	N
POACEAE	Digitaria	sanguinalis			LARGE CRABGRASS	E
POACEAE	Diplachne	fusca	var.	uninervia	MEXICAN SPRANGLETOP	N
POACEAE	Distichlis	littoralis			SHOREGRASS	N
POACEAE	Distichlis	spicata			SALTGRASS	N
POACEAE	Echinochloa	crus-galli			COMMON BARNYARD GRASS	E
POACEAE	Ehrharta	erecta			PANIC VELDT GRASS	E
POACEAE	Ehrharta	longiflora			LONG-FLOWER VELDT GRASS	E
POACEAE	Elymus	×gouldii			MANY-FLOWER WILD-RYE	N
POACEAE	Elymus	condensatus			GIANT WILD-RYE	N
POACEAE	Elymus	glaucus	ssp.	glaucus	BLUE WILDRYE	N
POACEAE	Elymus	multisetus			BIG SQUIRRELTAIL	N
POACEAE	Elymus	triticoides			BEARDLESS WILD-RYE	N
POACEAE	Eragrostis	cilianensis			STINKGRASS	E
POACEAE	Eragrostis	lehmanniana			LEHMANN LOVEGRASS	E
POACEAE	Eragrostis	pectinacea	var.	pectinacea	SPREADING LOVEGRASS	N

FAMILY	Genus	SpEp	Rank	Infra# Name	Common Name	Origin*
POACEAE	Festuca	arundinacea			TALL FESCUE	E
POACEAE	Festuca	bromoides			BROME FESCUE	E
POACEAE	Festuca	microstachys			GRAY'S FESCUE	N
POACEAE	Festuca	myuros			RAT-TAIL FESCUE	E
POACEAE	Festuca	octoflora			TUFTED FESCUE	N
POACEAE	Festuca	perennis			PERENNIAL RYEGRASS, ITALIAN RYEGRASS	E
POACEAE	Festuca	temulenta			DARNEL	E
POACEAE	Gastridium	phleoides			NIT GRASS	E
POACEAE	Hainardia	cylindrica			BARBGRASS	E
POACEAE	Hordeum	brachyantherum	ssp.	californicum	CALIFORNIA BARLEY	N
POACEAE	Hordeum	depressum			LOW BARLEY	N
POACEAE	Hordeum	intercedens			VERNAL BARLEY	N
POACEAE	Hordeum	marinum	ssp.	gussoneanum	MEDITERRANEAN BARLEY	E
POACEAE	Hordeum	murinum	ssp.	glaucum	GLAUCOUS BARLEY	E
POACEAE	Hordeum	murinum	ssp.	leporinum	HARE BARLEY	E
POACEAE	Hordeum	vulgare	var.	trifurcatum	CULTIVATED BARLEY	E
POACEAE	Koeleria	gerardii			BRISTLY KOELER'S GRASS	E
POACEAE	Koeleria	macrantha			JUNEGRASS	N
POACEAE	Lamarckia	aurea			GOLDEN-TOP	E
POACEAE	Melica	frutescens			TALL MELIC	N
POACEAE	Melica	imperfecta			COAST RANGE MELIC	N
POACEAE	Melinis	repens	ssp.	repens	NATAL GRASS	E
POACEAE	Muhlenbergia	microsperma			LITTLE-SEED MUHLY	N
POACEAE	Muhlenbergia	rigens			DEERGRASS	N
POACEAE	Panicum	capillare			WITCHGRASS	N
POACEAE	Panicum	miliaceum	ssp.	miliaceum	BROOMCORN MILLET	E
POACEAE	Parapholis	incurva			SICKLEGRASS	E
POACEAE	Paspalum	dilatatum			DALLIS GRASS	E
POACEAE	Paspalum	distichum			COMMON KNOTGRASS	N
POACEAE	Paspalum	vaginatum			SEASHORE PASPALUM	E
POACEAE	Pentameris	airoides	ssp.	airoides	FALSE HAIR GRASS	E
POACEAE	Phalaris	lemmonii			LEMMON'S CANARY GRASS	N
POACEAE	Phalaris	minor			LITTLE-SEED CANARY GRASS	E
POACEAE	Phalaris	paradoxa			PARADOX CANARY GRASS	E

FAMILY	Genus	SpEp	Rank	Infra# Name	Common Name	Origin*
POACEAE	Phragmites	australis	ssp.	americanus	COMMON REED (for *P. australis*)	N
POACEAE	Phragmites	australis	ssp.	australis	COMMON REED (for *P. australis*)	E
POACEAE	Poa	annua			ANNUAL BLUEGRASS	E
POACEAE	Poa	secunda	ssp.	secunda	ONE-SIDED BLUEGRASS	N
POACEAE	Polypogon	interruptus			DITCH BEARD GRASS	E
POACEAE	Polypogon	maritimus			MEDITERRANIAN BEARDGRASS	E
POACEAE	Polypogon	monspeliensis			ANNUAL BEARDGRASS	E
POACEAE	Polypogon	viridis			WATER BEARDGRASS	E
POACEAE	Schismus	arabicus			ARABIAN SCHISMUS	E
POACEAE	Schismus	barbatus			MEDITERRANEAN SCHISMUS	E
POACEAE	Sorghum	halepense			JOHNSON GRASS	E
POACEAE	Stenotaphrum	secundatum			SAINT AUGUSTINE GRASS	E
POACEAE	Stipa	cernua			NODDING NEEDLEGRASS	N
POACEAE	Stipa	coronata			GIANT STIPA	N
POACEAE	Stipa	lepida			FOOTHILL NEEDLEGRASS	N
POACEAE	Stipa	miliacea	var.	miliacea	SMILO GRASS	E
POACEAE	Stipa	pulchra			PURPLE NEEDLEGRASS	N
POACEAE	Triticum	aestivum			CEREAL WHEAT	E
POLEMONIACEAE	Allophyllum	glutinosum			BLUE FALSE-GILIA	N
POLEMONIACEAE	Eriastrum	filifolium			THREAD-LEAF WOOLLY-STAR	N
POLEMONIACEAE	Eriastrum	sapphirinum	ssp.	dasyanthum	MANY-FLOWER WOOLLY-STAR	N
POLEMONIACEAE	Eriastrum	sapphirinum	ssp.	sapphirinum	SAPPHIRE WOOLY-STAR	N
POLEMONIACEAE	Gilia	achilleifolia	ssp.	multicaulis	MANY-STEM CALIFORNIA GILIA	N
POLEMONIACEAE	Gilia	angelensis			GRASSLAND GILIA	N
POLEMONIACEAE	Gilia	capitata	ssp.	abrotanifolia	BALL GILIA	N
POLEMONIACEAE	Gilia	ochroleuca	ssp.	exilis	VOLCANIC GILIA	N
POLEMONIACEAE	Leptosiphon	liniflorus			GREAT BASIN LINANTHUS	N
POLEMONIACEAE	Leptosiphon	parviflorus			COAST BABY-STAR	N
POLEMONIACEAE	Linanthus	dianthiflorus			FARINOSE GROUND PINK	N
POLEMONIACEAE	Navarretia	fossalis			SPREADING NAVARRETIA	N
POLEMONIACEAE	Navarretia	hamata	ssp.	hamata	HOOKED SKUNKWEED	N
POLEMONIACEAE	Navarretia	hamata	ssp.	leptantha	HOOKED PINCUSHION PLANT	N
POLEMONIACEAE	Saltugilia	caruifolia			CARAWAY LEAF-GILIA	N
POLYGALACEAE	Rhinotropis	cornuta	var.	fishiae	FISH'S MILKWORT	N

FAMILY	Genus	SpEp	Rank	Infra# Name	Common Name	Origin*
POLYGONACEAE	Chorizanthe	fimbriata	var.	fimbriata	FRINGED SPINEFLOWER	N
POLYGONACEAE	Chorizanthe	polygonoides	var.	longispina	KNOTWEED SPINEFLOWER	N
POLYGONACEAE	Chorizanthe	procumbens			PROSTRATE SPINEFLOWER	N
POLYGONACEAE	Chorizanthe	staticoides			TURKISH RUGGING	N
POLYGONACEAE	Emex	spinosa			DEVIL'S THORN; SPINY EMEX	E
POLYGONACEAE	Eriogonum	elongatum	var.	elongatum	TALL BUCKWHEAT	N
POLYGONACEAE	Eriogonum	fasciculatum	var.	fasciculatum	COAST CALIFORNIA BUCKWHEAT	N
POLYGONACEAE	Eriogonum	fasciculatum	var.	foliolosum	INLAND CALIFORNIA BUCKWHEAT	N
POLYGONACEAE	Eriogonum	giganteum	var.	giganteum	SANTA CATALINA ISLAND BUCKWHEAT	E
POLYGONACEAE	Eriogonum	gracile	var.	gracile	SLENDER BUCKWHEAT	N
POLYGONACEAE	Eriogonum	gracile	var.	incultum	SMOOTH SLENDER BUCKWHEAT	N
POLYGONACEAE	Eriogonum	parvifolium			BLUFF BUCKWHEAT	N
POLYGONACEAE	Lastarriaea	coriacea			LASTARRIAEA	N
POLYGONACEAE	Nemacaulis	denudata	var.	denudata	COAST WOOLY-HEADS	N
POLYGONACEAE	Persicaria	amphibia			KELP SMARTWEED	N
POLYGONACEAE	Persicaria	lapathifolia			WILLOW SMARTWEED; WILLOW WEED	N
POLYGONACEAE	Persicaria	maculosa			LADY'S THUMB	E
POLYGONACEAE	Polygonum	aviculare	ssp.	depressum	COMMON KNOTWEED, DOOR WEED	E
POLYGONACEAE	Polygonum	aviculare	ssp.	neglectum	PROSTRATE KNOTWEED	E
POLYGONACEAE	Pterostegia	drymarioides			GRANNY'S HAIRNET; G.C.P.	N
POLYGONACEAE	Rumex	californicus			TOOTHED WILLOW DOCK	N
POLYGONACEAE	Rumex	conglomeratus			WHORLED DOCK	E
POLYGONACEAE	Rumex	crispus			CURLY DOCK	E
POLYGONACEAE	Rumex	dentatus			TOOTHED DOCK	E
POLYGONACEAE	Rumex	fueginus			GOLDEN DOCK	N
POLYGONACEAE	Rumex	hymenosepalus			DESERT RHUBARB	N
POLYGONACEAE	Rumex	persicarioides			YELLOW DOCK	N
POLYGONACEAE	Rumex	pulcher			FIDDLE DOCK	E
POLYGONACEAE	Rumex	salicifolius			WILLOW DOCK	N
POLYGONACEAE	Rumex	stenophyllus			NARROW-LEAF DOCK	E
POLYPODIACEAE	Polypodium	californicum			CALIFORNIA POLYPODY	N

FAMILY	Genus	SpEp	Rank	Infra# Name	Common Name	Origin*
PORTULACACEAE	Portulaca	oleracea			COMMON PURSLANE	E
POTAMOGETONACEAE	Stuckenia	pectinata			FENNEL-LEAF PONDWEED	N
PRIMULACEAE	Primula	clevelandii	ssp.	clevelandii	PADRE'S SHOOTING STAR	N
PTERIDACEAE	Adiantum	capillus-veneris			SOUTHERN MAIDENHAIR	N
PTERIDACEAE	Adiantum	jordanii			CALIFORNIA MAIDENHAIR	N
PTERIDACEAE	Aspidotis	californica			CALIFORNIA LACE FERN	N
PTERIDACEAE	Myriopteris	clevelandii			CLEVELAND'S LIP FERN	N
PTERIDACEAE	Myriopteris	newberryi			CALIFORNIA COTTON FERN	N
PTERIDACEAE	Pellaea	andromedifolia	var.	andromedifolia	COFFEE FERN	N
PTERIDACEAE	Pellaea	andromedifolia	var.	pubescens	HAIRY COFFEE FERN	N
PTERIDACEAE	Pellaea	mucronata	var.	mucronata	BIRD'S FOOT CLIFF-BRAKE	N
PTERIDACEAE	Pentagramma	triangularis	ssp.	maxonii	MAXON'S SILVERBACK FERN	N
PTERIDACEAE	Pentagramma	triangularis	ssp.	triangularis	CALIFORNIA GOLDENBACK FERN	N
PTERIDACEAE	Pentagramma	triangularis	ssp.	viscosa	STICKY SILVERBACK FERN	N
RANUNCULACEAE	Clematis	lasiantha			PIPESTEM VIRGIN'S BOWER	N
RANUNCULACEAE	Clematis	lasiantha x C. pauciflora			HYBRID ROPEVINE CLEMATIS	N
RANUNCULACEAE	Clematis	ligusticifolia			YERBA DE CHIVA	N
RANUNCULACEAE	Clematis	pauciflora			ROPEVINE CLEMATIS	N
RANUNCULACEAE	Delphinium	cardinale			CARDINAL/SCARLET LARKSPUR	N
RANUNCULACEAE	Delphinium	parryi	ssp.	parryi	PARRY'S LARKSPUR	N
RANUNCULACEAE	Myosurus	minimus			LITTLE MOUSETAIL	N
RANUNCULACEAE	Ranunculus	aquatilis	var.	diffusus	HAIR-LEAF WATER BUTTERCUP	N
RANUNCULACEAE	Ranunculus	californicus	var.	californicus	CALIFORNIA BUTTERCUP	N
RANUNCULACEAE	Ranunculus	hebecarpus			HAIRY-FRUIT BUTTERCUP	N
RANUNCULACEAE	Thalictrum	fendleri	var.	polycarpum	SMOOTH-LEAF MEADOW-RUE	N
RESEDACEAE	Oligomeris	liniflolia			NARROW-LEAF OLIGOMERIS	N
RHAMNACEAE	Ceanothus	aff. thyrsiflorus			BLUE BLOSSOM	N
RHAMNACEAE	Ceanothus	crassifolius			THICK-LEAF-LILAC	N
RHAMNACEAE	Ceanothus	leucodermis			CHAPARRAL WHITETHORN	N
RHAMNACEAE	Ceanothus	oliganthus	var.	orcuttii	ORCUTT'S HAIRY CEANOTHUS	N
RHAMNACEAE	Ceanothus	oliganthus	var.	sorediatus	JIM BRUSH	N
RHAMNACEAE	Ceanothus	sp.				N
RHAMNACEAE	Ceanothus	spinosus			GREEN-BARK-LILAC	N

FAMILY	Genus	SpEp	Rank	Infra# Name	Common Name	Origin*
RHAMNACEAE	Ceanothus	tomentosus			RAMONA-LILAC	N
RHAMNACEAE	Ceanothus	tomentosus x C. leucodermis			HYBRID RAMONA-LILAC	N
RHAMNACEAE	Frangula	californica	ssp.	californica	CALIFORNIA COFFEEBERRY	N
RHAMNACEAE	Frangula	californica	ssp.	tomentella	CHAPARRAL COFFEEBERRY	N
RHAMNACEAE	Rhamnus	ilicifolia			HOLLY-LEAF REDBERRY	N
ROSACEAE	Adenostoma	fasciculatum	var.	fasciculatum	CHAMISE	N
ROSACEAE	Adenostoma	fasciculatum	var.	obtusifolium	SAN DIEGO CHAMISE	N
ROSACEAE	Aphanes	occidentalis			WESTERN LADY'S MANTLE	N
ROSACEAE	Cercocarpus	betuloides	var.	betuloides	BIRCH-LEAF MOUNTAIN-MAHOGANY	N
ROSACEAE	Cercocarpus	minutiflorus			SAN DIEGO MOUNTAIN-MAHOGANY	N
ROSACEAE	Chamaebatia	australis			SOUTHERN MOUNTAIN MISERY	N
ROSACEAE	Coleogyne	ramosissima			BLACKBUSH	N
ROSACEAE	Drymocallis	glandulosa	var.	glandulosa	STICKY CINQUEFOIL	N
ROSACEAE	Drymocallis	glandulosa	var.	reflexa	GREENE'S CINQUEFOIL	N
ROSACEAE	Drymocallis	glandulosa	var.	wrangelliana	WRANGEL CINQUEFOIL	N
ROSACEAE	Heteromeles	arbutifolia			CHRISTMAS BERRY; TOYON	N
ROSACEAE	Horkelia	cuneata	ssp.	cuneata	COAST HORKELIA	N
ROSACEAE	Horkelia	cuneata	ssp.	puberula	MESA HORKELIA	N
ROSACEAE	Horkelia	truncata			RAMONA HORKELIA	N
ROSACEAE	Prunus	ilicifolia	ssp.	ilicifolia	HOLLY-LEAF CHERRY	N
ROSACEAE	Rosa	californica			CALIFORNIA ROSE	N
ROSACEAE	Rubus	ursinus			CALIFORNIA BLACKBERRY	N
RUBIACEAE	Galium	angustifolium	ssp.	angustifolium	NARROW-LEAF BEDSTRAW	N
RUBIACEAE	Galium	aparine			COMMON BEDSTRAW; GOOSE GRASS	N
RUBIACEAE	Galium	nuttallii	ssp.	nuttallii	SAN DIEGO BEDSTRAW	N
RUBIACEAE	Galium	parisiense			WALL BEDSTRAW	E
RUBIACEAE	Galium	porrigens	var.	porrigens	CLIMBING/OVAL-LEAF BEDSTRAW	N
RUPPIACEAE	Ruppia	maritima			BEADFRUIT SEA-TASSEL	N
RUSCACEAE	Nolina	cismontana			CHAPARRAL BEAR-GRASS	N
RUTACEAE	Cneoridium	dumosum			COAST SPICE BUSH; BUSH-RUE	N
SALICACEAE	Populus	fremontii	ssp.	fremontii	WESTERN COTTONWOOD	N

FAMILY	Genus	SpEp	Rank	Infra# Name	Common Name	Origin*
SALICACEAE	Populus	trichocarpa			BLACK COTTONWOOD	N
SALICACEAE	Salix	exigua	var.	hindsiana	HINDS'S WILLOW	N
SALICACEAE	Salix	gooddingii			GOODDING'S BLACK WILLOW	N
SALICACEAE	Salix	laevigata			RED WILLOW	N
SALICACEAE	Salix	lasiandra	var.	lasiandra	SHINING WILLOW	N
SALICACEAE	Salix	lasiolepis			ARROYO WILLOW	N
SAURURACEAE	Anemopsis	californica			YERBA MANSA	N
SAXIFRAGACEAE	Jepsonia	parryi			COAST JEPSONIA	N
SAXIFRAGACEAE	Lithophragma	affine			WOODLAND STAR	N
SCROPHULARIACEAE	Myoporum	laetum			NGAIO, MOUSEHOLE TREE	E
SCROPHULARIACEAE	Myoporum	montanum			WATERBUSH, BOOBIALA	E
SCROPHULARIACEAE	Myoporum	parvifolium			SLENDER MYOPORUM	E
SCROPHULARIACEAE	Scrophularia	californica	ssp.	floribunda	CALIFORNIA BEE PLANT; CALIFORNIA FIGWORT	N
SCROPHULARIACEAE	Verbascum	thapsus			COMMON MULLEIN	E
SCROPHULARIACEAE	Verbascum	virgatum			WAND MULLEIN	E
SELAGINELLACEAE	Selaginella	bigelovii			BIGELOW'S SPIKE-MOSS	N
SELAGINELLACEAE	Selaginella	cinerascens			MESA SPIKE-MOSS	N
SOLANACEAE	Datura	wrightii			WESTERN JIMSON WEED	N
SOLANACEAE	Lycium	andersonii			WATERJACKET	N
SOLANACEAE	Lycium	californicum			CALIFORNIA DESERT THORN	N
SOLANACEAE	Nicotiana	clevelandii			CLEVELAND'S TOBACCO	N
SOLANACEAE	Nicotiana	glauca			TREE TOBACCO	E
SOLANACEAE	Nicotiana	quadrivalvis			INDIAN TOBACCO	N
SOLANACEAE	Physalis	aff. greenei			GREENE'S GROUND-CHERRY	N
SOLANACEAE	Physalis	philadelphica			TOMATILLO	E
SOLANACEAE	Physalis	pubescens	var.	grisea	STRAWBERRY-TOMATO GROUND-CHERRY	E
SOLANACEAE	Solanum	americanum			WHITE NIGHTSHADE	N
SOLANACEAE	Solanum	douglasii			DOUGLAS'S NIGHTSHADE	N
SOLANACEAE	Solanum	eleagnifolium			SILVER-LEAF HORSE-NETTLE	E
SOLANACEAE	Solanum	furcatum			FORKED NIGHTSHADE	E
SOLANACEAE	Solanum	lycopersicum			GARDEN TOMATO	E
SOLANACEAE	Solanum	nigrum			BLACK NIGHTSHADE	E

FAMILY	Genus	SpEp	Rank	Infra# Name	Common Name	Origin*
SOLANACEAE	Solanum	parishii			PARISH'S NIGHTSHADE	N
SOLANACEAE	Solanum	tenuilobatum			SAN DIEGO NIGHTSHADE	N
SOLANACEAE	Solanum	xanti			CHAPARRAL NIGHTSHADE	N
STYRACACEAE	Styrax	redivivus			SNOWDROP BUSH	N
TAMARICACEAE	Tamarix	gallica			FRENCH TAMARISK	E
TAMARICACEAE	Tamarix	hohenackeri				E
TAMARICACEAE	Tamarix	ramosissima			~~TAMARISK~~[t2]; SALT CEDAR	E
THEMIDACEAE	Bloomeria	crocea	var.	crocea	COMMON GOLDENSTAR	N
THEMIDACEAE	Brodiaea	filifolia			THREAD-LEAF BRODIAEA	N
THEMIDACEAE	Brodiaea	orcuttii			ORCUTT'S BRODIAEA	N
THEMIDACEAE	Brodiaea	terrestris	ssp.	kernensis	DWARF BRODIAEA	N
THEMIDACEAE	Dichelostemma	capitatum	ssp.	capitatum	BLUE DICKS, SCHOOL BELLS	N
THEMIDACEAE	Muilla	maritima			COMMON MUILLA	N
THEOPHRASTACEAE	Samolus	parviflorus			WATER-PIMPERNEL, SEASIDE BROOKWEED	N
TROPAEOLACEAE	Tropaeolum	majus			GARDEN NASTURTIUM	E
TYPHACEAE	Sparganium	eurycarpum	var.	eurycarpum	BROAD-FRUIT BUR-WEED	N
TYPHACEAE	Typha	domingensis			SOUTHERN CATTAIL	N
TYPHACEAE	Typha	latifolia			BROAD-LEAF CATTAIL	N
ULMACEAE	Ulmus	parvifolia			CHINESE ELM	E
URTICACEAE	Hesperocnide	tenella			WESTERN NETTLE	N
URTICACEAE	Parietaria	hespera	var.	californica	CALIFORNIA PELLITORY	N
URTICACEAE	Parietaria	hespera	var.	hespera	WESTERN PELLITORY	N
URTICACEAE	Urtica	dioica	ssp.	holosericea	HOARY NETTLE	N
URTICACEAE	Urtica	urens			DWARF NETTLE	E
VALERIANACEAE	Plectritis	ciliosa			LONG-SPUR PLECTRITIS	N
VALERIANACEAE	Plectritis	congesta	ssp.	brachystemon	SHORT-SPUR PLECTRITIS	N
VERBENACEAE	Lantana	camara			LANTANA	E
VERBENACEAE	Verbena	bracteata			BRACT VERVAIN	N
VERBENACEAE	Verbena	lasiostachys	var.	lasiostachys	WESTERN VERVAIN	N
VERBENACEAE	Verbena	lasiostachys	var.	scabrida	ROBUST VERVAIN	N
VERBENACEAE	Verbena	litoralis			SEASHORE VERVAIN	E
VERBENACEAE	Verbena	menthifolia			MINT-LEAF VERVAIN	N
VIOLACEAE	Viola	pedunculata			JOHNNY JUMP-UP	N
VIOLACEAE	Viola	purpurea	ssp.	purpurea	MOUNTAIN VIOLET	N

FAMILY	Genus	SpEp	Rank	Infra# Name	Common Name	Origin*
VISCACEAE	Phoradendron	leucarpum	ssp.	macrophyllum	BIG-LEAF MISTLETOE	N
VISCACEAE	Phoradendron	leucarpum	ssp.	tomentosum	OAK MISTLETOE	N
VITACEAE	Vitis	girdiana			SOUTHERN CALIFORNIA WILD GRAPE	N
VITACEAE	Vitis	vinifera			CULTIVATED GRAPE, WINE GRAPE	E
ZYGOPHYLLACEAE	Tribulus	terrestris			PUNCTUREVINE	E
	Z. Totals					

*N=Native, E=European

Appendix I

Wildlife Species on Camp Pendleton

Appendix I
Wildlife Species on Camp Pendleton

All species are listed by taxonomic class. For amphibians, birds, mammals, and reptiles, the scientific and common names, and families were confirmed using the California Department of Fish and Wildlife (CDFW) Complete List of Amphibians, Reptiles, Birds, and Mammals in California (CDFW 2015) and the U.S. Fish and Wildlife Service Threatened and Endangered Species List (USFWS 2015). Information on the remaining classes was confirmed using various resources, including the Camp Pendleton Wildlife Database. The wildlife species listed have been included in sightings or surveys on-Base; however, their occurrence may require confirmation. This list is not expected to be comprehensive.

Common Name	Family	Species	Origin
Class Amphibia			
Arroyo Toad	Bufonidae	*Anaxyrus californicus*	Native
Southern California Toad	Bufonidae	*Anaxyrus boreas halophilus*	Native
Baja California Treefrog	Hylidae	*Pseudacris hypochondriaca*	Native
Pacific Treefrog	Hylidae	*Pseudacris regilla*	Native
Arboreal Salamander	Plethodontidae	*Aneides lugubris*	Native
Garden Slender Salamander	Plethodontidae	*Batrachoseps major*	Native
Pacific Slender Salamander	Plethodontidae	*Batrachoseps pacificus major*	Native
Monterey Ensatina	Plethodontidae	*Ensatina eschscholtzii eschscholtzii*	Native
Bullfrog	Ranidae	*Rana catesbeiana*	Exotic
California Red-legged Frog[1]	Ranidae	*Rana draytonii*	Extirpated
Coast Range Newt	Salamandridae	*Taricha torosa torosa*	Native
Western Spadefoot Toad	Scaphiopodidae	*Spea hammondii*	Native
Class Anopla			
Ribbon worm	Lineidae	*Cerebratulus* sp.	Native
Class Arachnida			
Hunting Spider	Agelenidae	*Agelenopsis aperta*	Native
Funnel Web Spider	Agelenidae	*Blabomma sancta*	Native
Web Spinning Spider	Agelenidae	*Blabomma* sp.	Native
Hunting Spider	Agelenidae	*Calilena gosoga*	Native
Hunting Spider	Agelenidae	*Calilena stylophora*	Native
Hunting Spider	Agelenidae	*Calymmaria monicae*	Native
Hunting Spider	Agelenidae	*Circurina utahana*	Native
Hunting Spider	Agelenidae	*Hololena dana*	Native
Hunting Spider	Agelenidae	*Rualena balboae*	Native
Hunting Spider	Agelenidae	*Yorima angelica*	Native
Hackled Band Weaver Spider	Amaurobiidae	*Metaltella simoni*	Native
Running Spider	Anyphaenidae	*Aysha incursa*	Native
Running Spider	Anyphaenidae	*Teudis mordax*	Native
Orb Weaver	Araneidae	*Araneus andrewsi*	Native
Ariel Web Spider	Araneidae	*Araneus bispinosus*	Native
Orb Weaver	Araneidae	*Araneus detrimentosus*	Native
Garden Spider	Araneidae	*Araneus pegnia*	Native
Garden Spider	Araneidae	*Argiope argentata*	Native
Orb Weaver	Araneidae	*Argiope blanda*	Native
Orb Weaver	Araneidae	*Argiope trifasciata*	Native
Orb Weaver	Araneidae	*Corinna bajula*	Native
Garden Spider	Araneidae	*Cyclosa turbinata*	Native
Garden Spider	Araneidae	*Eustala californiensis*	Native
Orb Weaver	Araneidae	*Eustala conshlea*	Native
Orb Weaver	Araneidae	*Gea heptagon*	Native
Garden Spider	Araneidae	*Hypsosingafunebris*	Native
Orb Weaver	Araneidae	*Larina directa*	Native
Orb Weaver	Araneidae	*Meriola decepta*	Native
Labyrinth Spider	Araneidae	*Metepeira crussipes*	Native
Running Spider	Clubionidae	*Agroeca trivittata*	Native
Running Spider	Clubionidae	*Anachemmis* sp.	Native
Running Spider	Clubionidae	*Castianeira occidens*	Native

Common Name	Family	Species	Origin
Running Spider	Clubionidae	*Castianeira thalia*	Native
Running Spider	Clubionidae	*Cheiracastrium inclusum*	Native
Running Spider	Clubionidae	*Cyspira eclectica*	Native
Running Spider	Clubionidae	*Drassinella gertschi*	Native
Running Spider	Clubionidae	*Liocranoides dolichopus*	Native
Running Spider	Clubionidae	*Phrurotimpus borealis*	Native
Running Spider	Clubionidae	*Scotinella kastoni*	Native
Running Spider	Clubionidae	*Syspira tigrina*	Native
Running Spider	Clubionidae	*Trachelas* sp.	Native
Funnel Web Spider	Cybaeidae	*Cybeaus* sp.	Native
Trap-door Spider	Cytaucheniidae	*Aptosticus* sp.	Native
Orb Weaver Spider	Dictynidae	*Dictyna abundans*	Native
Orb Weaver Spider	Dictynidae	*Dictyna agressa*	Native
Orb Weaver Spider	Dictynidae	*Dictyna cholla*	Native
Orb Weaver Spider	Dictynidae	*Dictyna completa*	Native
Orb Weaver Spider	Dictynidae	*Dictyna serena*	Native
Hackled Band Weaver Spider	Dictynidae	*Emblyna consulta*	Native
Hackled Band Weaver Spider	Dictynidae	*Emblyna hoya*	Native
Hackled Band Weaver Spider	Dictynidae	*Emblyna serena*	Native
Orb Weaver Spider	Dictynidae	*Tricholathys jacinto*	Native
Orb Weaver Spider	Dictynidae	*Tricholathys monterea*	Native
Tube Weaver Spider	Diguetidae	*Diguetia canities*	Native
Woodlouse Spider	Dysteridae	*Dystera crocata*	Native
Filistatids Spider	Filistatidae	*Filistatinellas* sp.	Native
Filistatids Spider	Filistatidae	*Kukulcania* sp.	Native
Running Spider	Gnanphosidae	*Micaria jeanae*	Native
Running Spider	Gnanphosidae	*Sergiolus montanus*	Native
Running Spider	Gnaphosidae	*Callilipes eremella*	Native
Running Spider	Gnaphosidae	*Callilipes gosoga*	Native
Running Spider	Gnaphosidae	*Cesonia trivittata*	Native
Running Spider	Gnaphosidae	*Drassyllus conformans*	Native
Running Spider	Gnaphosidae	*Drassyllus fractus*	Native
Running Spider	Gnaphosidae	*Drassyllus insularis*	Native
Running Spider	Gnaphosidae	*Drassyllus lamprus*	Native
Running Spider	Gnaphosidae	*Drassyllus salton*	Native
Running Spider	Gnaphosidae	*Gnaphosa californica*	Native
Running Spider	Gnaphosidae	*Haplodrussus maculatus*	Native
Parson Spider	Gnaphosidae	*Herpyllus gertschi*	Native
Running Spider	Gnaphosidae	*Micaria deserticola*	Native
Running Spider	Gnaphosidae	*Micaria icenogglei*	Native
Running Spider	Gnaphosidae	*Micaria utahana*	Native
Running Spider	Gnaphosidae	*Nodocion* sp.	Native
Running Spider	Gnaphosidae	*Sergiolus angustus*	Native
Running Spider	Gnaphosidae	*Sergiolus gertschi*	Native
Running Spider	Gnaphosidae	*Trachyzelotes lyonetti*	Native
Running Spider	Gnaphosidae	*Urozelotes rusticus*	Native
Running Spider	Gnaphosidae	*Zelotes gabriel*	Native
Running Spider	Gnaphosidae	*Zelotes gynethus*	Native
Running Spider	Gnaphosidae	*Zelotes monachus*	Native
Running Spider	Gnaphosidae	*Zelotes nilicola*	Native
Hunting Spider	Hahniidae	*Neoantistea santana*	Native
Crab Spider	Heteropodidae	*Olios schistus*	Native
Sheet-web Weaver	Linyphiidae	*Ceraticelus phylax*	Native
Sheet-web Spider	Linyphiidae	*Ceraticelus* sp.	Native
Sheet-web Spider	Linyphiidae	*Erigone dentosa*	Native
Sheet-web Spider	Linyphiidae	*Frontinella pyramitela*	Native
Sheet-web Spider	Linyphiidae	*Idionella nesiotes*	Native
Sheet-web Weaver	Linyphiidae	*Idionella sclerata*	Native
Sheet-web Weaver	Linyphiidae	*Linyphantes aliso*	Native
Sheet-web Spider	Linyphiidae	*Meioneta* sp.	Native
Sheet-web Weaver	Linyphiidae	*Microlinyphia mandibulata*	Native

Common Name	Family	Species	Origin
		punctata	
Sheet-web Spider	Linyphiidae	*Spirembolus erratus*	Native
Sheet-web Spider	Linyphiidae	*Spirembolus monicus*	Native
Sheet-web Spider	Linyphiidae	*Spirembolus monticolens*	Native
Sheet-web Weaver	Linyphiidae	*Spirembolus pusillus*	Native
Sheet-web Weaver	Linyphiidae	*Spirembolus tortuosus*	Native
Running Spider	Liocranidae	*Phrurotimpus mateonus*	Native
Wolf Spider	Lycosidae	*Alopecosa kochii*	Native
Wolf Spider	Lycosidae	*Pardosa californica*	Native
Wolf Spider	Lycosidae	*Pardosa hyperborea*	Native
Wolf Spider	Lycosidae	*Pardosa sierra*	Native
Wolf Spider	Lycosidae	*Pardosa sternatis*	Native
Wolf Spider	Lycosidae	*Schizocosa mccooki*	Native
Atypical Tarantula	Mecicobothriidae	*Megahexura fulva*	Native
Atypical Tarantula	Micicobothriidae	*Hexurella rupicola*	Native
Sheet-Web Weaver	Mimetidae	*Mimetus hesperus*	Native
Aerial Web Spider	Mimetidae	*Mimetus* sp.	Native
Running Spider	Miturgidae	*Syspira synthetica*	Native
Hackled Band Weaver Spider	Oecobiidae	*Oecobius annulipes*	Native
Primitive Weaver Spider	Oonopidae	*Opopaea bandidina*	Native
Primitive Weaver Spider	Oonopidae	*Orchestina* sp.	Native
Primitive Weaver Spider	Oonopidae	*Scaphiella hesperus*	Native
Lynx Spider	Oxyopidae	*Oxyopes salticus*	Native
Lynx Spider	Oxyopidae	*Oxyopes scalaris*	Native
Lynx Spider	Oxyopidae	*Oxyopes tridens*	Native
Lynx Spider	Oxyopidae	*Peucetia viridans*	Native
Crab Spider	Philodromidae	*Apollophanes texanus*	Native
Crab Spider	Philodromidae	*Ebo mexicanus*	Native
Crab Spider	Philodromidae	*Philodromus chamisis*	Native
Crab Spider	Philodromidae	*Philodromus gertschi gertschi*	Native
Crab Spider	Philodromidae	*Philodromus quercicola*	Native
Crab Spider	Philodromidae	*Tibellus chamberlini*	Native
Primitive Weaver Spider	Pholicidae	*Pholcophora americana*	Native
Primitive Weaver Spider	Pholicidae	*Psilochorus* sp.	Native
Primitive Weaver Spider	Plectreuridae	*Plectreueys conifera*	Native
Jumping Spider	Salticidae	*Eris* sp.	Native
Jumping Spider	Salticidae	*Habronattus californicus*	Native
Jumping Spider	Salticidae	*Habronattus elegans*	Native
Jumping Spider	Salticidae	*Habronattus hirsutus*	Native
Jumping Spider	Salticidae	*Habronattus oregonensis*	Native
Jumping Spider	Salticidae	*Habronattus tarsalis*	Native
Jumping Spider	Salticidae	*Habronattus tranquillus*	Native
Jumping Spider	Salticidae	*Metacyrba taeniola*	Native
Metaphid Jumping Spider	Salticidae	*Metaphidippus diplacis*	Native
Metaphid Jumping Spider	Salticidae	*Metaphidippus mannii*	Native
Metaphid Jumping Spider	Salticidae	*Metaphidippus taeniola*	Native
Metaphid Jumping Spider	Salticidae	*Metaphidippus vitis*	Native
Jumping Spider	Salticidae	*Peckhamia americana*	Native
Jumping Spider	Salticidae	*Phidippus coccineus*	Native
Jumping Spider	Salticidae	*Phidippus johnsoni*	Native
Jumping Spider	Salticidae	*Salticus palpalis*	Native
Jumping Spider	Salticidae	*Sarinda cutleri*	Native
Jumping Spider	Salticidae	*Sassacus papenhoei*	Native
Jumping Spider	Salticidae	*Sitticus dorsatus*	Native
Jumping Spider	Salticidae	*Synageles occidentalis*	Native
Jumping Spider	Salticidae	*Talavera minuta*	Native
Jumping Spider	Salticidae	*Thiodina* sp.	Native
Whip Scorpion	Schizomidae	*Trithyreus* sp.	Native
Primitive Hunting Spider	Scytodidae	*Scytodes* sp.	Native
Comb-Footed Spider	Therdiidae	*Theridion intervallatum*	Native
Comb-Footed Spider	Therdiidae	*Theridion llano*	Native

Common Name	Family	Species	Origin
Comb-Footed Spider	Therdiidae	*Theridion murarium*	Native
Comb-Footed Spider	Therdiidae	*Theridion punctipes*	Native
Comb-footed Spider	Theridiidae	*Achaearanea* sp.	Native
Comb-Footed Spider	Theridiidae	*Argyodes fictilium*	Native
Comb-footed Spider	Theridiidae	*Crustulina sticta*	Native
Comb-Footed Spider	Theridiidae	*Dipoena abdita*	Native
Comb-Footed Spider	Theridiidae	*Dipoena atopa*	Native
Comb-footed Spider	Theridiidae	*Dipoena prona*	Native
Comb-footed Spider	Theridiidae	*Enoplognatha selma*	Native
Comb-Footed Spider	Theridiidae	*Euryopis californica*	Native
Comb-Footed Spider	Theridiidae	*Euryopis spinigera*	Native
Comb-Footed Spider	Theridiidae	*Latrodectus hesperus*	Native
Comb-Footed Spider	Theridiidae	*Steassa marmorata*	Native
Crab Spider	Theridiidae	*Steatoda washona*	Native
Comb-Footed Spider	Theridiidae	*Theridion goodnightorum*	Native
Comb-Footed Spider	Theridiidae	*Theridion kawea*	Native
Comb-Footed Spider	Theridiidae	*Theridion rabuni*	Native
Comb-Footed Spider	Theridiidae	*Thymoites expulsus*	Native
Comb-Footed Spider	Theridiidae	*Tidarren sisyphoides*	Native
Crab Spider	Thomisidae	*Coriaeaechne utahensis*	Native
Crab Spider	Thomisidae	*Misumenops aikoae*	Native
Crab Spider	Thomisidae	*Misumenops californicus*	Native
Crab Spider	Thomisidae	*Misumenops formosipes*	Native
Crab Spider	Thomisidae	*Misumenops importunus belkini*	Native
Crab Spider	Thomisidae	*Misumenops lepidus*	Native
Crab Spider	Thomisidae	*Misumenops rothi*	Native
Crab Spider	Thomisidae	*Misumenops* sp.	Native
Longsighted Hunter Spider	Thomisidae	*Pellenes levii*	Native
Crab Spider	Thomisidae	*Philodroma rufus pacificus*	Native
Crab Spider	Thomisidae	*Steatoda grossa*	Native
Crab Spider	Thomisidae	*Steatoda triangulosa*	Native
Crab Spider	Thomisidae	*Tmarus* sp.	Native
Crab Spider	Thomisidae	*Xysticus calfornicus*	Native
Crab Spider	Thomisidae	*Xysticus gulosus*	Native
Crab Spider	Thomisidae	*Xysticus iviei iviei*	Native
Crab Spider	Thomisidae	*Xysticus pretiosus*	Native
Mites			Native
Ticks			Native
Class Aves			
Cooper's Hawk	Accipitridae	*Accipiter cooperii*	Native
Sharp-shinned Hawk	Accipitridae	*Accipiter striatus*	Native
Golden Eagle	Accipitridae	*Aquila chrysaetos*	Native
Zone-tailed Hawk	Accipitridae	*Buteo albonotatus*	Native
Red-tailed Hawk	Accipitridae	*Buteo jamaicensis*	Native
Rough-legged Hawk	Accipitridae	*Buteo lagopus*	Native
Red-shouldered Hawk	Accipitridae	*Buteo lineatus*	Native
Ferruginous Hawk	Accipitridae	*Buteo regalis*	Native
Swainson's Hawk	Accipitridae	*Buteo swainsoni*	Native
Northern Harrier	Accipitridae	*Circus cyaneus*	Native
White-tailed Kite	Accipitridae	*Elanus leucurus*	Native
Bald Eagle	Accipitridae	*Haliaeetus leucocephalus*	Native
Bushtit	Aegithalidae	*Psaltriparus minimus*	Native
California Horned Lark	Alaudidae	*Eremophila alpestris actia*	Native
Belted Kingfisher	Alcedinidae	*Ceryle alcyon*	Native
Pigeon Guillemot	Alcidae	*Cepphus columba*	Native
Rhinoceros Auklet	Alcidae	*Cerorhinca monocerata*	Native
Tufted Puffin	Alcidae	*Fratercula cirrhata*	Native
Cassin's Auklet	Alcidae	*Ptychoramphus aleuticus*	Native
Xantus' Murrelet[2]	Alcidae	*Synthliboramphus hypoleucus*	Native
Common Murre	Alcidae	*Uria aalge*	Native

Common Name	Family	Species	Origin
Mandarin Duck	Anatidae	*Aix galericulata*	Exotic
Wood Duck	Anatidae	*Aix sponsa*	Native
Northern Pintail	Anatidae	*Anas acuta*	Native
American Wigeon	Anatidae	*Anas americana*	Native
Northern Shoveler	Anatidae	*Anas clypeata*	Native
Green-winged Teal	Anatidae	*Anas crecca*	Native
Cinnamon Teal	Anatidae	*Anas cyanoptera*	Native
Blue-winged Teal	Anatidae	*Anas discors*	Native
Eurasian Wigeon	Anatidae	*Anas penelope*	Native
Mallard	Anatidae	*Anas platyrhynchos*	Native
Gadwall	Anatidae	*Anas strepera*	Native
Tule Greater White-fronted Goose	Anatidae	*Anser albifrons elgasi*	Native
Lesser Scaup	Anatidae	*Aythya affinis*	Native
Redhead	Anatidae	*Aythya americana*	Native
Ring-necked Duck	Anatidae	*Aythya collaris*	Native
Greater Scaup	Anatidae	*Aythya marila*	Native
Canvasback	Anatidae	*Aythya valisineria*	Native
Brant	Anatidae	*Branta bernicla*	Native
Aleutian Cackling Goose	Anatidae	*Branta hutchinsii leucopareia*	Native
Bufflehead	Anatidae	*Bucephala albeola*	Native
Common Goldeneye	Anatidae	*Bucephala clangula*	Native
Snow Goose	Anatidae	*Chen caerulescens*	Native
Ross's Goose	Anatidae	*Chen rossii*	Native
Long-tailed Duck	Anatidae	*Clangula hyemalis*	Native
Tundra Swan	Anatidae	*Cygnus columbianus*	Native
Hooded Merganser	Anatidae	*Lophodytes cucullatus*	Native
White-winged Scoter	Anatidae	*Melanitta fusca*	Native
Black Scoter	Anatidae	*Melanitta nigra*	Native
Surf Scoter	Anatidae	*Melanitta perspicillata*	Native
Common Merganser	Anatidae	*Mergus merganser*	Native
Red-breasted Merganser	Anatidae	*Mergus serrator*	Native
Ruddy Duck	Anatidae	*Oxyura jamaicensis*	Native
White-throated Swift	Apodidae	*Aeronautes saxatalis*	Native
Chimney Swift	Apodidae	*Chaetura pelagica*	Native
Vaux's Swift	Apodidae	*Chaetura vauxi*	Native
Great Egret	Ardeidae	*Ardea alba*	Native
Great Blue Heron	Ardeidae	*Ardea herodias*	Native
American Bittern	Ardeidae	*Botaurus lentiginosus*	Native
Cattle Egret	Ardeidae	*Bubulcus ibis*	Native
Green Heron	Ardeidae	*Butorides virescens*	Native
Little Blue Heron	Ardeidae	*Egretta caerulea*	Native
Reddish Egret	Ardeidae	*Egretta rufescens*	Native
Snowy Egret	Ardeidae	*Egretta thula*	Native
Tricolored Heron	Ardeidae	*Egretta tricolor*	Native
Least Bittern	Ardeidae	*Ixobrychus exilis*	Native
Yellow-crowned Night Heron	Ardeidae	*Nyctanassa violacea*	Native
Black-crowned Night Heron	Ardeidae	*Nycticorax nycticorax*	Native
Cedar Waxwing	Bombycillidae	*Bombycilla cedrorum*	Native
Chestnut-collared Longspur	Calcariidae	*Calcarius ornatus*	Native
Lesser Nighthawk	Caprimulgidae	*Chordeiles acutipennis*	Native
Common Poorwill	Caprimulgidae	*Phalaenoptilus nuttallii*	Native
Northern Cardinal	Cardinalidae	*Cardinalis cardinalis*	Exotic
Blue Grosbeak	Cardinalidae	*Guiraca caerulea*	Native
Lazuli Bunting	Cardinalidae	*Passerina amoena*	Native
Rose-breasted Grosbeak	Cardinalidae	*Pheucticus ludovicianus*	Native
Black-headed Grosbeak	Cardinalidae	*Pheucticus melanocephalus*	Native
Western Tanager	Cardinalidae	*Piranga ludoviciana*	Native
Summer Tanager	Cardinalidae	*Piranga rubra*	Native
Dickcissel	Cardinalidae	*Spiza americana*	Native
Turkey Vulture	Cathartidae	*Cathartes aura*	Native
California Condor	Cathartidae	*Gymnogyps californianus*	Extirpated

Common Name	Family	Species	Origin
Brown Creeper	Certhidae	*Certhia americana*	Native
Western Snowy Plover	Charadriidae	*Charadrius alexandrinus nivosus*	Native
Mountain Plover	Charadriidae	*Charadrius montanus*	Native
Semipalmated Plover	Charadriidae	*Charadrius semipalmatus*	Native
Killdeer	Charadriidae	*Charadrius vociferus*	Native
Lesser Golden Plover	Charadriidae	*Pluvialis dominica*	Native
Black-bellied Plover	Charadriidae	*Pluvialis squatarola*	Native
Wood Stork[3]	Ciconiidae	*Mycteria americana*	Vagrant
Band-tailed Pigeon	Columbidae	*Columba fasciata*	Native
Rock Pigeon	Columbidae	*Columba livia*	Exotic
Common Ground-Dove	Columbidae	*Columbina passerina*	Native
Spotted Dove	Columbidae	*Streptopelia chinensis*	Exotic
Eurasian Collared Dove	Columbidae	*Streptopelia decaocto*	Exotic
White-winged Dove	Columbidae	*Zenaida asiatica*	Native
Mourning Dove	Columbidae	*Zenaida macroura*	Native
Western Scrub Jay	Corvidae	*Aphelocoma californica*	Native
Black-throated Magpie-Jay	Corvidae	*Calocitta colliei*	Native
American Crow	Corvidae	*Corvus brachyrhynchus*	Native
Common Raven	Corvidae	*Corvus corax*	Native
Steller's Jay	Corvidae	*Cyanocitta stelleri*	Native
Yellow-billed Cuckoo, western DPS[4]	Cuculidae	*Coccyzus americanus*	Native
Greater Roadrunner	Cuculidae	*Geococcyx californianus*	Native
Laysan Albatross	Diomedeidae	*Phoebastria immutabilis*	Native
Southern California Rufous- crowned Sparrow	Emberizidae	*Aimophila ruficeps canescens*	Native
Grasshopper Sparrow	Emberizidae	*Ammodramus savannarum*	Native
Bell's Sage Sparrow	Emberizidae	*Amphispiza belli belli*	Native
Lark Bunting	Emberizidae	*Calamospiza melanocorys*	Native
Lark Sparrow	Emberizidae	*Chondestes grammacus*	Native
Dark-eyed Junco	Emberizidae	*Junco hyemalis*	Native
Swamp Sparrow	Emberizidae	*Melospiza georgiana*	Native
Lincoln's Sparrow	Emberizidae	*Melospiza lincolnii*	Native
Song Sparrow	Emberizidae	*Melospiza melodia*	Native
Belding's Savannah Sparrow	Emberizidae	*Passerculus sandwichensis beldingi*	Native
Large-billed Savannah Sparrow	Emberizidae	*Passerculus sandwichensis rostratus*	Native
Fox Sparrow	Emberizidae	*Passerella iliaca*	Native
Green-tailed Towhee	Emberizidae	*Pipilo chlorurus*	Native
California Towhee	Emberizidae	*Pipilo crissalis*	Native
Canyon Towhee	Emberizidae	*Pipilo fuscus*	Native
Spotted Towhee	Emberizidae	*Pipilo maculatus*	Native
Vesper Sparrow	Emberizidae	*Pooecetes gramineus*	Native
Black-chinned Sparrow	Emberizidae	*Spizella atrogularis*	Native
Brewer's Sparrow	Emberizidae	*Spizella breweri*	Native
Clay-colored Sparrow	Emberizidae	*Spizella pallida*	Native
Chipping Sparrow	Emberizidae	*Spizella passerina*	Native
White-throated Sparrow	Emberizidae	*Zonotrichia albicollis*	Native
Golden-crowned Sparrow	Emberizidae	*Zonotrichia atricapilla*	Native
White-crowned Sparrow	Emberizidae	*Zonotrichia leucophrys*	Native
Merlin	Falconidae	*Falco columbarius*	Native
Prairie Falcon	Falconidae	*Falco mexicanus*	Native
American Peregrine Falcon	Falconidae	*Falco peregrinus anatum*	Native
American Kestrel	Falconidae	*Falco sparverius*	Native
Magnificent Frigatebird	Fregatidae	*Fregata magnificens*	Native
Lawrence's Goldfinch	Fringillidae	*Carduelis lawrencei*	Native
Pine Siskin	Fringillidae	*Carduelis pinus*	Native
Lesser Goldfinch	Fringillidae	*Carduelis psaltria*	Native
American Goldfinch	Fringillidae	*Carduelis tristis*	Native
House Finch	Fringillidae	*Carpodacus mexicanus*	Native
Purple Finch	Fringillidae	*Carpodacus purpureus*	Native

Common Name	Family	Species	Origin
Red Crossbill	Fringillidae	*Loxia curvirostra*	Native
Arctic Loon	Gaviidae	*Gavia arctica*	Native
Common Loon	Gaviidae	*Gavia immer*	Native
Pacific Loon	Gaviidae	*Gavia pacifica*	Native
Red-throated Loon	Gaviidae	*Gavia stellata*	Native
Black Oystercatcher	Haematopodidae	*Haematopus bachmani*	Native
Barn Swallow	Hirundinidae	*Hirundo rustica*	Native
Cliff Swallow	Hirundinidae	*Petrochelidon pyrrhonota*	Native
Purple Martin	Hirundinidae	*Progne subis*	Native
Bank Swallow	Hirundinidae	*Riparia riparia*	Native
Northern Rough-winged Swallow	Hirundinidae	*Stelgidopteryx serripennis*	Native
Tree Swallow	Hirundinidae	*Tachycineta bicolor*	Native
Violet-green Swallow	Hirundinidae	*Tachycineta thalassina*	Native
Fork-tailed Storm-Petrel	Hydrobatidae	*Oceanodroma furcata*	Native
Ashy Storm-Petrel	Hydrobatidae	*Oceanodroma homochroa*	Native
Black Storm-petrel	Hydrobatidae	*Oceanodroma melania*	Native
Least Storm-Petrel	Hydrobatidae	*Oceanodroma microsoma*	Native
Red-winged Blackbird	Icteridae	*Agelaius phoeniceus*	Native
Tricolored Blackbird	Icteridae	*Agelaius tricolor*	Native
Brewer's Blackbird	Icteridae	*Euphagus cyanocephalus*	Native
Bullock's Oriole	Icteridae	*Icterus bullockii*	Native
Hooded Oriole	Icteridae	*Icterus cucullatus*	Native
Baltimore Oriole	Icteridae	*Icterus galbula*	Native
Scott's Oriole	Icteridae	*Icterus parisorum*	Native
Orchard Oriole	Icteridae	*Icterus spurius*	Native
Brown-headed cowbird	Icteridae	*Molothrus ater*	Exotic
Great-tailed Grackle	Icteridae	*Quiscalus mexicanus*	Native
Western Meadowlark	Icteridae	*Sturnella neglecta*	Native
Yellow-headed Blackbird	Icteridae	*Xanthocephalus xanthocephalus*	Native
Loggerhead Shrike	Laniidae	*Lanius ludovicianus*	Native
Black Tern	Laridae	*Chlidonias niger*	Native
Gull-billed Tern	Laridae	*Gelochelidon nilotica*	Native
Herring Gull	Laridae	*Larus argentatus*	Native
California Gull	Laridae	*Larus californicus*	Native
Mew Gull	Laridae	*Larus canus*	Native
Ring-billed Gull	Laridae	*Larus delawarensis*	Native
Glaucous-winged Gull	Laridae	*Larus glaucescens*	Native
Heermann's Gull	Laridae	*Larus heermanni*	Native
Glaucous Gull	Laridae	*Larus hyperboreus*	Native
Yellow-footed Gull	Laridae	*Larus livens*	Native
Little Gull	Laridae	*Larus minutus*	Native
Western Gull	Laridae	*Larus occidentalis*	Native
Bonaparte's Gull	Laridae	*Larus philidelphia*	Native
Thayer's Gull	Laridae	*Larus thayeri*	Native
Laughing Gull	Laridae	*Leucophaeus atricilla*	Native
Franklin's Gull	Laridae	*Leucophaeus pipixcan*	Native
Bridled Tern	Laridae	*Onychoprion anaethetus*	Vagrant
Sooty Tern	Laridae	*Onychoprion fuscatus*	Vagrant
Black-legged Kittiwake	Laridae	*Rissa tridactyla*	Native
Black skimmer	Laridae	*Rynchops nigra*	Native
Caspian Tern	Laridae	*Sterna caspia*	Native
Forster's Tern	Laridae	*Sterna forsteri*	Native
Common Tern	Laridae	*Sterna hirundo*	Native
Royal Tern	Laridae	*Sterna maxima*	Native
Arctic Tern	Laridae	*Sterna paradisaea*	Native
California Least Tern	Laridae	*Sternula antillarum browni*	Native
Elegant Tern	Laridae	*Thalasseus elegans*	Native
Gray Catbird	Mimidae	*Dumetella carolinensis*	Vagrant
Northern Mockingbird	Mimidae	*Mimus polyglottos*	Native
Sage Thrasher	Mimidae	*Oreoscoptes montanus*	Native
California Thrasher	Mimidae	*Toxostoma redivivum*	Native

Common Name	Family	Species	Origin
American Pipit	Motacillidae	*Anthus rubescens*	Native
Osprey	Pandionidae	*Pandion haliaetus*	Native
Oak Titmouse	Paridae	*Baeolophus inornatus*	Native
Mountain Chickadee	Paridae	*Parus gambeli*	Native
Yellow-rumped Warbler	Parulidae	*Dendroica coronata*	Native
Prairie Warbler	Parulidae	*Dendroica discolor*	Native
Black-throated Gray Warbler	Parulidae	*Dendroica nigrescens*	Native
Hermit Warbler	Parulidae	*Dendroica occidentalis*	Native
Palm Warbler	Parulidae	*Dendroica palmarum*	Native
Chestnut-sided Warbler	Parulidae	*Dendroica pensylvanica*	Native
Yellow Warbler	Parulidae	*Dendroica petechia*	Native
Blackpoll Warbler	Parulidae	*Dendroica striata*	Native
Townsend's Warbler	Parulidae	*Dendroica townsendi*	Native
Black-and-White Warbler	Parulidae	*Dendroica varia*	Native
Common Yellowthroat	Parulidae	*Geothlypis trichas*	Native
Yellow-breasted Chat	Parulidae	*Icteria virens*	Native
MacGillivray's Warbler	Parulidae	*Oporornis tolmiei*	Native
Northern Waterthrush	Parulidae	*Seiurus noveboracensis*	Native
American Redstart	Parulidae	*Setophaga ruticilla*	Native
Orange-crowned Warbler	Parulidae	*Vermivora celata*	Native
Lucy's Warbler	Parulidae	*Vermivora luciae*	Native
Tennessee Warbler	Parulidae	*Vermivora perigrina*	Native
Nashville Warbler	Parulidae	*Vermivora ruficapilla*	Native
Hooded Warbler	Parulidae	*Wilsonia citrina*	Native
Wilson's Warbler	Parulidae	*Wilsonia pusilla*	Native
House Sparrow	Passeridae	*Passer domesticus*	Exotic
American White Pelican	Pelicanidae	*Pelecanus erythrorhynchos*	Native
California Brown Pelican	Pelicanidae	*Pelecanus occidentalis californicus*	Native
Red-billed Tropicbird	Phaethontidae	*Phaethon aethereus*	Vagrant
Double-crested Cormorant	Phalacrocoracidae	*Phalacrocorax auritus*	Native
Pelagic Cormorant	Phalacrocoracidae	*Phalacrocorax pelagicus*	Native
Brant's Cormorant	Phalacrocoracidae	*Phalacrocorax penicillatus*	Native
Chukar	Phasianidae	*Alectoris chukar*	Exotic
California Quail	Phasianidae	*Callipepla californica*	Native
Wild Turkey	Phasianidae	*Meleagris gallopavo*	Exotic
Mountain Quail	Phasianidae	*Oreortyx pictus*	Native
Ring-necked Pheasant	Phasianidae	*Phasianus colchicus*	Exotic
Northern Flicker	Picidae	*Colaptes auratus*	Native
Acorn Woodpecker	Picidae	*Melanerpes formicivorus*	Native
Lewis' Woodpecker	Picidae	*Melanerpes lewis*	Native
Nuttall's Woodpecker	Picidae	*Picoides nuttallii*	Native
Downy Woodpecker	Picidae	*Picoides pubescens*	Native
Hairy Woodpecker	Picidae	*Picoides villosus*	Native
Red-naped Sapsucker	Picidae	*Sphyrapicus nuchalis*	Native
Red-breasted Sapsucker	Picidae	*Sphyrapicus ruber*	Native
Orange Bishop	Ploceidae	*Euplectes franciscanus*	Exotic
Clark's Grebe	Podicipedidae	*Aechmophorus clarkii*	Native
Western Grebe	Podicipedidae	*Aechmophorus occidentalis*	Native
Horned Grebe	Podicipedidae	*Podiceps auritus*	Native
Eared Grebe	Podicipedidae	*Podiceps nigricollis*	Native
Pied-billed Grebe	Podicipedidae	*Podilymbus podiceps*	Native
Blue-gray Gnatcatcher	Polioptilidae	*Polioptila caerulea*	Native
Coastal California Gnatcatcher	Polioptilidae	*Polioptila californica californica*	Native
Black-tailed Gnatcatcher	Polioptilidae	*Polioptila melanura*	Native
Northern Fulmar	Procellariidae	*Fulmaris glacialis*	Native
Pink-footed Shearwater	Procellariidae	*Puffinus creatopus*	Native
Sooty Shearwater	Procellariidae	*Puffinus griseus*	Native
Black-vented Shearwater	Procellariidae	*Puffinus opisthomelas*	Native
Red-crowned Parrot	Psittacidae	*Amazona viridigenalis*	Exotic
Budgerigar	Psittacidae	*Melopsittacus undulatus*	Exotic
Phainopepla	Ptilogonatidae	*Phainopepla nitens*	Native

Common Name	Family	Species	Origin
American Coot	Rallidae	*Fulica americana*	Native
Common Gallinule	Rallidae	*Gallinula chloropus*	Native
Sora Rail	Rallidae	*Porzana carolina*	Native
Virginia Rail	Rallidae	*Rallus limicola*	Native
Light-footed Ridgway's Rail[5]	Rallidae	*Rallus obsoletus levipes*	Native
Black-necked Stilt	Recurvirostridae	*Himantopus mexicanus*	Native
American Avocet	Recurvirostridae	*Recurvirostra americana*	Native
Ruby-crowned Kinglet	Regulidae	*Regulus calendula*	Native
Golden-crowned Kinglet	Regulidae	*Regulus satrapa*	Native
Spotted Sandpiper	Scolopacidae	*Actitis macularia*	Native
Surfbird	Scolopacidae	*Aphriza virgata*	Native
Ruddy Turnstone	Scolopacidae	*Arenaria interpres*	Native
Black Turnstone	Scolopacidae	*Arenaria melanocephala*	Native
Sanderling	Scolopacidae	*Calidris alba*	Native
Dunlin	Scolopacidae	*Calidris alpine*	Native
Baird's Sandpiper	Scolopacidae	*Calidris bairdii*	Native
Red Knot	Scolopacidae	*Calidris canutus*	Native
Curlew Sandpiper	Scolopacidae	*Calidris ferruginea*	Vagrant
Stilt Sandpiper	Scolopacidae	*Calidris himantopus*	Native
Western Sandpiper	Scolopacidae	*Calidris mauri*	Native
Pectoral Sandpiper	Scolopacidae	*Calidris melanotos*	Native
Least Sandpiper	Scolopacidae	*Calidris minutilla*	Native
Semipalmated Sandpiper	Scolopacidae	*Calidris pusilla*	Native
Willet	Scolopacidae	*Catoptrophorus semipalmatus*	Native
Wilson's Snipe	Scolopacidae	*Gallinago delicata*	Native
Common Snipe	Scolopacidae	*Gallinago gallinago*	Native
Wandering Tattler	Scolopacidae	*Heteroscelus incanus*	Native
Short-billed Dowitcher	Scolopacidae	*Limnodromus griseus*	Native
Long-billed Dowitcher	Scolopacidae	*Limnodromus scolopaceus*	Native
Marbled Godwit	Scolopacidae	*Limosa fedoa*	Native
Long-billed Curlew	Scolopacidae	*Numenius americanus*	Native
Whimbrel	Scolopacidae	*Numenius phaeopus*	Native
Red Phalarope	Scolopacidae	*Phalaropus fulicaria*	Native
Red-necked Phalarope	Scolopacidae	*Phalaropus lobatus*	Native
Wilson's Phalarope	Scolopacidae	*Phalaropus tricolor*	Native
Spotted Redshank	Scolopacidae	*Tringa erythropus*	Native
Lesser Yellowlegs	Scolopacidae	*Tringa flavipes*	Native
Greater Yellowlegs	Scolopacidae	*Tringa melanoleuca*	Native
Solitary Sandpiper	Scolopacidae	*Tringa solitaria*	Native
Red-breasted Nuthatch	Sittidae	*Sitta canadensis*	Native
White-breasted Nuthatch	Sittidae	*Sitta carolinensis*	Native
Parasitic Jaeger	Stercorariidae	*Stercorarius parasiticus*	Native
Pomarine Jaeger	Stercorariidae	*Stercorarius pomarinus*	Native
Short-eared Owl	Strigidae	*Asio flammeus*	Native
Long-eared Owl	Strigidae	*Asio otus*	Native
Burrowing Owl	Strigidae	*Athene cunicularia*	Native
Great Horned Owl	Strigidae	*Bubo virginianus*	Native
Flammulated Owl	Strigidae	*Otus flammeolus*	Native
Western Screech Owl	Strigidae	*Otus kennicottii*	Native
California Spotted Owl	Strigidae	*Strix occidentalis occidentalis*	Native
European Starling	Sturnidae	*Sturnus vulgaris*	Exotic
Red-footed Booby	Sulidae	*Sula sula*	Vagrant
Wrentit	Sylviidae	*Chamaea fasciata*	Native
Roseate Spoonbill	Threskiornithidae	*Ajaia ajaja*	Vagrant
White-faced Ibis	Threskiornithidae	*Plegadis chihi*	Native
Rose-throated Becard	Tityridae	*Pachyramphus aglaiae*	Native
Black-chinned Hummingbird	Trochilidae	*Archilocus alexandri*	Native
Anna's Hummingbird	Trochilidae	*Calypte anna*	Native
Costa's Hummingbird	Trochilidae	*Calypte costae*	Native
Broad-billed Hummingbird	Trochilidae	*Cynanthus latirostris*	Native
Rufous Hummingbird	Trochilidae	*Selasphorus rufus*	Native

Common Name	Family	Species	Origin
Allen's Hummingbird	Trochilidae	*Selasphorus sasin*	Native
Calliope Hummingbird	Trochilidae	*Stellula calliope*	Native
Coastal Cactus Wren	Troglodytidae	*Campylorhynchus brunneicapillus sandiegensis*	Native
Canyon Wren	Troglodytidae	*Catherpes mexicanus*	Native
Clark's Marsh Wren	Troglodytidae	*Cistothorus palustris clarkae*	Native
Rock Wren	Troglodytidae	*Salpinctes obsoletus*	Native
San Clemente Bewick's Wren	Troglodytidae	*Thryomanes bewickii leucophrys*	Native
House Wren	Troglodytidae	*Troglodytes aedon*	Native
Winter Wren	Troglodytidae	*Troglodytes troglodytes*	Native
Hermit Thrush	Turdidae	*Catharus guttatus*	Native
Swainson's Thrush	Turdidae	*Catharus ustulatus*	Native
Varied Thrush	Turdidae	*Ixoreus naevius*	Native
Mountain Bluebird	Turdidae	*Sialia currucoides*	Native
Western Bluebird	Turdidae	*Sialia mexicana*	Native
American Robin	Turdidae	*Turdus migratorius*	Native
Olive-sided Flycatcher	Tyrannidae	*Contopus cooperi*	Native
Western Wood-Peewee	Tyrannidae	*Contopus sordidulus*	Native
Pacific-slope Flycatcher	Tyrannidae	*Empidonax difficilis*	Native
Hammond's Flycatcher	Tyrannidae	*Empidonax hammondii*	Native
Dusky Flycatcher	Tyrannidae	*Empidonax oberholseri*	Native
Southwestern Willow Flycatcher	Tyrannidae	*Empidonax traillii extimus*	Native
Gray Flycatcher	Tyrannidae	*Empidonax wrightii*	Native
Ash-throated Flycatcher	Tyrannidae	*Myiarchus cinerascens*	Native
Vermillion Flycatcher	Tyrannidae	*Pyrocephalus rubinus*	Native
Black Phoebe	Tyrannidae	*Sayornis nigricans*	Native
Eastern Phoebe	Tyrannidae	*Sayornis phoebe*	Native
Say's Phoebe	Tyrannidae	*Sayornis saya*	Native
Western Kingbird	Tyrannidae	*Tyrannus verticalis*	Native
Cassin's Kingbird	Tyrannidae	*Tyrannus vociferans*	Native
Barn Owl	Tytonidae	*Tyto alba*	Native
Least Bell's Vireo	Vireonidae	*Vireo bellii pusillus*	Native
Cassin's Vireo (formerly Solitary vireo)	Vireonidae	*Vireo cassinii*	Native
Yellow-throated Vireo	Vireonidae	*Vireo flavifrons*	Native
Warbling Vireo	Vireonidae	*Vireo gilvus*	Native
White-eyed Vireo	Vireonidae	*Vireo griseus*	Native
Catalina Hutton's Vireo	Vireonidae	*Vireo huttoni unitti*	Native
Plumbeous Vireo	Vireonidae	*Vireo plumbeus*	Native
Gray Vireo	Vireonidae	*Vireo vicinior*	Native
Class Bivalvia			
Asiatic Clam	Corbiculidae	*Corbicula fluminea*	Exotic
Class Chilopoda			
Centipede			Native
Class Crustacea			
Brine shrimp	Artemiidae	*Artemia salina*	Native
Red Swamp Crayfish	Astacidae	*Procambarus clarkii*	Exotic
Lindahl's fairy shrimp	Branchinectidae	*Branchinecta lindahli*	Native
San Diego fairy shrimp	Branchinectidae	*Branchinecta sandiegonensis*	Native
Red ghost shrimp	Callianassidae	*Callianassa californiensis*	Native
Rock crab	Cancridae	*Cancer antennarius*	Native
Yellow shore-crab	Grapsidae	*Hemigrapsus oregonensis*	Native
Striped shore-crab	Grapsidae	*Pachygrapsus crassipes*	Native
Kelp crab	Majidae	*Pugettia producta*	Native
Fiddler crab	Ocypodidae	*Uca crenulata*	Native
Broken-back/Grass Shrimp	Palaemonidae	*Palaemon macrodactylus*	Exotic
Riverside fairy shrimp	Streptocephalidae	*Streptocephalus woottoni*	Native
Sowbug			Native
Class Diplopoda			
Millipede			

Common Name	Family	Species	Origin
Class Gastropoda			
Striped sea hare	Aglajidae	*Navanax inermis*	Native
Cloudy bubble snail	Bullidae	*Bulla gouldiana*	Native
California horn snail	Certhideidae	*Cerithidea californica*	Native
White abalone	Haliotidae	*Haliotis sorenseni*	Native
Festive rock shell	Muricidae	*Pteropurpura festivus*	Native
Purple Olive	Olividae	*Olivella biplicata*	Native
Class Insecta			
Achilid planthopper	Achilidae		Native
Darner	Aeshnidae	*Aeshna* sp.	Native
Leaf miner fly	Agromyzidae		Native
Scale insect	Aleyroddidae	*Trialeurodes vaporariorum*	Native
Comb-clawed beetle	Alleculidae		Native
Broad-headed bug	Alydidae		Native
Stonefly	Amphinemuridae	*Malenka* sp.	Native
Andrenid bee	Andrenidae		Native
Drugstore beetle	Anobiidae		Native
Antlike flower beetle	Anthicidae		Native
Minute pirate bugs	Anthocoridae		Native
Anthomyiid fly	Anthomidae		Native
Aphelinid	Aphelinidae		Native
Aphid	Aphididae		Native
Bumble bee	Apidae	*Bombus occidentalis*	Native
Common (European) Honeybee	Apidae	*Apis mellifera*	Exotic
Robber fly	Asilidae		Native
Small mayfly	Baetidae		Native
Mayfly	Baetidae	*Callibaetis* sp.	Native
Giant water bug	Belostomatidae		Native
Stilt bug	Berytidae	*Acanthophysa echinata*	Native
Stilt bug	Berytidae	*Jalysus wickhami*	Native
Stilt bug	Berytidae	*Pronotacantha annulata*	Native
Bethylid	Bethylidae		Native
March fly	Bibionidae		Native
Cockroach	Blatellidae		Native
Bee fly	Bombyliidae		Native
Powder post beetle	Bostrichidae		Native
Braconid	Braconidae		Native
Seed beetle	Bruchidae		Native
Metallic wood-boring beetle	Buprestidae		Native
Small mayfly	Caenidae		Native
Blow fly	Calliphoridae		Native
Broad-winged damselfly	Calopterygidae		Native
Soldier beetle	Cantharidae		Native
Ground beetle	Carabidae		Native
Gall gnats	Cecidomyiidae		Native
Longhorn beetle	Ceramycidae	*Ipochus fasciatus*	Native
Ceraphronid	Ceraphronidae		Native
Biting midge	Ceratopogonidae		Native
Scale insect	Cercopodae		Native
Midge	Chironomidae		Native
Fruit fly	Chloropidae		Native
Leaf beetle	Chrysomelidae	*Chlamisus* sp.	Native
Leaf beetle	Chrysomelidae	*Cryptocephalus sanguinecollis*	Native
Leaf beetle	Chrysomelidae	*Trirhabda* sp.	Native
Brown lacewing	Chrysopidae	*Chrysoperla carnea*	Native
Green lacewing	Chrysopidae	*Hremochrysa* sp.	Native
Cicada	Cicadellidae	*Aceratagallia obscura*	Native
Cicada	Cicadellidae	*Ballana sera*	Native
Cicada	Cicadellidae	*Ballana simplex*	Native
Cicada	Cicadellidae	*Cochlorhinus unispinosus*	Native
Cicada	Cicadellidae	*Colladonus montanus*	Native

Common Name	Family	Species	Origin
Cicada	Cicadellidae	*Cuerna gladiola*	Native
Cicada	Cicadellidae	*Deltacephalus sonorus*	Native
Cicada	Cicadellidae	*Empoasoa decora*	Native
Cicada	Cicadellidae	*Exitianus exitiosus*	Native
Cicada	Cicadellidae	*Gyponana* sp.	Native
Cicada	Cicadellidae	*Idiocerus* sp.	Native
Cicada, Vanduzee's	Cicadellidae	*Okanagana vanduzeei*	Native
Cicada	Cicadellidae	*Phlepsius ovatus*	Native
Cicada	Cicadellidae	*Scaphytopius elegans*	Native
Cicada	Cicadellidae	*Scaphytopius loricatas*	Native
Cicada	Cicadellidae	*Tiaga* sp.	Native
Cicada	Cicadellidae	*Twiningia permista*	Native
Cicada	Cicadellidae	*Xerophloea peltata*	Native
Fly	Cicidomyiidae		Native
Tiger beetle	Cincindelidae		Native
Scale insect	Cixiidae	*Oliaris sp.*	Native
Scale Insect	Clastopteridae	*Clastoptera lineatocollis*	Native
Checked Beetle	Cleridae		Native
Wax Scales	Coccidae		Native
Ladybird Beetle	Coccinellidae	*Cycloneda sanguinea*	Native
Lacewing	Coenagrionidae		Native
Narrow-winged Damselflies	Coenagrionidae		Native
Forktail	Coenagrionidae	*Ischnura cervula*	Native
Lacewing	Coniopterygidae		Native
Leaf-footed Bugs	Coreidae	*Anasa* sp.	Native
Water Boatmen	Corixidae		Native
Common water boatman	Corixidae	*Corisella inscripta*	Native
Large water boatman	Corixidae	*Hesperocorixa laevigata*	Native
Water boatman	Corixidae	*Trichocorixa* sp.	Native
Dobsonflies	Corydalidae	*Neohermes californicus*	Native
Flat Bark Beetle	Cucujidae		Native
Mosquito	Culicidae	*Culex* sp.	Native
Mosquito	Culicidae	*Culiseta* sp.	Native
Snout Beetle	Curculionidae	*Anthonomus*	Native
Snout Beetle	Curculionidae	*Anthonomus decipiens*	Native
Snout Beetle	Curculionidae	*Anthonomus inermis*	Native
Snout Beetle	Curculionidae	*Anthonomus ornatulus*	Native
Potato Stalk Borer	Curculionidae	*Trichobaris*	Native
Burrower Bugs	Cydnidae		Native
Cynipids	Cynipidae		Native
Delphacid Planthoppers	Delphacidae		Native
Tooth-necked Fungus Beetle	Derdontidae		Native
Earwigs	Dermestidae		Native
Diapriids	Diapriidae		Native
Dictyopharid Planthoppers	Dictyopharidae	*Scolops* sp.	Native
Dictyopharid Planthoppers	Dictyopharidae	*Ticida* sp.	Native
Long-legged Flies	Dolichopodidae		Native
Pomace Flies	Drosophilidae		Native
Dryinids	Dryinidae		Native
Long-toed Water Beetle	Dryopidae		Native
River beetle	Dytiscidae	*Agabus disintegratus*	Native
Predaceous Diving Beetles	Dytiscidae	*Cybister* sp.	Native
	Dytiscidae	*Deronectes striatellus*	Native
Giant green water beetle	Dytiscidae	*Dytiscus marginicollis*	Native
	Dytiscidae	*Hygrotus* sp.	Native
Predaceous Diving Beetle	Dytiscidae	*Laccophilus mexicanus atristernalis*	Native
Predaceous Diving Beetle	Dytiscidae	*Merragata hebroides*	Native
Predaceous Diving Beetle	Dytiscidae	*Rhantus gutticollis*	Native
Click Beetle	Elateridae		Native
Riffle Beetles	Elmidae		Native

Common Name	Family	Species	Origin
Dance Flies	Empilidae		Native
Encyrtids	Encyrtidae		Native
Shore Flies	Ephydridae		Native
Eulophids	Eulophidae		Native
Eupelmids	Eupelmidae		Native
Eurytomids	Eurytomidae		Native
Figitids	Figitidae		Native
Flatid Planthoppers	Flatidae	*Metcalfa pruinosa*	Native
Ants	Formicidae		Native
Argentine ants	Formicidae	*Iridiomyrmex humilis*	Exotic
Gasteruptiids	Gasteruptiidae		Native
Geometer Moths	Geometridae		Native
Water strider	Gerridae	*Gerris incognitus*	Native
Common water strider	Gerridae	*Gerris remigis*	Native
Clubtails	Gomphidae		Native
Grasshoppers	Gryllacrididae		Native
Lacewing	Gryllidae		Native
Whirligig Beetles	Gyrinidae		Native
Halictid Bees	Halictidae		Native
Crawling Water Beetles	Haliplidae		Native
Water Striders	Haliplidae		Native
Crawling Water Beetle	Haliplidae	*Peltodytes simplex*	Native
Helomyzid Flies	Helomyzidae		Native
Brown Lacewings	Hemerobiidae	*Micromus subantious*	Native
Brown Lacewings	Hemerobiidae	*Micromus variolosus*	Native
Brown Lacewings	Hemerobiidae	*Sympherobius californicus*	Native
Brown Lacewings	Hemerobiidae	*Sympherobius killingtoni*	Native
Fiery Skipper	Hesperiidae	*Hylephila phyleus*	Native
Woodland Skipper	Hesperiidae	*Ochlodes agricola*	Native
Checkered Skipper	Hesperiidae	*Pyrgus albescens*	Native
Hister Beetles	Histeridae		Native
Water Scavenger Beetle	Hydrophilidae	*Berosus striatus*	Native
Water Scavenger Beetle	Hydrophilidae	*Enochrus* sp.	Native
Water Scavenger Beetle	Hydrophilidae	*Helophorus* sp.	Native
Common scavenger water beetle	Hydrophilidae	*Tropisternus lateralis*	Native
Net-spinning Caddisflies	Hydropsychidea	*Hydropsyche oslari*	Native
Micro-caddisflies	Hydroptilidae		Native
Ichneumons	Ichneumonidae	*Ophion* sp.	Native
Issid Planthoppers	Issidae	*Danepteryx manca*	Native
Issid Planthoppers	Issidae	*Dictyssa mutata*	Native
Issid Planthoppers	Issidae	*Dictyssaobliqua*	Native
Issid Planthoppers	Issidae	*Neaethus* sp.	Native
Red Bug or Stainer	Largidae		Native
Minute Brown Scavenger Beetle	Lathrididae	*Corticarina* sp.	Native
Round Fungus Beetle	Leiodidae	*Leiodessus* sp.	Native
Lepidostomids	Lepidostomtidea	*Lepidostoma* sp.	Native
Mayflies	Leptophlebidae		Native
Common Skimmer	Libellulidae		Native
Pastel skimmer	Libellulidae	*Sympetrum corruptum*	Native
Western Pygmy Blue	Lycaenidae	*Brephidium exile*	Native
Bernardino Blue	Lycaenidae	*Euphilotes battoides bernardino*	Native
Marine Blue	Lycaenidae	*Leptotes marina*	Native
Acmon Blue	Lycaenidae	*Plebeius acmon*	Native
Common Hairstreak	Lycaenidae	*Strymon melinus*	Native
Seed Bugs	Lygaeidae	*Corius* sp.	Native
Seed Bugs	Lygaeidae	*Geocoris* sp.	Native
Seed Bugs	Lygaeidae	*Lygaceua* sp.	Native
Jumping Bristletails	Machilidae		Native
Leafcutting Bees	Megaspilidae		Native
Soft-Winged Flower Beetle	Melyridae		Native
Treehoppers	Membracidae	*Paranthronae hispida*	Native

Common Name	Family	Species	Origin
Treehoppers	Membracidae	*Philya californensis*	Native
Treehoppers	Membracidae	*Spissistilus festunis*	Native
Treehoppers	Membracidae	*Stictocephala* sp.	Native
Treehoppers	Membracidae	*Thelamonanthe* sp.	Native
Plant Bugs	Miridae	*Daracela* sp.	Native
Plant Bugs	Miridae	*Lopidea confraterna*	Native
Plant Bugs	Miridae	*Phytocoris babiequiro*	Native
Plant Bugs	Miridae	*Phytocoris borrego*	Native
Plant Bugs	Miridae	*Phytocoris californica*	Native
Plant Bugs	Miridae	*Phytocoris canecens*	Native
Plant Bugs	Miridae	*Phytocoris rosens*	Native
Tumbling Flower beetles	Mordellidae	*Mordellis tena*	Native
Muscid Flies	Muscidae		Native
Velvet Ants	Mutillidae		Native
Fungus Gnats	Myctophilidae		Native
Fairyflies	Mymaridae		Native
Damsel Bugs	Nabidae		Native
Creeping Water Bugs	Naucoridae		Native
Spring Stoneflies	Nemouridae		Native
Alfalfa Looper	Noctuiidae	*Autographa californica*	Native
Noctuid Moths	Noctuiidae	*Hemieuxoa rudens*	Native
Noctuid Moths	Noctuiidae	*Leucania multilinea*	Native
Noctuid Moths	Noctuiidae	*Orthodes rufula*	Native
Variegated Cutworm	Noctuiidae	*Peridroma saucia*	Native
Armyworm	Noctuiidae	*Pseudaletia unipuneta*	Native
Cabbage Looper	Noctuiidae	*Trichoplusia ni*	Native
Early Spring Miller	Noctuiidae	*Xylomyges curialis*	Native
Small backswimmer	Notonectidae	*Buenoa margaritacea*	Native
Scimitar Backswimmer	Notonectidae	*Buenoa scimitra*	Native
Large backswimmer	Notonectidae	*Notonecta undulata*	Native
Single-banded backswimmer	Notonectidae	*Notonecta uniufaciata*	Native
Queen	Nymphalidae	*Danaus gilippus*	Native
Monarch butterfly	Nymphalidae	*Danaus plexippus*	Native
Chalcedon Checkerspot	Nymphalidae	*Euphydryas chalcedona*	Native
Buckeye	Nymphalidae	*Junonia coenia*	Native
Lorquin's Admiral	Nymphalidae	*Liminitis lorquini lorquini*	Native
Mourning Cloak	Nymphalidae	*Nymphalis antiopa*	Native
West Coast Lady	Nymphalidae	*Vanessa annabella*	Native
Painted Lady	Nymphalidae	*Vanessa cardui*	Native
American Painted Lady	Nymphalidae	*Vanessa virginiensis*	Native
Bot Flies	Oestridae		Native
Pale Swallowtail	Papilionidae	*Papilio eurymedon*	Native
Western Tiger Swallowtail	Papilionidae	*Papilio rutulus*	Native
Anise Swallowtail	Papilionidae	*Papilio zelicaon*	Native
Wasp	Pemphredonidae		Native
Stink Bugs	Pentatomidae	*Cosmopepla intergressus*	Native
Stink Bugs	Pentatomidae	*Euchistus conspersus*	Native
Harlequin cabbage bug	Pentatomidae	*Murgantia histrionica*	Native
Stink Bugs	Pentatomidae	*Thyanta pallidovirens*	Native
Perlodid Stoneflies	Perlodidae	*Isoperta* sp.	Native
Lacewing	Phasmatidae		Native
Caddisflies	Philimyiidae		Native
Finger-net Caddisflies	Philopotamidae		Native
Humpbacked Flies	Phoridae		Native
Phylloxeran	Phylloxeridae		Native
Ambush Bugs	Phymatidae		Native
Sara's Orangetip	Pieridae	*Anthocharis sara*	Native
Alfalfa Butterfly	Pieridae	*Colias eurytheme*	Native
Cloudless Sulfur	Pieridae	*Phoebis sennae*	Native
Small Cabbage White	Pieridae	*Pieris rapae*	Exotic
Checkered White	Pieridae	*Pontia protodice*	Native

Common Name	Family	Species	Origin
Skipper Flies	Piophilidae		Native
Big-headed Flies	Pipunculidae		Native
platygasterids	Platygastridae	*Inosternma* sp.	Native
Trumpet-net Caddisflies	Polycentropoidae		Native
Spider Wasps	Pompilidae		Native
Ambush Bugs	Prostemminae		Native
Water-penny Beetles	Psephenidae	*Psephenus* sp.	Native
Sand Flies	Psychodidae		Native
Tube-making Caddisflies	Psychomiidae		Native
Psyllids	Psyllidae		Native
Pyeromalids	Pteromalidae		Native
Plume Moths	Pterophoridae		Native
Pyralid Moths	Pyralidae		Native
Snakeflies	Raphidiidae	*Agulla* sp.	Native
Assassin Bugs	Reduvidae	*Zelus tetracanthus*	Native
Snipe Fly	Rhagionidae		Native
Scentless Plant Bugs	Rhopalidae	*Arhyssus lateralis*	Native
Primitive Caddisflies	Rhyacophilidae		Native
Behr's Metalmark	Riodinidae	*Apodemia mormo virgulti*	Native
Fatal Metalmark	Riodinidae	*Caliphelis nemesis*	Native
Shore Bugs	Saldidae		Native
Large Heath	Nymphalidae	*Coenonympha tullia*	Native
California Ringlet	Nymphalidae	*Coenonympha tullia californica*	Native
Shining Fungus Beetle	Scarabaeidae	*Dichelonyx* sp.	Native
Anthomyiid Flies	Scatophagidae		Native
Minute Black Scavenger Flies	Scatopsidae		Native
Scelionids	Scelionidae		Native
Window Flies	Scenopinidae		Native
Dark-Winged Fungus Gnats	Sciaridae		Native
March Flies	Sciomyzidae		Native
Engraver Beetle	Scolytidae		Native
Shield-backed Bugs	Scutelleridae	*Homaemus aneifrons*	Native
Shield-backed Bugs	Scutelleridae	*Honaemus variegatus*	Native
Antlike Stone Beetle	Scydmaenidae		Native
Seelionid	Seelionidae		Native
Carrion Beetle	Silphidae		Native
Black Flies	Simuliidae	*Simulium vittatum*	Native
Mayflies	Siphlonuridae		Native
Small Dung Flies	Sphaeoceridae		Native
Wasp	Sphecidae		Native
Rove Beetle	Staphylinidae		Native
Soldier Flies	Stratiomyidae		Native
Syrphid Flies	Syrphidae		Native
Fruit Flies	Tachinidae		Native
Darkling Beetle	Tenebrionidae		Native
Fruit Flies	Tephritidae	*Aciurina thoracion*	Native
Fruit Flies	Tephritidae	*Dioxyna sororcula*	Native
Fruit Flies	Tephritidae	*Tephritis arizonensis*	Native
Fruit Flies	Tephritidae	*Tephritis baccharis*	Native
Fruit Flies	Tephritidae	*Trupanea wheeleri*	Native
Common Sawflies	Tetracampidae		Native
Lacewing	Tettigoniidae		Native
Stiletto Flies	Therividae		Native
Negro Bugs	Thyreocoridae		Native
Lace Bugs	Tingidae	*Corythuchu spinosa*	Native
Crane Flies	Tipulidae	*Tipula* sp.	Native
Torymids	Torimidae	*Monodontomerinae*	Native
Tortricid Moths	Tortricidae		Native
Mammal Chewing Lice	Trichodectidae		Native
Trichogrammatids	Trichogrammatidae		Native
Trixoscelidid Flies	Trixoscelidae		Native

Common Name	Family	Species	Origin
Skin Beetle	Trogidae		Native
Diplurans			Native
Webspinners			Native
Termites			Native
Fleas			Native
Springtails			Native
Class Mammalia			
Sei Whale	Balaenoptiidae	*Balaenoptera borealis*	Native
Blue whale	Balaenoptiidae	*Balaenoptera musculus*	Native
Finback whale	Balaenoptiidae	*Balaenoptera physalus*	Native
Humpback whale	Balaenoptiidae	*Megaptera novaeangliae*	Native
Plains Bison	Bovidae	*Bison bison bison*	Exotic
Coyote	Canidae	*Canis latrans*	Native
Gray Fox	Canidae	*Urocyon cinereoargenteus*	Native
Beaver	Castoridae	*Castor canadensis*	Exotic
Southern Mule Deer	Cervidae	*Odocoileus hemionus fuliginatus*	Native
Long-beaked common Dolphin	Delphinidae	*Delphinus capensis*	Native
Bottle-nosed Dolphin	Delphinidae	*Tursiops truncatus*	Native
Opossum	Didelphiidae	*Didelphis virginiana*	Native
Gray Whale	Eschrichtiidae	*Eschrichtius robustus*	Native
Feral Cat	Felidae	*Felis catus*	Exotic
Mountain Lion	Felidae	*Puma concolor*	Native
Bobcat	Felidae	*Puma rufus*	Native
Botta's Pocket Gopher	Geomyidae	*Thomomys bottae*	Native
Dulzura Pocket Mouse	Heteromyidae	*Chaetodipus californicus femoralis*	Native
Northwestern San Diego Pocket Mouse	Heteromyidae	*Chaetodipus fallax fallax*	Native
Pallid San Diego Pocket Mouse	Heteromyidae	*Chaetodipus fallax pallidus*	Native
Pacific Kangaroo Rat	Heteromyidae	*Dipodomys agilis*	Native
Dulzura Kangaroo Rat	Heteromyidae	*Dipodomys simulans*	Native
Stephens' Kangaroo Rat	Heteromyidae	*Dipodomys stephensi*	Native
Pacific Pocket Mouse	Heteromyidae	*Perognathus longimembris pacificus*	Native
San Diego Black-tailed Jackrabbit	Leporidae	*Lepus californicus bennetti*	Native
Desert Cottontail	Leporidae	*Sylvilagus audubonii*	Native
Brush Rabbit	Leporidae	*Sylvilagus bachmani*	Native
Striped Skunk	Mephitidae	*Mephitis mephitis*	Native
Western Mastiff Bat	Molossidae	*Eumops perotis californicus*	Native
Pocketed Free-tailed Bat	Molossidae	*Nyctinomops femorrosaccus*	Native
Big Free-tailed Bat[6]	Molossidae	*Nyctinomops macrotis*	Native
Brazilian Free-tailed Bat	Molossidae	*Tadarida brasiliensis*	Native
California Vole	Muridae	*Microtus californicus*	Native
House Mouse	Muridae	*Mus musculus*	Exotic
Dusky-footed Woodrat	Muridae	*Neotoma fuscipes*	Native
San Diego Desert Woodrat	Muridae	*Neotoma lepida intermedia*	Native
Southern Grasshopper Mouse	Muridae	*Onychomys torridus ramona*	Native
Brush Mouse	Muridae	*Peromyscus boylii*	Native
California Mouse	Muridae	*Peromyscus californicus*	Native
Cactus Mouse	Muridae	*Peromyscus eremicus*	Native
Deer Mouse	Muridae	*Peromyscus maniculatus*	Native
Pinon Mouse	Muridae	*Peromyscus truei*	Native
Norway Rat	Muridae	*Rattus norvegicus*	Exotic
Black Rat	Muridae	*Rattus rattus*	Exotic
Western Harvest Mouse	Muridae	*Reithrodontomys megalotis*	Native
Long-tailed Weasel	Mustelidae	*Mustela frenata*	Native
Western Spotted Skunk	Mustelidae	*Spilogale gracilis*	Native
American Badger	Mustelidae	*Taxidea taxus*	Native
California Sea Lion	Otariidae	*Zalophus californianus*	Native
Northern Elephant Seal	Phocidae	*Mirounga angustirostris*	Native
Mexican Long-tongued Bat[6]	Phyllostomidae	*Choeronycteris mexicana*	Native
Sperm whale[7]	Physeteridae	*Physeter macrocephalus*	Native

Common Name	Family	Species	Origin
Ringtail	Procyonidae	*Bassariscus astutus*	Native
Raccoon	Procyonidae	*Procyon lotor*	Native
California Ground Squirrel	Sciuridae	*Spermophilus beecheyi*	Native
Desert Shrew	Soricidae	*Notiosorex crawfordi*	Native
Ornate Shrew	Soricidae	*Sorex ornatus*	Native
Broad-footed Mole	Talpidae	*Scapanus latimanus*	Native
Pallid Bat	Vespertilionidae	*Antrozous pallidus*	Native
Townsend's Big-eared Bat[6]	Vespertilionidae	*Corynorhinus townsendii*	Native
Big Brown Bat	Vespertilionidae	*Eptesicus fuscus*	Native
Spotted Bat[6]	Vespertilionidae	*Euderma maculatum*	Native
Western Red Bat[6]	Vespertilionidae	*Lasiurus blossevillii*	Native
California Leaf-nosed Bat[6]	Phyllostomidae	*Macrotus californicus*	Native
Yuma Myotis	Vespertilionidae	*Myotis yumanensis*	Native
Western Pipistrelle	Vespertilionidae	*Pipistrellus hesperus*	Native
Class Osteichthyes			
Topsmelt	Atherinidae	*Atherinops affinis*	Native
Jacksmelt	Atherinidae	*Atherinopsis californiensis*	Native
California Grunion	Atherinidae	*Leuresthes tenuis*	Native
Pacific Sanddab	Bothidae	*Citharichthys sordidus*	Native
Speckled Sanddab	Bothidae	*Citharichthys stigmaeus*	Native
Longfin Sanddab	Bothidae	*Citharichthys xanthostigma*	Native
California Halibut	Bothidae	*Paralichthys californicus*	Native
Gray Smoothhound	Carcharhinidae	*Mustelus californicus*	Native
Green Sunfish	Centrarchidae	*Lepomis cyanellus*	Exotic
Bluegill	Centrarchidae	*Lepomis macrochirus*	Exotic
Redear Sunfish	Centrarchidae	*Lepomis microlophus*	Exotic
Redeye Bass	Centrarchidae	*Micropterus coosae*	Exotic
Largemouth Bass	Centrarchidae	*Micropterus salmonides*	Exotic
Smallmouth bass	Centrarchidae	*Micropterus dolomieu*	Exotic
Spotted Sand Bass	Centrarchidae	*Paralabrax clathratus*	Native
Black Crappie	Centrarchidae	*Pomoxis nigromaculatus*	Exotic
Giant Sea Bass	Centrarchidae	*Stereolepis gigas*	Native
Bay Blenny	Clinidae	*Hypsoblennius gentilis*	Native
Staghorn Sculpin	Cottidae	*Leptocottus armatus*	Native
California Tonguefish	Cynoglossidae	*Symphurus atricauda*	Native
Carp	Cyprinidae	*Cyprinus carpio*	Exotic
Arroyo Chub	Cyprinidae	*Gila orcutti*	Native
Golden Shiner	Cyprinidae	*Notemigonus crysoleucas*	Exotic
Flathead Minnow	Cyprinidae	*Pimphales promelas*	Exotic
California Killifish	Cyprinodontidae	*Fundulus parvipinnis*	Native
Barred Surfperch	Embiotocidae	*Amphistichus argenteus*	Native
Shiner Surfperch	Embiotocidae	*Cymatogaster aggregata*	Native
Dwarf Surfperch	Embiotocidae	*Micrometrus minimus*	Native
Deepbody Anchovy	Engraulididae	*Anchoa compressa*	Native
Bay Anchovy	Engraulididae	*Anchoa delicatissima*	Native
Northern anchovy	Engraulididae	*Engraulis mordax*	Native
Unarmored Threespine Stickleback	Gasterosteidae	*Gasterosteus aculeatus williamsoni*	Extirpated
Opaleye	Girellidae	*Girella nigricans*	Native
Arrow Goby	Gobiidae	*Clevlandia ios*	Native
Longtail Goby	Gobiidae	*Ctenogobius sagitulla*	Native
Tidewater Goby	Gobiidae	*Eucyclogobius newberryi*	Native
Longjaw Mudsucker	Gobiidae	*Gillichthys mirabilis*	Native
Cheekspot Goby	Gobiidae	*Ilypnus gilberti*	Native
Shadow Goby	Gobiidae	*Quietula y-cauda*	Native
Black Bullhead	Ictaluridae	*Ameiurus melas*	Exotic
Yellow Bullhead	Ictaluridae	*Ameiurus natalis*	Exotic
Brown Bullhead	Ictaluridae	*Ictalurus nebulosus*	Exotic
Channel Catfish	Ictaluridae	*Ictalurus punctatus*	Exotic
Striped Mullet	Mugilidae	*Mugil cephalus*	Native
Butterfly Ray	Myliobatididae	*Gymnura marmorata*	Native
Bat Ray	Myliobatididae	*Myliobatis californica*	Native

Common Name	Family	Species	Origin
Round Stingray	Myliobatididae	*Urolophus halleri*	Native
Yellowfin Goby	Percidae	*Acanthogobius flavimanus*	Exotic
Diamond Turbot	Pleuronectidae	*Hypsopsetta guttulata*	Native
Starry Flounder	Pleuronectidae	*Platyichthys stellatus*	Native
Mosquitofish	Poeciliidae	*Gambusia affinis*	Exotic
Silver Salmon	Salmonidae	*Oncorhynchus kisutch*	Native
Southern California Steelhead	Salmonidae	*Oncorhynchus mykiss*	Native
White Seabass	Sciaenidae	*Cynoscion nobilis*	Native
California Corbina	Sciaenidae	*Menticirrhus undulatus*	Native
Spotfin Croaker	Sciaenidae	*Roncador sternsii*	Native
Queenfish	Sciaenidae	*Seriphus politus*	Native
Yellowfin Croaker	Sciaenidae	*Umbrina roncador*	Native
Pacific Bonito	Scombridae	*Sarda chiliensis*	Native
Pacific Mackerel	Scombridae	*Scomber japonicus*	Native
Albacore	Scombridae	*Thunnus alalunga*	Native
Striped Bass	Serranidae	*Morone saxatilis*	Exotic
Kelp Bass	Serranidae	*Paralabrax clathratus*	Native
Spotted Sand Bass	Serranidae	*Paralabrax maculatofasciatus*	Native
Barred Sand Bass	Serranidae	*Paralabrax nebulifer*	Native
Giant Sea Bass	Serranidae	*Stereolepis gigas*	Native
California Sheephead	Sphyraenidae	*Pimelometopon pulchrum*	Native
California Barracuda	Sphyraenidae	*Sphyraena argentea*	Native
Bay Pipefish	Syngnathidae	*Syngnathus auliscus*	Native
Pipefish	Syngnathidae	*Syngnathus leptorhynchus*	Native
Class Phalangida			
Harvestmen			Native
Class Reptilia			
San Diego Alligator Lizard	Anguidae	*Elgaria multicarinata webbii*	Native
Silvery Legless Lizard[6]	Anniellidae	*Anniella pulchra pulchra*	Native
Coastal Rosy Boa	Boidae	*Charina trivirgata roseofusca*	Native
Loggerhead Sea Turtle[8]	Cheloniidae	*Caretta caretta*	Native
Green Sea Turtle	Cheloniidae	*Chelonia mydas*	Native
Olive Ridley Sea Turtle	Cheloniidae	*Lepidochelys olivacea*	Native
Common Snapping Turtle	Chelydridae	*Chelydra serpentina*	Exotic
California Glossy Snake	Colubridae	*Arizona elegans occidentallis*	Native
Western Yellow-bellied Racer	Colubridae	*Coluber constrictor mormon*	Native
San Diego Ringneck Snake	Colubridae	*Diadophis punctatus similis*	Native
Night Snake	Colubridae	*Hypsiglena torquata*	Native
California Kingsnake	Colubridae	*Lampropeltis getula californiae*	Native
Red Racer	Colubridae	*Masticophis flagellum piceus*	Native
California Striped Racer	Clubridae	*Masticophis lateralis lateralis*	Native
San Diego Gopher Snake	Colubridae	*Pituophis melanoleucus annectens*	Native
Longnose Snake	Colubridae	*Rhinoceilus lecontei*	Native
Coast Patch-nosed Snake	Colubridae	*Salvadora hexalepis virgultea*	Native
California Black-head Snake	Colubridae	*Tantilla planiceps eiseni*	Native
California Lyre Snake	Colubridae	*Trimorphodon lyrophanes*	Native
Leatherback Sea Turtle	Dermochelyidae	*Dermochelys coriacea*	Native
Painted Turtle[9]	Emydidae	*Chrysemys picta*	Exotic
Southwestern Pond Turtle	Emydidae	*Emys marmorata*	Native
Florida Red-bellied Turtle[9]	Emydidae	*Pseudemys nelsoni*	Exotic
Red-eared Slider	Emydidae	*Trachmys scripta elegans*	Exotic
San Diego Banded Gecko[10]	Eublepharidae	*Coleonyx variegatus abbotti*	Native
Western Blind Snake	Leptotyphlopidae	*Leptotyphlops humilis*	Native
Two-striped Garter Snake	Natricidae	*Thamnophis hammondii*	Native
California Red-Sided Garter Snake	Natricidae	*Thamnophis sirtalis infernalis*	Native
Coast Horned Lizard	Phrynosomatidae	*Phrynosoma blainvillii*	Native
Western Fence Lizard	Phrynosomatidae	*Sceloporus occidentalis*	Native
Granite Spiny Lizard	Phrynosomatidae	*Sceloporus orcutti*	Native
Side-blotched Lizard	Phrynosomatidae	*Uta stansburiana*	Native
Gilbert's Skink	Scincidae	*Plestiodon gilberti*	Native
Western Skink	Scincidae	*Plestiodon skiltonianus*	Native

Common Name	Family	Species	Origin
Coronado Skink[8]	Scincidae	*Plestiodon skiltonianus interparietalis*	Native
Orange-throated Whiptail	Teiidae	*Aspidoscelis hyperythra*	Native
Coastal Western Whiptail	Teiidae	*Aspidoscelis tigris stejnegeri*	Native
Western Whiptail	Teiidae	*Cnemidophorus tigris multiscutatus*	Native
Southwestern Speckled Rattlesnake	Viperidae	*Crotalus mitchelli pyrrhus*	Native
Red Diamond Rattlesnake	Viperidae	*Crotalus ruber ruber*	Native
Southern Pacific Rattlesnake	Viperidae	*Crotalus viridis helleri*	Native

[1] Red-legged frogs were historically present on Camp Pendleton but were not located during survey efforts of all drainages from 1995 to 1997 (Holland and Goodman 1998a, 1998b). Considered extirpated from San Diego County by U.S. Fish and Wildlife Service (USFWS).

[2] Xantus' murrelet is now split in to two species, Scripp's murrelet and Guadalupe murrelet; it is unknown which of these species was observed on Camp Pendleton but occurrence for either species on Camp Pendleton would be considered rare.

[3] The wood stork is listed as a vagrant on Camp Pendleton's "Checklist of Birds" having been observed only twice on-Base, 23 December 1983 and 20 February 1984.

[4] As of the 2015 updated Species List, name has been dropped by USFWS; the western distinct population section (DPS) was changed to (FE).

[5] Formerly light-footed clapper rail. The name change has not been formally published by USFWS in the Federal Register; however, CDFW has adopted the new name.

[6] High potential to exist on-Base, but no official observation found on record.

[7] USFWS nomenclature at time of listing was *Physeter catodon*.

[8] Uncommon in the San Diego area; only a single record of a Pacific loggerhead turtle exists on Camp Pendleton (Holland and Goodman 1998a, 1998b).

[9] Likely an "accidental"/captive release.

[10] The San Diego banded gecko was not found on Camp Pendleton during the Holland and Goodman (1998a, 1998b) study despite intensive survey efforts; however, a single museum record exists from De Luz (from 1945) and it is assumed that this species does occur on-Base.

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California Department of Fish and Wildlife. 2015. *Complete List of Amphibians, Reptiles, Birds, and Mammals in California*. Available at http://www.dfg.ca.gov/wildlife/nongame/list.html.

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Holland, D. C., and R. H. Goodman, Jr. 1998b. *Sensitive Species of Amphibians and Reptiles on MCB Camp Pendleton, San Diego County, California*, with management recommendations. Camp Pendleton Amphibian and Reptile Survey, Fallbrook, California. Unpublished report (18 November 1998) prepared for MCB Camp Pendleton, California (Contract No. M00681-94-C-0039).

U.S. Fish and Wildlife Service. 2015. Threatened and Endangered Species List. Available at http://ecos.fws.gov/.

Appendix J

Species Management Plans

This appendix includes the following documents:

- 2015 Bison Management Plan

Bison Herd Management Plan

Marine Corps Base Camp Pendleton, California

April 2015

Prepared by: Jim Asmus

Marine Corps Installations West,
Marine Corps Base Camp Pendleton,
Environmental Security

Acronyms and Abbreviations

AU	animal unit
Base	Marine Corps Base Camp Pendleton
BVC	bison-vehicle-collision
CDFG	California Department of Fish and Game
CI	chemical immobilization
CY	Comparative Yield
DWR	Dry Weight Rank
IUCN	International Union for Conservation of Nature
lb(s)	pound(s)
MCB	Marine Corps Base
NIAC	Northern Impact Area Control
NRCS	Natural Resources Conservation Service
OP-W	Observation Post Whiskey
RDM	Residual Dry Matter
SD	Standard Deviation
SIAC	Southern Impact Area Control
SNP50	Single Nucleotide Polymorphism at 54,000 loci
TA	Training Area
USFWS	United States Fish and Wildlife Service

BISON HERD MANAGEMENT PLAN
MARINE CORPS BASE CAMP PENDLETON, CALIFORNIA

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LIST OF FIGURES

1.0 INTRODUCTION

This management plan describes management actions for maintaining a wild roaming herd of plains bison (*Bison bison*) on Marine Corps Base (MCB) Camp Pendleton (Base). The animals are not native to southern California. Fall 2011, the herd had approximately 120 bison. Bison most often choose to graze and roam within the high hazard impact area on Base (Figure 1).

1.1 PURPOSE AND NEED

This document describes the management actions required to successfully maintain a small conservation herd of bison on Base. As the number of bison on Base continues to increase, this plan identifies the timing and action that will be used to limit the herd's size. Successfully implementing the steps in this plan will promote a sustainably sized bison herd while minimizing disruptions to military training.

Maintaining a small conservation herd of bison on Base supports the United States Marine Corps' commitment to land stewardship without impeding the training mission. Effective bison conservation requires an interstate and multiagency effort that includes herds on federal lands. Maintaining a sustainably sized bison herd on Base where it can provide ecological value in natural grasslands will contribute to the broader goal of bison conservation while supporting the Base's goals for ecosystem management.

2.0 GOALS, OBJECTIVES, AND METHODS

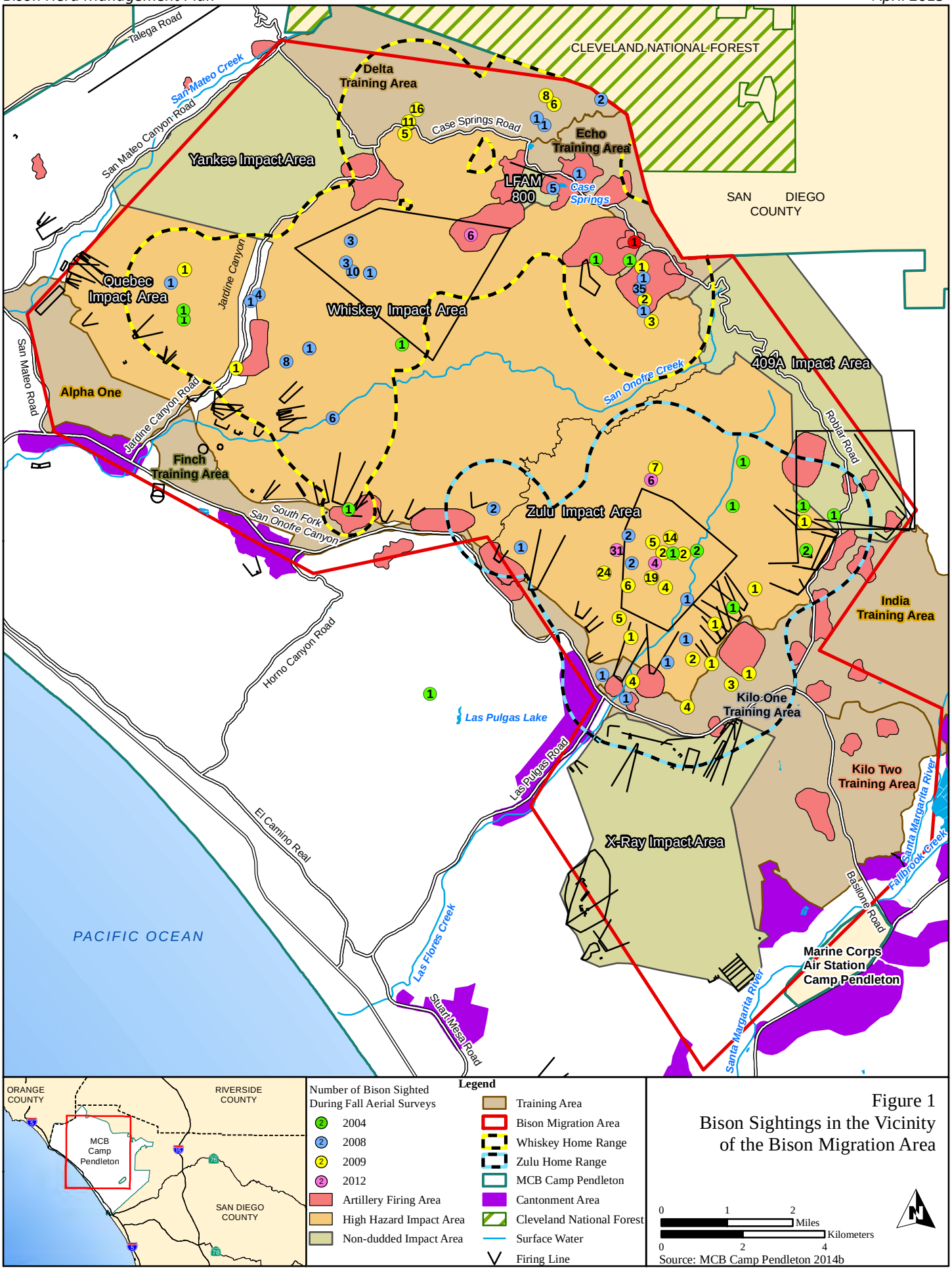
The format of this document emphasizes adaptive management as used in the Interagency Bison Management Plan for Yellowstone National Park and surrounding lands (National Park Service et al. 2000, 2008). The following describes goals, objectives, monitoring metrics, and triggers that require management response. Supporting text with maps, and figures follows the management plan. This plan will be revised as needed to incorporate new information.

2.1 GOAL 1: MAINTAIN A SMALL CONSERVATION HERD OF BISON PERMANENTLY ON MCB CAMP PENDLETON

2.1.1 Objective 1: Monitor and Minimize Bison Impacts to Training

Metrics

- Game Warden staff will track bison disruptions of traffic and bison-vehicle-strikes, if they occur.
- The Range Control Office will document reports of training conflicts with bison and the Game Warden Office will track other wildlife conflicts that involve bison. Records of conflicts should include location, time, date, a brief description of the conflict, training time lost, and the action taken.
- The Game Warden Office will, as needed, summarize and review bison wildlife complaints recorded in the Code 12 database to monitor trends and patterns of disruptions.


CLEVELAND NATIONAL FOREST
SAN DIEGO COUNTY
Talega Road
San Mateo Creek
San Mateo Canyon Road
Delta Training Area
Case Springs Road
Echo Training Area
Yankee Impact Area
LFAM 800
Case Springs
Quebec Impact Area
Jardine Canyon
Whiskey Impact Area
409A Impact Area
San Mateo Road
Alpha One
Jardine Canyon Road
San Onofre Creek
Roblar Road
Finch Training Area
South Fork San Onofre Canyon
Zulu Impact Area
India Training Area
Horno Canyon Road
Las Pulgas Lake
Kilo One Training Area
Las Pulgas Road
Kilo Two Training Area
X-Ray Impact Area
El Camino Real
Santa Margarita River
Fallbrook Creek
Basilone Road
Las Flores Creek
Marine Corps Air Station Camp Pendleton
Stuart Mesa Road
PACIFIC OCEAN
ORANGE COUNTY
RIVERSIDE COUNTY
MCB Camp Pendleton
SAN DIEGO COUNTY
Legend
Number of Bison Sighted During Fall Aerial Surveys
2004
2008
2009
2012
Artillery Firing Area
High Hazard Impact Area
Non-dudded Impact Area
Training Area
Bison Migration Area
Whiskey Home Range
Zulu Home Range
MCB Camp Pendleton
Cantonment Area
Cleveland National Forest
Surface Water
Firing Line
Figure 1
Bison Sightings in the Vicinity of the Bison Migration Area
0 1 2 Miles
0 2 4 Kilometers
Source: MCB Camp Pendleton 2014b

Management responses

- Game Warden staff will respond to wildlife complaints of bison on ranges that are unavoidably interfering with training. Game Wardens will haze the animals to disperse them from training ranges.
- Regardless of herd size, if bison substantially impede training with recurring interruptions that are not effectively controlled by hazing, the Game Warden Office may decide to kill one or more bison to ensure the usability of training lands.

2.1.2 Objective 2: Limit the Size of the Bison Herd at 300–400 Animals

Metrics

- Game Warden staff will perform helicopter surveys every second year, as funding allows, to estimate the size of the bison herd and record the locations of bison. Surveys will perform a simple count of all bison seen on Base.
- Game Warden staff will record incidental observations and reports of bison when they are present in training areas outside the high hazard impact area including Echo, Finch and India Training Areas. Incidental records will include age class and sex information that may be used in describing bison herd demographics.

Management responses

- If the bison herd is estimated at less than 290 animals and the herd's impact to training is effectively minimized, allow the size of the herd to increase.
- If the size of the bison herd is estimated at between 290 and 350 individuals, Game Warden biologist will initiate contraception treatments to limit the growth of the bison herd.
- If the size of the bison herd is estimated at greater than 350 animals, Game Warden biologist will arrange to permanently remove bison from the herd using capture-relocation, sharpshooting, and/or sport hunting. The justification for limiting the average size of the bison herd at 350 animals is discussed in section 3.6.

2.2 GOAL 2: MANAGE A SUSTAINABLE AND ROBUST BISON HERD

2.2.1 Objective 1: Measure Cattle Gene Introgression

Metrics

- Game Warden biologist will collect tissue or blood from injured or dead bison and submit the samples to a lab for genetic testing, as funding is available.
- If additional genetic samples are needed, the Game Warden biologist may collect skin samples remotely from healthy animals and submit for genetic testing.

Management responses

- Game Warden staff will share the results of genetic testing with other organizations that manage bison or that may want to receive translocated bison from MCB Camp Pendleton.

2.2.2 Objective 2: Monitor for Diseases within the Bison Herd, Especially Bovine Tuberculosis, Brucellosis, and Malignant Catarrhal Fever

Metrics

- If practicable, the Game Warden biologist will perform a cursory examination of any dead or downed bison for obvious signs of reportable illnesses. The biologist will collect nasal swab and blood samples and submit the samples to San Diego County Veterinary Services or a California Animal Health Lab for disease screening, as funding for testing is available.

Management responses

- Game Warden biologist will disclose evidence of reportable diseases to San Diego County Veterinary Services within 24 hours.
- Game Warden will consult with veterinary professionals and San Diego County Veterinary Services to respond to serious diseases that are detected by routine monitoring.
- Biological or veterinary staff will vaccinate bison against disease during processing after capture in a corral or using chemical immobilization. Consult with a veterinarian that is experienced with bison for specific vaccination recommendations.
- Game Warden staff will euthanize individual bison that are suffering from untreatable injuries, such as a broken leg, or cannot be captured and are badly tangled in wire debris.

2.2.3 Objective 3: Limit Grazing Pressure of Bison within Grasslands by Controlling Herd Size

Metrics

- Game Warden biologist will conduct springtime forage production surveys within grasslands adjacent to the high hazard impact area to estimate averages for annual forage production. Calculate how much forage the bison herd will likely consume based on recent results of herd surveys.
- Game Warden Biologist will conduct residual dry matter (RDM) surveys in the fall to estimate the relative effects of bison grazing during the recent growing season and to monitor for signs of overgrazing.

Management responses

- Reduce herd size using measures listed within section 2.1.2 if estimated forage consumption for the bison herd will exceed the grazing allotment.
- Reduce herd size if results of RDM surveys indicate extensive areas of heavy grazing pressure in grasslands outside of the high hazard impact area.

3.0 HISTORY, ECOLOGY, AND IMPLICATIONS OF MAINTAINING A BISON HERD ON MCB CAMP PENDLETON

3.1 STATE OF THE BISON HERD AND BISON MANAGEMENT ON BASE

Between 1973 and 1979, 14 plains bison were gifted from the San Diego Zoo to MCB Camp Pendleton because the zoo did not have adequate space to keep the animals. Aerial survey results from fall 2011 estimate the number of bison on Base was approximately 120 animals. The bison herd is not intensively managed and it is one of only two bison conservation herds in California; the other herd is on Santa Catalina Island (Gates et al. 2010). Management of bison on Base includes: monitoring the herd's size, growth rate, sex composition, and age structure; hazing bison away from ranges that are actively firing and away from Basilone Road when traffic is heavy; euthanizing badly injured animals; and collecting samples for disease and genetic screening from dead animals.

3.2 REASONS THE UNITED STATES MARINE CORPS SHOULD CONTINUE TO PARTICIPATE IN BISON CONSERVATION

The conservation of plains bison, which is a species that historically occupied much of North America, requires a coordinated, nationwide effort to restore the ecological function of the species. Congressional legislation has proposed the bison as a national symbol for the United States (Los Angeles Times 2012), similar to the bald eagle. Although designating bison as the Nation's mammal would be entirely symbolic, that status signifies the collective responsibility of all Americans, especially stewards of federal lands, to support bison conservation.

The Sikes Act encourages military installations to cooperate with outside natural resource agencies. MCB Camp Pendleton is managed by a single organization and bison restrict their movements to Base, which simplifies coordination for management actions of the bison herd. It is reasonable for the Base to participate in bison conservation given that other federal agencies participate in the effort and bison on federally–owned land are a public resource. The Base, coincidentally, has ecological conditions that make it suitable for bison management including spacious grasslands with little fencing that are isolated from domestic cattle herds. Although natural resource conservation is not the Base's primary mission, the 40 year presence of a bison herd has been compatible with military training.

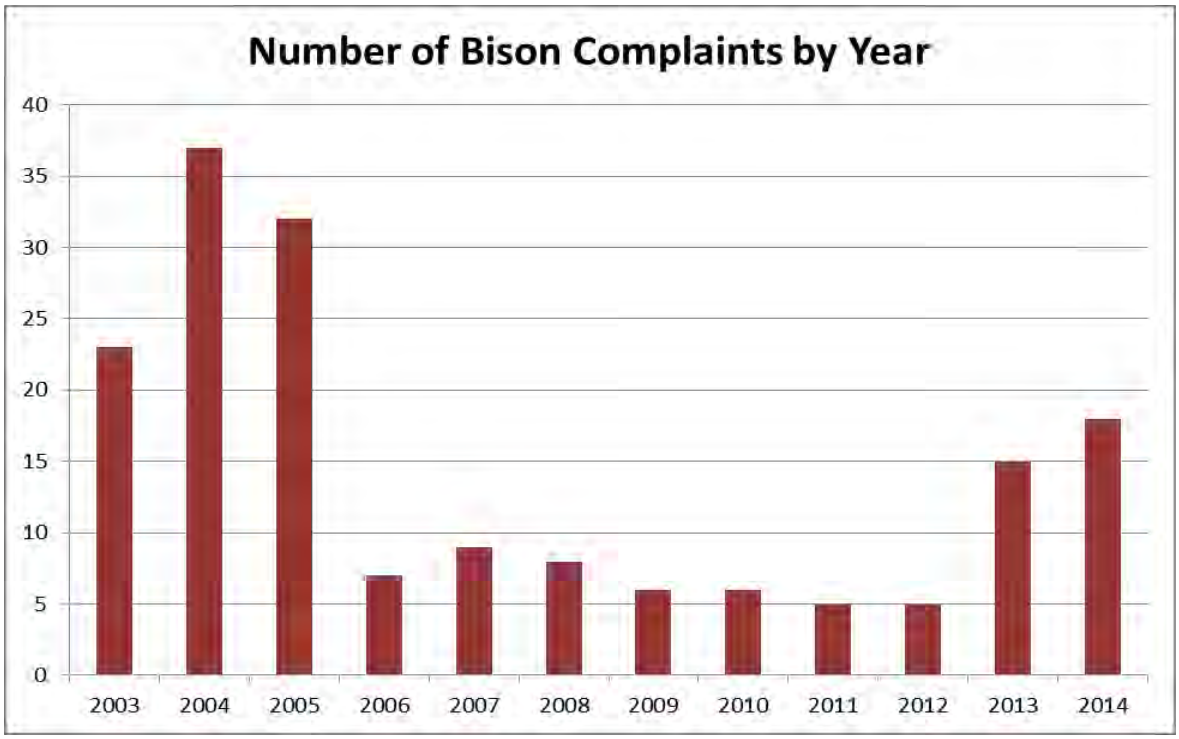
The bison herd provides substantial ecological value such as grazing within a grassland ecosystem that needs disturbance to thrive and remain ecologically robust. Bison have ably provided this service while producing, only, infrequent wildlife conflicts. Other sources of disturbance in grasslands include fire, mowing, or domestic grazing animals; each of those methods, however, brings substantial risk, cost, or limitations.

Eliminating the herd from Base would be expensive and may create unfavorable publicity for the USMC. The first animals removed, whether by capture or shooting, would likely be taken from Echo Training Area (TA) because that area is readily accessible and bison regularly use the area. As the herd size diminishes, the remaining animals may not reliably leave the high hazard impact area. Those animals would need to be shot from a helicopter until repeated surveys confirmed that no cows or calves remained. Contracted flight time would likely cost $500–$1,000 per hour.

3.3 A BISON HERD ON MCB CAMP PENDLETON IS COMPATIBLE WITH TRAINING

The main mission of MCB Camp Pendleton is to train Marines for combat. The presence of a bison herd on Base has not degraded that training mission for 40 years or during four major conflicts: wars in Vietnam, Persian Gulf, Iraq, and Afghanistan. Bison occasionally disrupt activities at firing ranges, however, a modification to range firing procedures in 2006 greatly reduced the number and type of bison complaint calls received at the Game Wardens Office, Figure 2. The modification allowed Marines to adjust and restrict their direction of fire to a portion of a range if bison were present elsewhere on the range. Formerly, bison had to be completely absent from a range before trainers could begin firing, which required Game Wardens and Explosive Ordnance Disposal personnel to visit firing ranges and move bison away from ranges by hazing. Hazing includes using loud noises (pyrotechnics or air horns) to frighten bison away from firing ranges. As a subset of all bison complaints between 2003 and 2006, the ranges 218A, 407, and 407A reported the most bison conflicts with 11, 20, and 14 total complaints, respectively.

Figure 2. Frequency of Bison Complaints Received by the Base Game Warden Office, 2003-2014



Bison prefer to roam in the high hazard impact area, despite the regular use of powerful munitions, because it has spacious grasslands and water available. Some may consider military bombing ranges as not suitable for wildlife use given the frequent use of live aerial bombs or artillery and mortar rounds. The counterintuitive reality is that areas that are too dangerous for humans to occupy can provide substantial conservation value for wildlife and their habitats (The Economist 2010). Other areas with restricted human access that provide conservation value include the demilitarized zone between North and South Korea, areas surrounding the defunct Chernobyl nuclear site in Ukraine, and Rocky Flats National Wildlife Refuge. Prior to being closed to hunting in 1980, the high hazard impact area were popular with

mule deer hunters on Base as it has thriving shrublands and oak savannah habitats that mule deer preferred. The high hazard impact area includes Quebec, Whiskey, and Zulu impact areas, which provide value as a refuge for mule deer and bison on Base. The net value of the high hazard impact area as a refuge for bison is clearly positive, but risks of injury and mortality are ever-present. For example, Marine pilots flying over Zulu Impact Area on 19 September 2012 discovered six bison that were killed, incidentally, by military ordnance such as mortar or artillery. This is the only known record of bison being directly killed by military ordnance on Base. Historic records from the Base show that bison have been occasionally injured after becoming entangled in discarded communication wire or concertina wire.

3.4 RISK OF BISON ROADKILL ACCIDENTS

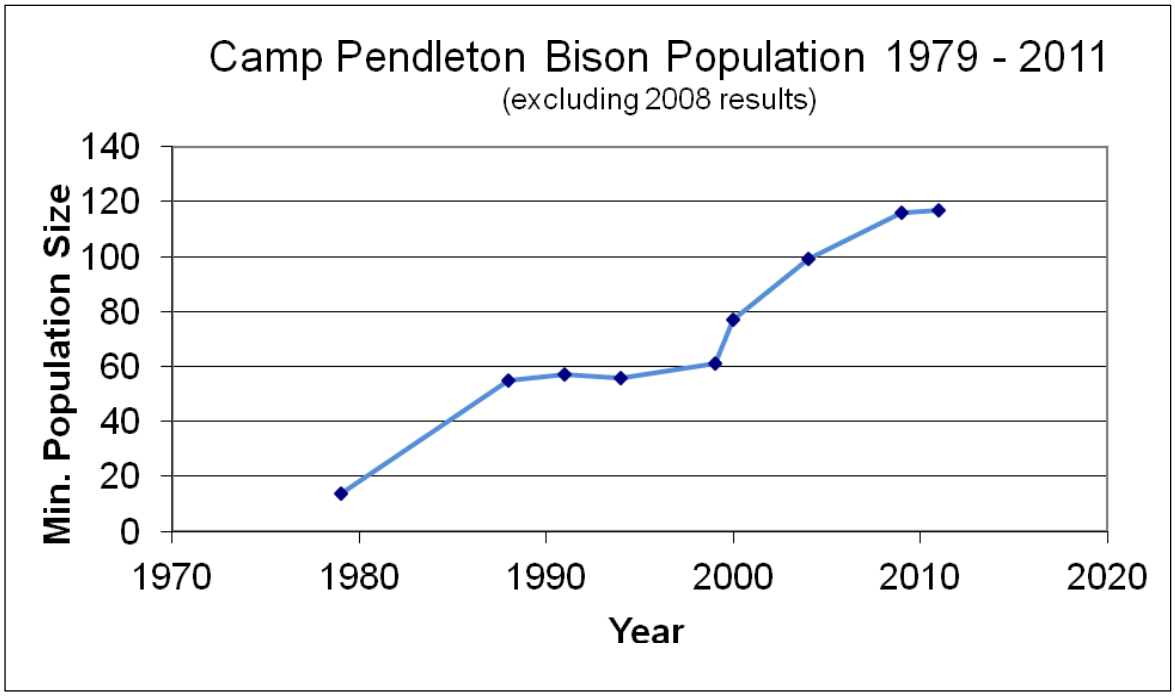
Vehicles have collided with bison 6 times on Base. All of those collisions occurred on Basilone Road, which is a paved, major road located along the southern edge of the high hazard impact area. The known occurrences of bison-vehicle-collision (BVC) follow: 1 in 1985, 2 in 1991, 1 in 1992, 1 in 1993, and 1 in 2012. Since the first recorded BVC, the estimated number of bison on Base increased from approximately 50 animals to approximately 120 animals in 2011. The number of bison-vehicle collisions did not increase as the herd size increased. The absence of bison on Base would, of course, eliminate bison-vehicle collisions; otherwise, the risk of a BVC is not related linearly or primarily to the number of bison on Base. Bison behavior such as moving among foraging or watering areas separated by a busy road are important factors affecting the frequency of a BVC (Bruggeman et al. 2007). Therefore, if habitat conditions within the high hazard impact area changed and bison began moving more frequently across roads, the chance of a BVC would increase. Game Warden staff respond to complaints of bison on Basilone Road that are a hazard to traffic. Game Wardens haze the bison away from the road and control traffic to reduce the risk of a BVC when bison are attempting to cross.

3.5 POPULATION SIZE AND GROWTH OF THE BISON HERD

The number of bison on Base and the rate of population increase were estimated using records of ground observations from Case Springs and results of aerial bison surveys, Figure 3. Tallies resulting from each method provided a minimum number of bison on Base at the time. Undercounting was more likely with ground surveys because the high hazard impact area could not be surveyed and it's likely that groups of bison were not detected. Aerial surveys greatly reduce the chance of not detecting groups of bison but lone animals are harder to see and could still go undetected. The best population estimate to date was provided by the 2011 aerial survey, which was performed on a single day and counted only bison. Aerial surveys from other years were multi-day surveys designed to estimate deer density rather than count bison. Counting bison over multiple days increases the risk of double counting animals as bison groups move, mingle, and disperse during the survey period. The aerial survey count from 2008 of approximately 150 bison was most likely an overestimate due to double counting.

Using the results of ground and aerial surveys for bison, the Base's bison population grows at an estimated average rate of 6.3% annually and has a doubling time of 11 years. Using the 2011 estimate of 120 bison and a growth rate of 6.3%, the Base's bison herd could reach 290 animals by 2025 and then 350 animals by 2028. These are deterministic estimates, which may not reliably predict the actual increase for the bison herd (whose growth is stochastic) in years well beyond 2011.

Figure 3. Bison Population Size Estimated From Ground and Aerial Surveys



3.6 LIMIT BISON HERD AT 300–400 ANIMALS

The most important considerations for identifying a sustainable size for the Base's bison herd were (1) conservation value of the bison herd as related to its size, (2) the amount of grazing forage allotted for bison, and (3) how the herd size may disrupt training. The International Union for Conservation of Nature (IUCN) report (Gates et al. 2010) stated that bison herds of greater than 1,000 animals have the best ability to conserve genetic diversity and should not need to receive breeding animals from other herds to supplement genetic diversity. A bison herd of this size on the Base would exceed the bison grazing allotment and would likely cause more frequent training disruptions. Most bison conservation herds in North America have fewer than 1,000 animals. Plains bison are not native to southern California grassland ecosystems and the Base's primary mission is training Marines rather than conservation. Therefore, MCB Camp Pendleton should not be expected to support the labor and costs of maintaining a large conservation herd. The Base should instead seek to maintain the largest bison herd that is feasible and sustainable.

It is not known how many bison the Base could support without causing intolerable impacts to training. Historic records of bison conflicts are likely not very useful for predicting the future impacts of a larger bison herd because the relationship is not known and likely not linear. Just as the rate of bison-vehicle-collisions is not a linear result of the herd's size, bison conflicts with training will not be directly proportional to the herd's size. Instead, bison movement patterns due to changes in forage or water availability are more likely to change the frequency and location of impacts to training.

Without artificial control, the bison herd would likely grow from 290 to 350 in three years. When the herd reaches that size, assuming an annual growth rate of 6.3%, 19–22 bison would have to be removed (i.e., killed or relocated) from the bison herd each year, or that many reproductively–mature females would

need contraception. As detailed in the next section, Base biologists estimate that grasslands available to the bison herd could sustainably provide forage to 300–400 bison without reducing the ecological services provided by those grasslands.

Animals should be selected for removal to achieve a slightly female-biased herd and removals should as recommended by the IUCN (Gates et al. 2010). The proportion of females estimated after the 2011 bison survey was 62%, which should be reduced to 50–60%. If sick or injured animals are not available for removal, younger animals would be preferred for removal. Selecting younger animals for removal promotes the conservation of genetic diversity within the herd as diversity is not actually lost until a mature animal is removed from the breeding population (Gates et al. 2010).

3.7 GRAZING FORAGE ALLOTMENT FOR BISON

An ecologically sustainable size for the bison herd is one that does not require supplemental feeding and will not overgraze the available grasslands. The grazing allotment for bison is the total amount of vegetation that bison will be allowed to consume annually. Calculation of the allotment begins by estimating the average amount of grazing forage (pounds [lbs]/acre, dry weight) produced within grasslands that bison use. The estimate is then reduced by 1,400 lbs/acre to conserve plant biomass in the grasslands. The final adjustment of the grazing allotment occurs when weights are deducted for plant species that are not useful as grazing forage. Un-grazed biomass will support ecological functions that are performed by the native species within the Base's grassland ecosystem. Native consumers and decomposers including insects, birds, small mammals, fungi, and soil microbes will process living and dead plant material into simpler forms, which contributes to nutrient cycling and encourages a robust ecological network. Conserving plant biomass within grasslands also promotes the non-living benefits of thatch and leaf litter, which includes moderating soil and water transport.

Forage production surveys performed on Base in 2011 and 2012 concur with forage productivity estimates provided by the Natural Resources Conservation Service (NRCS) through the Soil Data Mart (Soil Data Mart 2007). The NRCS estimates range from 1,200 to 3,000 lbs/acre in unfavorable and favorable production years, respectively, for soil types occurring on Base. Estimates of annual forage production were 2,761 lbs/acre (SD = 935) in 2011 and 2,201 lbs/acre (SD = 521) in 2012 (Asmus 2012a). By estimating the area of grasslands likely to be grazed as 13,212 ac and calculating 1,400 lbs/acre for forage allowed, the bison grazing allotment for 2012 was approximately 10.6 million lbs of forage. The estimated number of bison on Base was 120 in fall 2011. That many animals would consume approximately 1.7 million lbs of forage each year, which was approximately 16.3% of the grazing allotment. The 95% confidence interval ranging from 6.0 to 15.2 million pounds of available forage for 2012 indicated that the bison herd may have consumed as little as 11.4% or as much as 29.0% of the available forage. Therefore, the bison herd could triple in size without exceeding the grazing allotment. Preventing the bison herd from exceeding the grazing allotment is a primary reason to limit herd size to approximately 350 animals.

RDM surveys measure the effect of grazing on grasslands. The Base performs RDM surveys during the fall prior to the start of the next growing season; survey methods are described in Asmus 2011. The surveys estimated the amount of plant biomass remaining un-grazed at the end of a growing season. Results of RDM surveys showed light grazing pressure in Finch and Echo Training Areas from 2010–2012. Each area had greater than 650 lbs/acre of plant biomass remaining at the end of each growing season, which is sufficient to support ecosystem processes in grasslands and conserve soil (Bartolome et al. 2002).

During the Rancho Period in the 1800s, grasslands on Base were grazed heavily by domestic cattle, which produce more concentrated disturbance because they do not roam as much as bison. Domestic grazers during that period also included sheep and horses. To compare historic grazing intensities from domestic animals to that of bison, an animal unit (AU), here, is the number of acres of forage needed to support one cow or one bison. Based on historic records and previous analysis, Minnich (2008) showed that 9 acres of forage were allotted per animal unit of all grazers (including 13 acre per AU of cattle) at Rancho Santa Margarita during that period. Bison grazing pressure is currently much less, and approximately 38 acres of forage would be allotted per animal if the size of the bison herd on Base increased to 350 animals.

3.8 ECOLOGICAL EFFECTS OF BISON GRAZING IN MCB CAMP PENDLETON GRASSLANDS

In general, grassland ecosystems co-evolved with hoofed herbivores and need the disturbance provided by those animals to maintain their ecological integrity. In prehistoric times, prior to 10,000 years ago, grassland communities in California, including those on Base, were inhabited by many grazing animals that have since gone extinct. Those large grazers included mammoths, horses, camels, antique bison (*B. antiquus*), and wild oxen. In prehistoric times and recently, California grassland communities benefitted from the activities of grazing animals which included trampling that discouraged shrub encroachment; grazing of thatch that encouraged basal sprouting from established perennial grasses and germination of native grass seeds between existing bunchgrasses; and recycling of nutrients onsite that otherwise may have been lost to wind erosion, especially in semi-arid areas. The various effects of grazing combined with effects from fire provide a diversity of disturbances within grasslands that promote structural heterogeneity within the vegetation community, which in turn provides heterogeneous habitats for wildlife (Edwards 1992).

Plains bison did not co-evolve recently with the endemic species inhabiting grasslands of MCB Camp Pendleton, but they can perform ecological functions that similar to those that were previously performed by species such as pronghorn and grizzly bears, which were extirpated from Base lands. Pronghorn formerly roamed grasslands on Base where they grazed forbs, browsed shrubs, and, to a lesser extent, ate grasses. In contrast to bison that graze mostly on grasses, pronghorn consume mostly forbs while feeding in grasslands. Grazing by either species contributes to nutrient cycling, promotes new growth in grazed plants, and their hooves turn over grassland soils, which promotes aeration and water infiltration. Bison are free roaming on Base. They wander more than cattle, which disperses the effects of their low-intensity grazing. Grizzly bears formerly roamed throughout California's grasslands, including MCB Camp Pendleton. They served as ecological engineers by turning over the soil as they foraged for ground squirrels and plant roots, which created bare patches of soil that allowed new plant growth. Although it's not known how often grizzlies did this in MCB Camp Pendleton grasslands, bison may mimic this type of disturbance when they create bare patches of soil at their dust wallows.

California grasslands evolved with fire and grazing as sources of disturbance, which work differently but provide complementary effects. Modest grazing pressure affects grasslands by maintaining the litter layer, encouraging vigorous re-growth from grazed plants, and reducing soil lost to erosion. In contrast, fire scarifies seed coats, quickly releases nutrients, and promotes soil warming, all of which greatly increases seedling production. Excessive fire and over-grazing, however, can harm grasslands by promoting the growth of non-native plants and greatly increasing erosion. Fire is an important source of disturbance in California grasslands, although the frequency of fire in MCB Camp Pendleton grasslands is likely higher than historic rates of occurrence (Harrison et al. 2003, Marty et al. 2005, Vermeire et al. 2005)

Although bison are not native to either Santa Catalina Island or MCB Camp Pendleton, the ecological effects of their activities are less likely to provide benefits in the ecosystems on the small, coastal island. In contrast, grasslands on the nearby mainland, including MCB Camp Pendleton, supported pronghorn and grizzly bears that were extirpated during the 1800s and 1900s. Catalina did not host those animals, so bison do not offer replacement value for many lost ecological functions in the island's ecosystems.

MCB Camp Pendleton grasslands are substantially different from those on Catalina Island, as well as being more extensive and ecologically robust. An ecological report of bison and grazing lands on Catalina Island listed the dominant plant species that produced forage within sampled sites. The list did not include any native plants such as purple needlegrass, which is major species of native grass in coastal California grasslands. Although it occurs on Catalina Island it did not rank as a primary forage producer by comprising at least 5% of measured forage species (Sweitzer et al 2003). Whereas, MCB Camp Pendleton grasslands purple needlegrass provides greater than 5% of forage, and at some sites it is the dominant forage species (Asmus 2012).

Bison carcasses provide a food source for many animals that scavenge or supplement their diet with carrion. Common animals such turkey vultures may benefit from bison carrion along with rarer animals including badgers and golden eagles. California condors do not presently occur on MCB Camp Pendleton, but they did historically, and condors from reintroduced populations elsewhere in California could eventually find their way to the Base. California condors prefer to feed on large animal carcasses. Serving as a source of large animal carcasses for scavengers is another ecological role that bison can provide on behalf of native animals that were extirpated from the Base.

Examples of animals that may benefit directly from bison grazing include Stephen's Kangaroo Rat, side-blotched lizards, and ground squirrels (Fehmi et al. 2005). SKR require sparse coastal sage scrub and grassland habitats. These habitats can be maintained by modest levels of bison grazing; although very heavy, concentrated grazing pressure from ungulates, such as horses confined in corrals, can harm SKR habitat (United States Fish and Wildlife Service [USFWS] 1997). Burrowing owls may benefit directly and indirectly from bison grazing because they require short vegetation and open space in grasslands and they nest in burrows created by ground squirrels. The management plan for burrowing owls on Lower Otay Mesa in San Diego County states the benefits of grazing for burrowing owl habitat (Wildlife Research Institute 2005). The American badger may benefit indirectly as bison grazing promotes ground squirrel populations and directly by scavenging on bison carrion.

Thread-leaved brodiaea, California gnatcatcher, Riverside fairy shrimp, and San Diego fairy shrimp are other federally listed species on Base that occur or may occur within the bison home range. Effects to these species from bison grazing, if they are occur, are likely beneficial, discountable, or insignificant. For example, the USFWS stated that domestic grazing is not a range–wide threat to the continued existence of thread-leaved brodiaea. Bison may infrequently trample or eat Brodiaea. The below-ground bulbs, however, are not affected, and bison grazing may reduce competition from non-native grasses, which pose a substantial threat to brodiaea (USFWS 2009).

Bison may support some ecological invaders that are not desirable within the Base's native grasslands including invasive plants and brown-headed cowbirds. Bison translocate viable native and non-native seeds in their fur and dung (Rosas et al. 2008). Researchers from University of California Davis noted that bison hair is a significant mechanism for spreading non-native seeds on Santa Catalina Island based on the prevalence of non-native seeds recovered from their hair clumps. They also reported that non-native grasses and forbs dominated the vegetation plots that were sampled in grasslands on the island

(Sweitzer et al. 2003). Therefore, it follows that non-native plant species would dominate the types of seeds found in bison fur collected on Catalina Island.

3.9 VALUE OF A SMALL CONSERVATION HERD ON CAMP PENDLETON

Small conservation herds of bison on Base could help retain the ecological and genetic characteristics of the species (Gates et al. 2010). Although bison are not native to southern California, the MCB Camp Pendleton herd can provide value to the larger bison recovery effort that spans many states within the historic range of plains bison by serving as a source-herd for relocation and establishing new conservation herds within the bison's original range.

It is beneficial to have an isolated, *Brucella*-free bison herd located on MCB Camp Pendleton. Brucellosis is a disease caused by *Brucella* bacteria and is transmissible among wild animals, domestic animals, and humans. Transmission of brucellosis from free-roaming bison to nearby cattle herds is an important concern for bison managers working in states such as Wyoming and Montana (National Park Service et al. 2000). The limited testing performed on MCB Camp Pendleton bison did not find any evidence of brucellosis. Rugged topography and dense chaparral along the north and east boundaries of the Base restrict bison movements to grasslands on the Base (biologists once found bison dung on a firebreak within Cleveland National Forest land immediately adjacent to MCB Camp Pendleton, although there is no evidence that bison have escaped or regularly wander far from Base). Additionally, bison on Base are very unlikely to encounter cattle, given that the closest cattle are animals grazed at Naval Weapons Station Fallbrook, bison do not use lands within 3 miles of the Base boundary adjacent to Naval Weapons Station Fallbrook, and chain-link fence separates the two installations. Bison have never entered NWS Fallbrook. Isolation protects the MCB Camp Pendleton bison herd from other diseases that may be transmitted between cattle and bison.

If a major disease event occurred that affected cattle and bison in the plains states, it would be very beneficial to have an isolated, disease-free herd on Base. For an analogous example, conservation efforts to rescue the American chestnut from the devastation of chestnut blight have benefitted greatly from disease free trees living in areas outside of the tree's native range (Freinkel 2007). Isolation from disease and cattle herds, substantial genetic diversity, and relatively low cattle gene introgression make the Base's bison herd a good source herd that could provide animals to other bison herds.

4.0 METHODS FOR MANAGING THE BISON HERD

4.1 MARKING OF BISON

If a corral and capture pens are available, marking every bison captured with an ear tag would better enable for bison managers to perform management tasks with the bison herd such as monitor reproduction, estimate survival, issue contraception, immunize animals for disease, test for disease, and collect DNA. Biologists could also use additional tools such as GPS radio collars or vaginal transmitter implants to monitor movement patterns or timing of births.

Without a capture facility, bison can be remotely marked with oil–based paint applied using a paintball gun. Paint marking is temporary and would be lost the next time an animal shed its fur, which happens twice annually. Temporary marking limits the use or effectiveness of tasks such as issuing contraception, DNA collection, estimating herd size, estimating survival, and tracking movement patterns.

4.2 BISON DNA COLLECTION AND GENETIC MONITORING

If bison were captured in a corral and pen facility, DNA would be routinely collected the first time an animal was captured. A portion of the tissue collected would be tested initially for the presence of cattle genes, and the remaining tissue samples would be saved for future analysis.

Without a corral facility, DNA could be collected remotely from bison using a DNA dart where the dart is fired from a dart gun and collects a plug of tissue from a bison before ejecting and falling to the ground. The first round of remote DNA collection requires that only adult animals were sampled and that they were simultaneously marked with paintballs so that they were not sampled twice. After the paint marks wore off of the first animals sampled, new individuals could still be reliably sampled if biologists targeted only yearlings and successfully paint-marked each new animal sampled. Results from the DNA analysis of animals without permanent, unique marks would limit inferences to the herd rather than individuals.

Bison on Base have genetic diversity that may not be well represented in other herds, although, genetic testing has confirmed domestic cattle genes in bison on Base. Genetic screening used the most sensitive test for detecting cattle introgression, which measured single nucleotide polymorphisms at over 54,000 locations (SNP50) on bison chromosomes. Limited testing of the MCB Camp Pendleton bison herd (8% as of 2012) indicated that animals within the herd had a mean diploid rate of cattle gene introgression of 0.5% (SD 0.17%, n=10). This level is low within the range (0.5–1.0%) that is typical for bison herds in the US that have been tested using SNP50 (Asmus 2012b). Bison managers and researchers presume that cattle genes may reduce the ability of wild bison to survive or reproduce, e.g. lack of winter hardiness or reduced ability to survive on poor forage. The Base will consider supplementing a small number of bison to its herd if future genetic analyses indicate that the herd lacks sufficient genetic diversity to remain viable.

4.3 DISEASE MONITORING VACCINATION OF BISON

The IUCN bison conservation guidelines (Gates et al. 2010) list nine diseases that are important for bison conservation: Anaplasmosis, anthrax, bluetongue, bovine spongiform encephalopathy, bovine brucellosis, bovine tuberculosis, bovine viral diarrhea, Johne's disease, and malignant catarrhal fever. The California Department of Food and Agriculture (CDFA 2011) provides a list of animal diseases that are legally reportable per Sec 9101 of the California Food and Agricultural Code and Title 9 Code of Federal Regulations Section 161.3(f). Base biological staff will consult with veterinarians and CDFA employees to determine which diseases should be screened based on the level of bison management actions such as capture and relocation versus basic disease monitoring of sick and injured bison. A higher level of disease screening is possible if bison are captured in a corral facility. Opportunities for disease screening are fewer if testing is only performed on downed animals when they are conveniently available.

A 1997 summary written by a Base veterinarian stated that "a number of samples" were collected from multiple bison including blood and fecal samples. All samples tested negative for either brucellosis or internal parasites (Geertsema 1997). Ten bison were culled in 2008 for testing that included disease screening. Nine bison were screened for heavy metals and all tested negative for lead poisoning. Two animals were screened for infectious disease. Both tested negative for the following: Bovine herpesvirus-1, bovine viral diarrhea, and parainfluenza virus 3. Tests for five types of *Leptospira* bacteria in those two animals were all reported as contaminated (Derr 2011). Leptospira has over 180 forms and infects many wild animals without causing the clinical disease, leptospirosis. Leptospira is not a concern for wildlife management, except for minimizing the transmission of the bacteria to domestic animals or humans.

Future disease screening for bison on Base will be performed conveniently as bison are captured for relocation, euthanized, or harvested by a hunter. If a corral facility was available, dozens of bison could be captured and screened for disease and vaccinated by hand prior to release or relocation. Otherwise, substantially fewer would be screened if remote delivery was used for contraception or animals were killed within the high hazard impact area.

4.4 IMPLICATIONS FOR NOT ACTIVELY MANAGING THE BISON HERD ON MCB CAMP PENDLETON

Some biologists discourage actively managing a bison herd, which they define as regularly capturing, handling, moving animals among grazing areas. These activities may habituate bison to human activity and make them less wild. Managers may also select animals for culling that are difficult to handle, thereby altering the wild genetic composition of the herd. Some suggest handling bison infrequently or preferably not at all (Gates et al. 2010).

If a bison corral facility was not built on Base, handling bison would be greatly limited. Chemical immobilization (CI) would be the only practical method of capture. Researchers and veterinarians have documented successful drug combinations and precautions that should be used when chemically immobilizing bison (Kock and Berger 1987, Roffe and Sweeney 2002) to prevent overheating, hypoxemia, and regurgitating rumen contents in anesthetized bison. Dr. Winston Vickers has worked with the bison herd on Catalina Island and, after reviewing Kock and Berger 1987, and Roffe and Sweeney 2002, he agrees that CI may be safely used for bison on MCB Camp Pendleton (personal communication). The warm climate of southern California limits the seasons when CI should be used with bison on Base to avoid overheating. The risks of using CI with bison should be carefully weighed against the benefits; of course, this is also true for capturing bison in a corral, which can injure animals even when done properly. For example, CI would be justified for placing a tracking collar on an animal but may not be justified for simply installing an ear tag. If a bison died due to CI its carcass could not be left in place to decompose because its tissues would be toxic to scavenging animals.

If bison on Base could not be captured in a corral or with CI, some management methods would be impractical or unusable. Without permanent individual marks, vaccination for contraception or disease would not be reliable. Radio collars would not be used, which means the timing and movements of bison could only be inferred through chance encounters and, infrequently, aerial surveys. Bison could not be donated to other herds. Conversely, however, if bison were not captured, the Base's bison management program would be concurring with the IUCN bison conservation guidelines which discouraged actively managing wild bison herds (Gates et al. 2010).

4.5 GROUND BASED BISON SURVEYS

Ground based surveys of the bison herd may provide useful estimates of sex ratio and age ratio for the bison herd. Those ratios are difficult to accurately estimate during aerial surveys especially for young animals and large groups of bison. Bias would be inherent with ground based surveys as some animals would not reliably leave the impact areas and be visible during a survey. Animals may be occasionally surveyed within Zulu from SIAC, along Jardine Canyon, or within Whiskey from OP-W, or within Quebec from NIAC.

4.6 METHODS FOR LIMITING AND REDUCING THE SIZE OF THE BISON HERD

Limiting the size of the bison herd may be achieved through contraception, hunting, sharpshooting, and/or capture-relocation. The Base should maintain the ability to use any or all of these methods (and future technologies) to preserve management flexibility for the bison herd. Factors including available funding, training conflicts, space restrictions, and bison behavior may limit the usefulness of each of the methods listed above. Therefore, the Base should retain all practicable options for managing the size of its bison herd.

A corral facility, temporary or permanent, would provide the best conditions for base biologists to capture bison for relocation, administer vaccines, collect genetic samples, and install permanent marks. Dozens of animals can be guided or lured to a corral for capture, which allows managers and biologists to work on many animals quickly. Contracted bison workers may be hired to install a temporary corral, round-up bison for capture, transport selected bison for relocation, and disassemble the corral. Bison captured in a corral can walk through chutes and be loaded on cattle trucks.

A chemically immobilized bison is not practical to move or relocate. For the animal's safety, CI may be limited to only a few months each year due to the warm climate of southern California. If a bison died during CI, the carcass would be difficult dispose of, but could not be left in place because it would be a toxic hazard for wildlife. Compared to bison captured in a corral, most of the same procedures can be performed on a bison captured with CI. CI could be used to supplement the number of animals removed each year by hunting or sharpshooting, but it is not preferred due to difficulty in safely moving an immobilized bison.

Capture and relocation would be expensive, but it would also best employ the conservation value of the Base's bison herd. Capturing dozens of bison in a corral could be performed every few years for herd control to reduce the cost of each animal captured. Chemical contraception could be reliably administered to permanently marked animals and better enable supplemental dosing using a dart gun for remote delivery. The Base may get favorable publicity each time bison were relocated. If corralling were not effective or available, the Base should use a combination of hunting, sharpshooting, and contraception (remotely or using CI) to reduce and limit the size of the bison herd. A temporary corral may be installed and used by a private contractor experienced with bison capture and handling. A site for a temporary or permanent corral has not been specified or approved on Base, but Echo TA is most practicable. Captured animals would be processed (e.g., vaccinated) prior to release or transfer to a site off Base. Bison could be sold or donated to private or public organizations for purposes ranging from augmenting bison conservation herds to being slaughtered for meat production. Preference will be given to organizations that pay for the capture and relocation of bison from Base and that intend to use bison for conservation.

In contrast to corralling animals or using CI, allowing hunters or a sharpshooter to kill bison would be much less expensive; in fact, hunting fees would off-set some of the cost of managing a bison hunting program. Public opinion may not favor shooting bison, except for advocates of hunting. Sharpshooting could be used with minimal coordination and logistical planning. Animals killed by a sharpshooter would be left to decompose in place as a resource for wild scavengers. Using non-lead ammunition would not expose wildlife to lead-contaminated carcasses. Bison killed by hunters or sharpshooters would provide samples for genetic and disease screening. Shooting bison could be effectively used all months of the year and would not risk being expensive and ineffective, which are risks with corralling and CI.

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Appendix K

Estuarine and Beach Ecosystem Conservation Plan

APPENDIX K
ESTUARINE AND BEACH ECOSYSTEM CONSERVATION PLAN

During 1994 Camp Pendleton entered into formal consultation under Section 7 of the ESA for ongoing and planned training activities, infrastructure maintenance activities, several construction projects and a Riparian and Estuarine Ecosystem Conservation Plan. On 30 October 1995 the USFWS issued a BO (1-6-95-F-02) covering those actions. This appendix contains the Estuarine and Beach Ecosystem Conservation Plan portion of those actions. Terms and conditions of the BO covering this plan and the Riparian Ecosystem Plan are contained in Appendix M.

The primary purpose of the Estuarine and Beach Ecosystem Conservation Plan is to manage fish and wildlife resources in the estuarine and beach areas of Camp Pendleton. This plan is "programmatic" in the sense that it addresses long-term requirements of the estuarine and beach resources in a comprehensive, "programmatic" fashion. This conservation plan is programmatic in its strategy: habitat management actions will be planned and evaluated in the context of achieving and maintaining a "healthy ecosystem" for sensitive species. It is the intention to apply this programmatic approach to all ongoing and future actions at Camp Pendleton, as they potentially affect the integrity of estuarine and beach ecosystems.

The mission of MCB Camp Pendleton is to operate an amphibious training base, while protecting the environment and providing facilities, services, and support to prepare Marines and Sailors for combat. Camp Pendleton's 125,000 acres (approximately 200 square miles) of ocean front beach, coastal plains and terraces, hills, mountains and stream valleys, with the Base's associated restricted airspace, offer a unique combination of natural resources that assure well-prepared national security forces.

Camp Pendleton's military mission is combat training and support of Marine Corps units and other DoD forces. Training activities include, but are not limited to: amphibious landings, fixed and rotary-winged aircraft flights and landings, tracked/wheeled vehicle and personnel maneuvers, artillery and small arms firing, aerial weapons delivery, engineer unit operations, organization of supply, field combat service support, employment of communications, airlifting of troops and weapons, equipment maintenance, and field medical treatment.

Camp Pendleton's training and combat service support functions share the use of Base lands with several non-military functions. Such uses include: a Department of Justice border patrol checkpoint, a California State Parks and Recreation campground and beach, the SONGS, agriculture and grazing outleases, and public schools. These functions are important uses of Camp Pendleton's land, and they require additional land management attention to assure the Base meets its primary commitments to the military mission and conservation.

The Base manages access to sensitive wildlife habitat and acknowledges the importance of this practice as a necessary precaution to preserve wildlife corridors and vital habitat for listed species and to enable the Base's mission to co-exist with sensitive wildlife communities.

1. ECOSYSTEM CONSERVATION MANAGEMENT

1.1. Overview

DoD has embraced "ecosystem management" as its tool for conserving natural resources. In a memorandum of 8 August 1994, concerning implementation of ecosystem management in the DoD, the Deputy Under Secretary of Defense (Environmental Security) promulgated the following policy statements:

> Ecosystem Management is the basis for future management of DoD lands and waters. It will blend multiple-use needs and provide a consistent framework for managing DoD installations, ensuring the integrity of ecosystems.
>
> Ecosystem management is a goal-driven approach to environmental management at a scale compatible with natural processes, recognizes social and economic viability within functioning ecosystems, and is realized through effective partnerships among private and government agencies.
>
> 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 that people and their social and economic needs are an integral part of the whole.
>
> In applying the principles and guidelines for DoD ecosystem management, military installations will:
>
> - Develop a vision of ecosystem health. Existing natural resource, social, and economic conditions should be factored into the vision;
> - Develop coordinated approaches to work toward ecosystem health. Since ecosystems rarely coincide with ownership and political boundaries, cooperation across ownerships is an important component of ecosystem-based management;
> - Maintain and improve the sustainability and native biological diversity of ecosystems;
> - Support sustainable human activities. People and their social, economic, and security needs are an integral part of ecological systems, and management of ecosystems depends upon sensitivity to these issues;
> - Use benchmarks to monitor and evaluate outcomes and establish milestones to ensure accountability.

Camp Pendleton's conservation program starts with recognition of its military mission. In fact, the Estuarine and Beach Ecosystem Conservation Plan assumes that only through continuance of that mission will the objectives of the plans be accomplished.

The conservation program also proceeds with recognition of the following biological principles: 1) ecosystems are dynamic by nature; 2) the functioning of ecosystem components operate at

different rates; 3) all components are interrelated; 4) the ecosystem is a complex, dynamic system functioning as a whole, not as a collection of parts; and 5) ecosystem integrity may be disrupted by excessive "interference" of any single component.

The Base uses these guidelines in establishing programmatic instructions for military training, facility and range maintenance, recreation, and new project planning. This approach is used to develop prudent and reasonable alternatives, which seek to avoid and minimize impacts to species and their habitats and maintain ecosystem integrity.

The Base Estuarine and Beach Ecosystem Conservation Plan was developed to maintain and improve the sustainability and native biological diversity of the estuarine and beach ecosystems, while supporting Camp Pendleton's mission of training Marines. Camp Pendleton intends that this program provide a comprehensive framework for assuring the consistent management of the Camp Pendleton estuarine and beach ecosystems.

The thrust of the Estuarine and Beach Ecosystem Conservation Plan is to manage habitat on an ecosystem basis. Benchmarks have been established to monitor and evaluate the integrity and functioning of the ecosystems aboard Camp Pendleton. Specific habitat and species goals were established in consultation with the USFWS and aim at contributing to threatened and endangered species recovery. Based on periodic assessments, the program calls for management objectives and strategies to be modified to meet changing circumstances and requirements.

The program depends on the development of formal and informal partnerships among private and government agencies to achieve its goals. It is based on the assumption that without such partnering the integrity of the ecosystems cannot be maintained. The plan further assumes that successful partnering will not happen without each party respecting the legitimate needs of the other.

1.2. Integration with Regional Conservation Planning

The Camp Pendleton conservation program depends on its integration with regional conservation planning efforts. The Base acknowledges the USFWS's broader role in the regional planning process and expects the USFWS to be its advocate in this arena. Camp Pendleton assumes that the USFWS will view the Base's ecosystems in an ecoregion context, setting appropriate goals for the subareas thereof. This means that the responsibility for conservation of wildlife in the southern California coastal ecoregion does not fall solely on Camp Pendleton. Camp Pendleton expects that the USFWS, in its oversight and wildlife advocacy role in the region conservation planning process, will promote the distribution of information and consistent application of Section 7 and Section 10 procedures to foster species recovery throughout the ecoregion.

1.3. Management Activity Funding

The Estuarine and Beach Ecosystem Conservation Plan is premised on the understanding that funding and achievement of the plan's goals are interrelated with assuring and enhancing the ongoing maintenance and flexibility of the Base's military mission. Funding for management activities aimed at the conservation of the Base's ecosystems derive from 1) agricultural leases and resource utilization programs and 2) new projects. In the past, policy has resulted in single

project-related, on-site, in-kind mitigation measures. This focus did not promote an ecosystem approach to resource management. This plan promotes a policy that will tailor individual project mitigation to the needs of the ecosystem. In addition, this plan recognizes the USFWS's proposal to assume (see conservation recommendations in the BO) some of the costs associated with the conservation program by in-kind resources. This is intended to increase the flexibility of Camp Pendleton to devote more effort towards the ecosystems goals previously established, and in turn enhance its operational flexibility. However, this approach is tempered in light of the current legislative proscription, under the Anti-Deficiency Act, from obligation of funds prior to Congressional authorization. Should this proscription be changed or legislation enacted that addresses the challenge of long-term funding for recurring ecosystem maintenance and enhancement requirements, Camp Pendleton and the USFWS will reexamine the current funding and management strategies aimed at achieving the program goals.

1.4. Ecosystem Boundaries

Camp Pendleton recognizes that the ecosystem habitats observe no specific delineation, tending to merge together in a very fluid and continuous manner, and that whatever ecosystem boundaries it designates are artificial. However, to facilitate the consistent mapping, monitoring, assessment and other management activities for each ecosystem, the following artificial boundaries were established in consultation with the USFWS. The riparian ecosystem aboard Camp Pendleton is comprised of those lands lying within the 100-year flood plain of the drainages flowing through the Base to the estuary and beach systems at the stream/river mouths junction with the Pacific Ocean. The estuary and beach ecosystem consists of those coastal areas and associated salt/fresh water marshes between the head of tidal action and the low tide line at the beach, which support unique estuarine species. The beaches included in this ecosystem are the coastal beaches with associated dune systems that border estuary and riparian regions of the Base and along the coast. The uplands ecosystem consists of the remaining undeveloped areas of Camp Pendleton.

1.5. Programmatic Instructions

The Base has incorporated into this plan a system of "programmatic instructions" that will be used to avoid and minimize adverse impacts to the ecosystem. If adverse impacts cannot be avoided, appropriate compensation procedures will be implemented, per Section 2.4.3. Activities will be scheduled during the non-breeding season where possible. Military training units will follow guidance given in the Programmatic Instructions to avoid incidental take and adverse impacts. Construction sites will be selected to impact the least amount of estuarine/beach habitat possible.

1.6. General Goals

Camp Pendleton, in consultation with the USFWS, has developed habitat acreage goals and species population numbers. Additionally, Camp Pendleton established enhancement actions specified within the Estuarine and Beach Ecosystem Conservation Plan.

2. ESTUARINE/BEACH ECOSYSTEM CONSERVATION PLAN

2.1. Background

This estuarine/beach conservation program is designed to sustain and enhance Camp Pendleton's natural resources along its coastline emphasizing coastal lagoons and the Santa Margarita River Estuary. This includes conservation of listed species and their associated habitat, maintaining and enhancing the functionality and biodiversity of the Santa Margarita River Estuary, and the coastal lagoons located at Cocklebur, French, Aliso, Las Flores, San Onofre, and San Mateo Creeks. This will be done through continuation of the active management programs conducted by Camp Pendleton and through application of the Programmatic Instructions contained herein, for the 319 acres of habitat associated with this ecosystem. Further, acreage assigned to estuary and beach areas will be managed to avoid future, permanent project impacts (other than transient training traffic or exercises) from construction. Permanent impacts to this habitat will be consulted on separately with the USFWS.

Entirely compatible with this objective is the support of Camp Pendleton's foremost mission--the training of Marines to defend the sovereignty of the United States. The philosophic approach behind this Conservation Program is to sustain and enhance estuarine and beach ecosystem dynamics, such that estuarine and beach communities on Camp Pendleton are sufficiently resilient to withstand a continued array of disturbances and incursions occasioned by military training activities.

The dynamics of the estuarine and beach conservation plan are outlined in the context of the ecosystem goals, terms and conditions and conservation recommendations below. Within the land areas designated as management zones, programmatic instructions and minimization measures will be enforced to protect these areas from permanent intrusion or effects which will disrupt the balance which has been achieved between Marines pursuing training activities, and threatened and endangered species residing in these areas. Protective fencing; warning signs; predator management; exotic vegetation management; monitoring of estuary salinity and tidal conditions are central tenets of the conservation program. Funding for future enhancement activities listed under the conservation recommendations, terms and conditions and reasonable and prudent measures will be actively pursued to promote recovery of the appropriate species. These activities have fostered a growth in the California least tern population over the years and with further study should promote the same in the western snowy plover population.

2.2. Goals

The overall objective of the estuarine/beach ecosystem conservation plan is to manage and protect the natural resources along the Base's coastline emphasizing coastal lagoons and the Santa Margarita River Estuary. This includes protection of listed species and their essential habitat, maintaining the functionality and biodiversity of the following focused management areas to be designated as: the Santa Margarita River Estuary and the coastal lagoons located at Cocklebur Creek, French Creek, Aliso Creek, Las Flores Creek, San Onofre Creek, and San Mateo Creek.

The primary goals of the estuarine/beach ecosystem conservation plan are to:

2.2.1. With Regards to Base Management

1) Facilitate greater latitude in conduct of training activities;
2) Provide a framework for consistency in mitigation related to current and future estuarine/beach impacts resulting from Base activities;
3) Preclude the need for the designation of critical habitat for the western snowy plover and other listed species;
4) Promote partnership with the USFWS for estuarine/beach ecosystem conservation in the region.

2.2.2. With Regards to Ecosystem Management

Implementation of the following conservation strategies should maintain and improve the integrity of estuarine/beach ecosystems and support viable, expanding populations of sensitive species. This plan proposes to implement specific management practices for listed species, including the western snowy plover, in lieu of Federal designation of critical habitat.

1) Provide a framework for managing estuarine/beach habitats from an ecosystem perspective.
2) Maintain connectivity with riparian and upland ecosystems.
3) Promote natural hydrological processes to maintain estuarine water quality and quantity in conformance with approved basin plans.
4) Minimize reduction or loss of upland buffers surrounding coastal wetlands.
5) Restore the dune system in the vicinity of the Santa Margarita Estuary following the guidance developed by The Nature Conservancy, as funds become available.

2.2.3. With Regards to Habitat Management

It is Camp Pendleton's intent to manage estuarine/beach habitat to preclude long-term damage and degradation. Habitat management will continue toward meeting the following goals:

1) Maintain natural processes and areal extent of estuarine/lagoon and beach/dune areas by avoiding and minimizing the permanent loss of the habitat value of these areas.
2) Maintain integrity of listed species' habitat.
3) Eliminate/control exotic plants whenever practical.
4) Maintain suitable tidewater goby habitat in the complex of lagoons associated with the creeks listed above.

2.2.4. With Regards to Species Management

1) Promote the growth of current tern populations over the entire SMR estuary (not only the North Beach colony) and at both Aliso Creek and French Creek Lagoons.

2) Maintain the integrity of the least tern nesting colonies.

3) Promote growth of current population of snowy plovers in the vicinity of the tern nesting colony sites.

4) Maximize the probability of a metapopulation persistence within the lagoon complex for tidewater gobies. The dynamic fluctuations in numbers of individuals associated with habitat types prone to episodic catastrophic events, such as drought and flooding, prevent the specification of precise population objectives.

2.3. Estuarine Ecosystem Baseline

This plan intends to conduct enhancement activities and studies that benefit regional habitat conservation, as funds and personnel permit. Appropriate compensation credit will be afforded to Camp Pendleton for such actions.

2.4. Plan Implementation

Existing management efforts for listed species conservation will be continued at the following Management Zones:

1) SMR Management Zone: The beach area extending from southern edge White Beach (MG 594795) to the southern end of the SMR Estuary delineated by the dirt access running seaward at the southern edge of the Estuary (MG 621758). This Management Zone shall encompass Cocklebur Canyon outlet and the Santa Margarita River Estuary extending east to Stuart Mesa Bridge. Habitats within this zone include least tern foraging areas; inter-tidal beaches (between mean low water and mean high tide) for snowy plover foraging; all nesting locations for the western snowy plover, California least tern, and light-footed clapper rail; salt pan; dune systems in nesting areas; salt marsh; mud flats; and all wetlands.

2) Other Management Zones: Habitats for listed species within the coastal lagoon systems of French, Aliso, Las Flores, San Onofre, and San Mateo watersheds.

2.4.1. Avoidance and Minimization

Programmatic Instructions are provided below which outline activities that are authorized in the Management Zones.

1) In the event nesting by California least tern or western snowy plovers should occur outside the traditionally fenced nesting areas within the management zones, individual nests and any young produced shall be afforded protection by posting and fencing around the immediate vicinity of the nest(s).

2) Prior to each nesting season an evaluation of vegetative cover shall be made at all nesting sites and any necessary vegetation control may be implemented utilizing herbicides or mechanical techniques prior to the breeding season. Enhancement of nesting areas decreases the likelihood of birds nesting outside the management zones.

3) In addition to signs posted at wetlands and nesting sites, the Management Zone will be posted in strategic locations including the Del Mar recreation area, atop the bluffs at Cocklebur Beach, beach access from the agriculture field just north of the North Beach least tern colony, the dirt road running along the southern and eastern portions of the Santa Margarita River Estuary, and on the beach ½ mile south of the LCAC ramp.

4) Camp Pendleton has adopted and implemented the Programmatic Instructions described below, to regulate the operational, maintenance, and recreational programs in and adjacent to estuarine and beach habitats to help ensure that the impact of incidental take is avoided and minimized to the maximum extent practicable. Any activity not specifically addressed in these Programmatic Instructions or otherwise covered herein under the class system for future consultations, requires concurrence from the USFWS to determine if impacts are offset by the ecosystem conservation plans described in this Plan and its BO. If the proposed project is compatible with the objectives established in this ecosystem conservation plan, the USFWS shall approve the proposed action. Indirect effects for noise and dust are considered mitigated by this conservation plan.

5) Weather permitting, construction of fencing at California least tern nesting colonies shall be completed by 15 March. This conservation plan will be updated as recovery plans for listed species are published so that conservation efforts contribute to regional recovery goals.

6) All terms and conditions identified in the BO 1-6-92-F49 will be implemented.

7) Tidewater goby populations on Camp Pendleton will be monitored to determine if there are any impacts to gobies from relocation of effluent infiltration ponds. Populations shall be surveyed to determine their status at least once every three years or as funding permits.

8) Conservation measures currently in place as a result of the LCAC FEIS will continue until completed, including the restricted status of the Santa Margarita River Estuary (with the exception of small boat raid operations up the river) and management of the designated Cocklebur Sensitive Area.

9) Protection measures.

- Signs will be posted at entrances (along access roads or beaches) to all wetlands, nesting sites, and the management zones, to deter unauthorized entry.
- In addition to the permanent fence at the White Beach tern colony, a buffer shall be demarcated along the northern border of the colony during the breeding season with an additional barrier i.e., communication wire. This is especially necessary on the northern end of the colony where vehicular and troop movements occur.
- A seasonal fence extension from the White Beach tern colony extending to the French Creek Lagoon shall be constructed.
- The chick fencing which is employed at the North Beach colony to protect least terns from vehicular traffic shall be breached in several locations on the eastern boundary. This will allow movement of flightless snowy plover chicks that have hatched inside the least tern fencing to escape in order to reach foraging areas. Openings shall be placed according to nest distribution of snowy plovers within the fenced areas. Breaches shall be closed during monitoring or other activities in the

colony that could potentially scatter least tern chicks resulting in the separation of siblings on both sides of the fence. Monitoring will be scheduled to avoid, as much as possible, periods of activity on the beaches adjacent to the colonies in order to minimize risk of tern siblings becoming separated by the fence. Chick barriers at White Beach shall be maintained open ended at French Creek Lagoon.

10) Non-native animal predators/competitor species that threaten listed species will be controlled.

11) All lighting in estuaries will be fully minimized year-round. Indirect illumination from pyrotechnics may be used during the non-breeding season in accordance with the Fire Danger Rating System (FDRS).

12) Information will be published by Base notices to Base personnel regarding sensitive species and habitat areas along the coastal areas.

13) The breeding/nesting season for the western snowy plover and California least tern shall be designated as 15 March - 31 August. The non-breeding season shall be designated as 1 September - 14 March for all activities authorized to occur outside of the breeding season.

14) Introduction of exotic vegetation into estuarine and beach habitats shall be controlled to the extent possible and existing infestations will be targeted for suppression, with an ultimate goal of eradication. Priority will be placed on the control of Arundo, Tamarix, and iceplant. Primary emphasis will be on preventive measures for existing California least tern and western snowy plover nesting sites. Prevention of exotic plant invasion will be done by removing sprouting giant reed stalks which are deposited on the beach during winter storms whenever possible.

15) The dune restoration plan developed for Camp Pendleton by The Nature Conservancy will be implemented as funds become available.

2.4.2. Maintenance and Enhancement of Estuarine/Beach Ecosystem

These are management actions that should be implemented to maintain the ecosystem's ability to support listed species and may be implemented to enhance the estuaries and beaches of Camp Pendleton.

1) Manage estuarine zones to maintain wetland values of coastal lagoons.

2) Fence nesting areas.

3) Control predators.

4) Restore dunes within nesting areas.

5) Explore habitat enhancement techniques including: (a) deepening smaller estuarine lagoons, and (b) controlling and removing exotic plants and fish.

6) Continue annual fencing of least tern nesting colonies; construct seasonal fencing; post warning signs at colonies; publish Base notices; monitor breeding activities (in compliance with the LCAC EIS funded monitors); study long term population trends; and manage nest predators at colonies.

7) Complete multi-year (3-5 year) study of breeding biology and effect of tern management on western snowy plovers with banding.

8) Monitor snowy plover breeding activity.

9) Protect last known nesting location of light-footed clapper rails (SMR).

10) Additional conservation activities included in the mitigation measures set forth in the LCAC EIS, which are currently in progress and will continue until completed, include:

- Maintain restricted status to the Santa Margarita Estuary.
- Protection and management of Cocklebur Sensitive Area.
- Assure no loss of Belding's savannah sparrow habitat.
- Monitoring the breeding status of the least tern to determine effects of LCAC operation and facility construction.

11) Vehicle access to estuary is authorized for the following activities during the non-breeding season:

- Removal of exotic plant species from the large sand deposition which occurred along the south bank of the river at eastern end of salt flats, to promote establishment of a nesting area for snowy plovers.
- Transporting and distributing sand on the Salt Flats Island to enhance this nesting site, should funding become available.

12) Maintain occupied tidewater goby habitat as well as maintaining historic habitat locations for recolonization.

13) Natural regeneration of native vegetation shall be emphasized.

14) Use best management practices based on current site conditions to implement adaptive management.

15) Sites will be selected based on the following criteria:

- Previously disturbed areas.
- Beach areas outside Santa Margarita River Estuary and plover management zone.
- Beach areas within plover management zone.
- Santa Margarita River Estuary.

16) Specific instructions for enhancement techniques are contained in Enclosure 4 to the BO and Appendix J of the BA.

2.4.3. Mitigation

Activities that cause permanent destruction of wetlands and sensitive dune areas will require replacement in kind by enhancement of degraded components of the ecosystem in consultation with the USFWS.

2.4.4. Compensation

Programmatic Instructions will be used to avoid and minimize adverse impacts to the appropriate species and its associated habitat. When these instructions are inadequate, the Table 1

compensation procedures will be implemented to mitigate for habitat losses and other indirect adverse affects to the species. These compensation procedures will apply to new projects or changes to current activities that affect estuarine or beach habitats. Although there are no foreseen losses of estuarine or beach habitat on the Base, these compensation procedures are applicable as long as the estuarine conservation goals (habitat and species) for the sensitive species affected are being met.

Compensation for the appropriate habitat will be calculated by means of Equation 1:

Equation 1: Compensation Required (Acres) =
3 x (Nesting Habitat{Acres}) +
1.5 x (Foraging habitat {Acres})+
3 x (Dune Habitat {Acres})+
2 x (Indirect Effect {Acres})

Compensation enhancement activities that may be applied, both on and off Camp Pendleton, subject to the USFWS's recommendation as the ecoregion manager, will be prioritized in descending order to be credited on the basis of $25,000 per acre of compensation required in accordance with Table 1.

TABLE 1. COMPENSATION FOR ESTUARY/BEACH IMPACTS

Bird Habitat	Tidewater Goby Habitat
Creation of nesting islands/new breeding colonies	Dredging of lagoons/new channels
Exotic Plant Control	Exotic fish control
Dune Restoration	Sedimentation traps
Predator control	Water quality monitoring
Warning signs/fencing	Warning signs/marker buoys
Studies	Studies

2.4.5. Monitoring

1) Water quality within the Santa Margarita River Estuary will continue to be monitored until estuary enhancement actions under the LCAC EIS are completed.

2) Oversee the Navy responsibilities in monitoring, minimizing, and determining impacts of the Landing Craft Air Cushion (LCAC) Facility at Camp Pendleton as identified in the Final EIS are carried out:

   - Watersheds need to remain healthy.
   - Natural hydrological regime of lagoons needs to be maintained or improved.
   - Marsh habitat adjacent to lagoons needs to be improved.
   - Maintain/enhance buffers surrounding wetlands.
   - Water quality in lagoons should be maintained or if necessary improved.

3) Least terns and snowy plovers shall be monitored at least biannually to determine number of pairs, hatching success, and reproductive success in order to assess the effectiveness of the conservation plan.

4) Survey tidewater goby populations and monitor their status every 3 years, or as funding is available.

5) Continue to permit access for clapper rail surveys by statewide survey efforts.

6) Conservation plan shall be updated as recovery plans are published so conservation efforts are consistent with recovery goals. The Base should participate in review of recovery plans to ensure compatibility with the Base's mission requirements.

2.5. Programmatic Instructions

This plan proposes instructions, and which activities are required to comply with to avoid and minimize impacts to estuarine/beach ecosystems and listed species.

2.5.1. General

1) All actions which develop/remove or degrade estuarine/beach habitat shall be compensated for pursuant to the program activity classifications identified in Section 3.

2) Avoid and minimize impacts as much as possible.

3) All activities shall comply with NEPA. Alternatives shall be fully considered.

4) Conduct enhancement activities and studies that will benefit regional habitat conservation. Appropriate compensation credit will be given to the Base for these studies.

2.5.2. Instructions for Military Training Activities

Troops

1) All training units using estuarine and beach areas shall be familiar with and follow the Fire Danger Rating System (FDRS).

2) Military activities shall be kept to a minimum within the Santa Margarita Management Zone during the breeding season. During the breeding season, all activities involving smoke, pyrotechnics, loud noises, blowing sand, and large groupings of personnel (14 or more) must be kept at least 1000 feet (300 meters) away from fenced or posted nesting areas. All other activities must be kept at least 15 feet (5 meters) from these areas.

3) No vegetation shall be cut for military training purposes, except exotic plant species when approved by AC/S ES.

4) All training foot traffic within the management zones shall be prohibited within 15 ft. (5 meters) of posted nesting areas during the breeding season with the exception of Environmental Security, animal damage control, law enforcement, research, and life guard personnel.

5) Estuary wetlands and salt flats shall not be entered unless specifically authorized in another section of these programmatic instructions.

6) Military activities will be kept to a minimum within the Management Zone during the non-breeding season (September 1-March 14) in order to minimize disturbance to wintering snowy plovers.

7) Foot traffic in coastal lagoons and the Santa Margarita River Estuary shall be minimized.

8) Boat traffic is not authorized in the Santa Margarita River and White Beach estuary/lagoon at any time during the breeding season (15 March-31 August). Boat traffic in other lagoons will avoid foraging birds, and transit as far away as possible from nesting sites.

Vehicles

1) Motorized vehicles shall remain at least 15 feet from nesting areas during the breeding season, with the exception of amphibious tracked vehicles, vehicles using the White Beach access road, vehicles required for animal damage control, law enforcement, Environmental Security staff, and lifeguards. Vehicle traffic within the management zones during the breeding season shall be kept to a minimum. Vehicles will remain on hard packed sand unless parked, outside posted (signed) areas during the breeding season and as much as possible at other times, and will avoid the dune system at the base of the bluffs, as well as coastal wetlands. Travel speeds are not to exceed 25 mph.

2) Vehicles shall be excluded from the edges of bluffs between the White Beach/French Creek nesting areas during the breeding season.

3) Amphibious tracked vehicles shall traverse the management zones while maintaining both tracks in water at all times. Upon entering the beach from Camp Del Mar vehicles shall transit in a direct line along a marked corridor bordering the southern edge of the Santa Margarita Management Zone before heading up-coast. During returns, vehicles shall proceed along the same marked corridor. During the breeding season, amphibious tracked vehicles shall not traverse the Santa Margarita Management Zone (see Paragraph B.2.4) in excess of a monthly, average of 20 traverses per day (one traverse equals one round trip to and from Camp Del Mar).

4) The Landing Craft Air Cushion (LCAC) shall not traverse the beach/estuary areas of the management zones (see Paragraph B2.4) during the breeding season.

5) Vehicles and troops accessing the beach at White Beach during the breeding season shall follow a route along the base of the northerly bluff to maintain the maximum distance from the tern colony.

2.5.3. Aircraft

1) During the breeding season, aircraft shall not land within 300 meters of fenced nesting areas on Blue Beach or White Beach as identified on the CP Special Training Map.

2) Aircraft shall maintain an altitude of 300 feet AGL or more above nesting areas.

3) Helicopter landing in the Santa Margarita estuary, wetlands, and salt flats shall not be authorized, except on an in-flight emergency basis and at LZ21 (Camp Del Mar).

4) Aircraft landing is authorized in established Landing Zones (LZ), CAL Sites, and V/STOL pads.

2.5.4. Engineering

1) No digging of fighting positions or bivouacking shall be authorized in the vicinity of nesting areas within the management zones during the breeding season.

2) Engineering training operations outside of NEPA approved landing operation support shall be prohibited within the management zones. At beaches, earth moving activity is authorized only for areas of unvegetated sand as least 300 meters from posted nesting areas unless specifically approved or requested by AC/S ES.

2.5.5. Facilities Maintenance Activities

1) No tree or brush trimming shall occur within management zones during the breeding season.

2) Tree trimming shall avoid entire trees except exotics.

3) Exotic plant species shall not be used to landscape areas adjacent to estuary and coastal wetlands.

4) Tree trimming equipment shall operate from roads as much as possible.

5) With the exception of the access road immediately west of I-5, no vehicles shall enter estuarine areas without prior approval from the AC/S ES.

6) Trimming of landscape trees may occur all year in compliance with the Migratory Bird Treaty Act.

7) Trimming of vegetation shall not exceed 10 feet from communication or power lines.

8) Trimming for improved road safety shall be no more than 10 feet from the road shoulder.

9) No road/culvert repairs shall be conducted during breeding season except under emergency conditions.

10) Exotics shall be thoroughly dried and properly disposed.

11) Proper erosion control on slopes shall be implemented as funding becomes available.

12) Sediment runoff shall be contained on construction sites.

2.5.6. Recreation Activities

1) Recreational activities shall be kept to a minimum within the Santa Margarita Management Zone during the breeding season.

2) All foot traffic within the management zone shall be prohibited within 150 ft. (50 meters) of posted nesting areas during the breeding season.

3) Surf fisherman shall stay at least 300 ft. from posted nesting areas during the breeding season. No live bait fish or amphibians will be allowed for use in fishing.

4) Fishing shall be prohibited within coastal lagoons except the Santa Margarita Estuary, from under the Interstate 5 freeway bridge access point to the Santa Margarita River mouth.

5) Watercraft shall not be permitted within coastal wetlands (except up to four non-motorized boats may be allowed in the Santa Margarita Estuary three days per week during the waterfowl hunting season).

6) Illumination from the Del Mar ball field will be shielded (when replaced) to deflect lighting away from the Santa Margarita River Estuary. Lights shall be extinguished when field is not in use.

7) Beach raking will be limited to the Del Mar and San Onofre Recreational Beaches.

8) Recreational use of all terrain vehicles, motorcycles, and off-road vehicles is prohibited within the management zones.

9) Cutting of vegetation is prohibited, except along recreational beach at San Onofre and Del Mar.

10) Beach fires are prohibited within the management zones.

11) Dogs on the beach must be on a leash when within 1000 feet of nesting areas during the breeding season.

12) Camping at Cocklebur Canyon beach access will be limited to the non-breeding season (September 1 -14 March).

3. ACTIVITY CLASSIFICATION SYSTEM FOR FUTURE CONSULTATION

The Estuarine and Beach Ecosystem Conservation Plan established a system to manage the conduct of future consultations between the USFWS and Camp Pendleton. The purpose of this system is: (1) to reduce staffing requirements; (2) to provide a systematic approach to deal with future proposed projects, activities and operations; (3) to increase the Base's mission flexibility; (4) to satisfy Section 7(e)20 of the Act requirements for future programmatic consultations; (5) to define activities which require formal consultation with the USFWS.

This "activity class" system is not intended to negate the requirement for consultation in the future. On the contrary, it is intended to define activities whose consultation requirements are programmatically covered by this Opinion or those for which no further consultation is required. This system establishes an annual reporting procedure for newly initiated Base activities, the effects of which are relatively minor and easily covered under the conservation plans. Further, the system defines types of activities for which an expedited consultation process can be implemented.

This plan establishes that Camp Pendleton activities be sorted into the following four categories: Class IV, III, II and I.

3.1. Class IV

3.1.1. Definition

Class IV activities are defined as any activity that does not have the potential to affect listed or proposed species. No Section 7 consultation is required for such activities.

3.1.2. Examples

1) Foot traffic on existing roads during all seasons.

2) Light foot traffic (movement by individuals) off of existing roads during the non-breeding season outside of posted nesting areas.

3) Vehicle operations on existing paved and dirt roads, including established creek crossings, during all seasons.

4) Vehicle operations off of existing roads in habitat outside the Tern/Plover Management Zone in the estuarine/beach ecosystem during the non-breeding season.

5) Live firing on established ranges.

6) New construction within cantonment areas that do not result in additional habitat degradation.

7) Vegetation management during the non-breeding season:

   - Limb Trimming of all vegetation within 10 feet of roads or above ground transmission cables.
   - Exotic Plant Control in all areas.

8) Maintenance activities during the breeding season:

   - Use of existing facilities and ranges that do not result in take of occupied habitat.
   - Culvert clearing of all vegetation within 15 feet of culvert entry and exit points.
   - Road Maintenance of existing roads.
   - Night-time Lighting including lighting from existing facilities and indirect illumination from pyrotechnics to the extent the Fire Danger Rating System allows.
   - Exotic Plant Control in areas greater than 100 feet from occupied habitat during the breeding season.
   - Recreational Access pursuant to Marine Corps Order P5090, Base Order P5000 and programmatic instructions.
   - Vehicle traffic on existing roads.
   - Foot traffic during state authorized hunting seasons.
   - Maintenance activities that do not remove native vegetation within 100 feet of occupied habitat.
   - Hunting of game during authorized seasons, except posted or fenced areas.
   - Hiking, running, and bird watching along established trails.
   - Fishing within waterways, along designated beaches and within lakes or ponds.

3.2. Class III

3.2.1. Definition

Class III activities are those discrete projects that "may affect" listed or proposed species. Potential effects to the species and their habitat are limited and considered offset by the on-going implementation of the estuarine/beach conservation plan. An annual report of activities occurring under this class will be sent by Camp Pendleton to the USFWS at the end of each fiscal year.

Class III activities are those which may potentially result in adverse effects to species in the estuarine/beach ecosystem that:

1) Are temporary disturbances to Plover Management Zone that is eliminated when activity ends.
2) Are temporary degradation of nesting areas during non-breeding season that can be restored before nesting season begins.

3.2.2. Examples

1) Aircraft overflights below 300 feet AGL over occupied territories of listed species during the breeding season along established Terrain flight (TERF) routes.
2) Small boats in the Santa Margarita River during the non-breeding season (military training and hunting).
3) Off-road troop movement (large groups) during the non-breeding season.
4) Indirect lighting of habitat during breeding season.
5) Weed control activities:
    - That result in the use of power tools during the breeding season within 100 feet of occupied habitat.
    - That result in affecting native vegetation of occupied habitat.
    - That use Rodeo or equivalent cut-stump or aerial spraying in occupied habitat.
6) Controlled burns conducted for habitat enhancement and protection during the non-breeding season.
7) Temporary sustained noise levels above 80 dBA L_{eq} hourly as measured over a 7-day period during the breeding season.
8) Vehicle access for enhancement activities.

3.3. Class II

3.3.1. Definition

Activities that may affect listed species and for which impacts may or may not be offset by the conservation plan with associated compensation measures and that require concurrence from the USFWS via a separate project concurrence letter. Concurrence letter will specify the project description for the proposed action; avoidance and minimization measures effected;

programmatic instructions recommended for implementation; assessment of the impact to listed species and associated habitat for direct and indirect effects (with the exception of dust and noise); annual bank balance; compensation requirements; and mitigation compensation measures proposed.

- Permanent development of beach habitat in excess of 1 acre.
- Permanent development of more than 1 acre of pickleweed salt marsh or 2 acres of coastal dune habitat.

3.3.2. Examples

General

1) Aircraft overflights below 300 feet AGL over occupied territories of listed species during the breeding season.
2) Results in lighting of habitat during breeding season that directly affects listed species.
3) Weed control activities that occur during the peak of the breeding season (March through June).
4) Aerial spraying of pesticides between March through August.
5) Result in permanent sustained noise levels above 80 dBA l_{eq} hourly calculated over a 7 day period during the breeding season.
6) Aircraft overflights below 300 feet AGL over nesting sites of listed species during the breeding season.

Project Examples

1) New facilities, structures or habitat modification that affects significant quantities of habitat.
2) Construction of new nesting island in Santa Margarita estuary.

3.4. Class I

3.4.1. Definition

Activities whose impacts are not offset by the Conservation Plan and/or additional mitigation not agreed upon through informal consultation. These activities will trigger the requirement to enter into formal consultation and require preparation of a separate BA by the Base, and consequent issuance of a BO by the USFWS. Reference may be made to measures within this Plan as guidelines for avoidance or minimization measures. However, credit for conservation plan activities conducted under this plan will not accrue to this "new consultation" and for which significant, separate compensation will be required.

- Activities that require construction or degradation of Santa Margarita Estuary, plover management zone, Cocklebur Canyon, and Red Beach Estuary.
- Activities whose indirect effect has potential to significantly degrade water quality and quantity of the Santa Margarita Estuary.

Appendix L

Riparian Ecosystem Conservation Plan

APPENDIX L
RIPARIAN ECOSYSTEM CONSERVATION PLAN

During 1994 Camp Pendleton entered into formal consultation under Section 7 of the ESA for ongoing and planned training activities, infrastructural maintenance activities, several construction projects, and a Riparian and Estuarine Ecosystem Conservation Plan. On 30 October 1995 the USFWS issued a BO (1-6-95-F-02) covering those actions. This appendix contains the Riparian Ecosystem Conservation Plan portion of those actions. Terms and conditions of the BO covering this plan and the Estuarine and Beach Ecosystem Plan are in Appendix M.

The primary purpose of the Riparian Ecosystem Conservation Plan is to manage fish and wildlife resources in riparian areas. This plan is "programmatic" in the sense that it addresses long-term requirements of the riparian resources in a comprehensive, "programmatic" fashion. This conservation plan is programmatic in its strategy: habitat management actions will be planned and evaluated in the context of achieving and maintaining a "healthy ecosystem" for sensitive species. It is the intention to apply this programmatic approach to all ongoing and future actions at Camp Pendleton, as they potentially affect the integrity of riparian ecosystems.

The mission of MCB Camp Pendleton is to operate an amphibious training base, while protecting the environment and providing facilities, services, and support to prepare Marines and Sailors for combat. Camp Pendleton's 125,000 acres (approximately 200 square miles) of ocean front beach, coastal plains, terraces, hills, mountains and stream valleys, and the Base's associated restricted airspace, offer a unique combination of natural resources that assure well-prepared national security forces.

Camp Pendleton's military mission is combat training and support of Marine Corps units and other DoD forces. Training activities include, but are not limited to: amphibious landings, fixed and rotary-winged aircraft flights and landings, tracked/wheeled vehicle and personnel maneuvers, artillery and small arms firing, aerial weapons delivery, engineer unit operations, organization of supply, field combat service support, employment of communications, airlifting of troops and weapons, equipment maintenance, and field medical treatment.

Camp Pendleton's training and combat service support functions share the use of Base lands with several non-military functions. Such uses include: a Department of Justice border patrol check point, a California State Parks and Recreation campground and beach, the SONGS, agriculture and grazing outleases, and public schools. These functions are important uses of Camp Pendleton's land, and they require additional land management attention to assure the Base meets its primary commitments to the military mission and conservation.

The Base manages access to sensitive wildlife habitat, and acknowledges the importance of this practice as a necessary precaution to preserve wildlife corridors and vital habitat for listed species, and to enable the Base's mission to co-exist with sensitive wildlife communities.

1. ECOSYSTEM CONSERVATION MANAGEMENT

1.1. Overview

DoD has embraced "ecosystem management" as its tool for conserving natural resources. In a memorandum of 8 August 1994, concerning implementation of ecosystem management in the DoD, the Deputy Under Secretary of Defense (Environmental Security) promulgated the following policy statements:

> Ecosystem Management is the basis for future management of DoD lands and waters. It will blend multiple-use needs and provide a consistent framework for managing DoD installations, ensuring the integrity of ecosystems.
>
> Ecosystem management is a goal-driven approach to environmental management at a scale compatible with natural processes, recognizes social and economic viability within functioning ecosystems, and is realized through effective partnerships among private and government agencies.
>
> 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 that people and their social and economic needs are an integral part of the whole.
>
> In applying the principles and guidelines for DoD ecosystem management, military installations will:
>
> - Develop a vision of ecosystem health. Existing natural resource, social, and economic conditions should be factored into the vision.
> - Develop coordinated approaches to work toward ecosystem health. Since ecosystems rarely coincide with ownership and political boundaries, cooperation across ownerships is an important component of ecosystem- based management.
> - Maintain and improve the sustainability and native biological diversity of ecosystems.
> - Support sustainable human activities. People and their social, economic, and security needs are an integral part of ecological systems, and management of ecosystems depends upon sensitivity to these issues.
> - Use benchmarks to monitor and evaluate outcomes and establish milestones to ensure accountability.

The Camp Pendleton's conservation program starts with recognition of its military mission. In fact, the Riparian Ecosystem Conservation Plan assumes that only through continuance of that mission will the objectives of the plans be accomplished.

The conservation program also proceeds with recognition of the following biological principles: 1) ecosystems are dynamic by nature; 2) the functioning of ecosystem components operate at different rates; 3) all components are interrelated; 4) the ecosystem is a complex, dynamic

system functioning as a whole, not as a collection of parts; and 5) ecosystem integrity may be disrupted by excessive "interference" of any single component.

The Base uses these guidelines in establishing programmatic instructions for military training, facility and range maintenance, recreation, and new project planning. This approach is used to develop prudent and reasonable alternatives, which seek to avoid and minimize impacts to species and their habitats and maintain ecosystem integrity.

The Base Riparian Ecosystem Conservation Plan was developed to maintain and improve the sustainability and native biological diversity of the riparian ecosystem, while supporting Camp Pendleton's mission of training Marines. Camp Pendleton intends that this program provide a comprehensive framework for assuring the consistent management of the Camp Pendleton riparian ecosystem.

The thrust of the Riparian Ecosystem Conservation Plan is to manage habitat on an ecosystem basis. Benchmarks have been established to monitor and evaluate the integrity and functioning of the ecosystems aboard Camp Pendleton. Specific habitat and species goals were established in consultation with the USFWS and aim at contributing to threatened and endangered species recovery. Based on periodic assessments, the program calls for management objectives and strategies to be modified to meet changing circumstances and requirements.

The program depends on the development of formal and informal partnerships among private and government agencies to achieve its goals. It is based on the assumption that without such partnering the integrity of the ecosystems cannot be maintained. The plan further assumes that successful partnering will not happen without each party respecting the legitimate needs of the other.

1.2. Integration with Regional Conservation Planning

The Camp Pendleton conservation program depends on its integration with regional conservation planning efforts. The Base acknowledges the USFWS's broader role in the regional planning process and expects the USFWS to be its advocate in this arena. Camp Pendleton assumes that the USFWS will view the Base's ecosystems in an ecoregion context, setting appropriate goals for the subareas thereof. This means that the responsibility for conservation of wildlife in the southern California coastal ecoregion does not fall solely on Camp Pendleton. Camp Pendleton expects that the USFWS, in its oversight and wildlife advocacy role in the region conservation planning process, will promote the distribution of information and consistent application of Section 7 and Section 10 procedures to foster species recovery throughout the ecoregion.

1.3. Management Activity Funding

The Riparian Ecosystem Conservation Plan is premised on the understanding that funding and achievement of the plan's goals are interrelated with assuring and enhancing the on-going maintenance and flexibility of the Base's military mission. Funding for management activities aimed at the conservation of the Base's ecosystems derive from 1) agricultural leases and resource utilization programs; and 2) new projects. In the past, policy has resulted in single project related, on-site, in-kind mitigation measures. This focus did not promote an ecosystem approach to resource management. This plan promotes a policy that will tailor individual project

mitigation to the needs of the ecosystem. In addition, this plan recognizes the USFWS' proposal to assume (see conservation recommendations in the BO) some of the costs associated with the conservation program by in-kind resources. This is intended to increase the flexibility of Camp Pendleton to devote more effort towards the ecosystems goals previously established, and in turn enhance its operational flexibility. However, this approach is tempered in light of the current legislative proscription, under the Anti-Deficiency Act, from obligation of funds prior to Congressional authorization. Should this proscription be changed or legislation enacted that addresses the challenge of long-term funding for recurring ecosystem maintenance and enhancement requirements, Camp Pendleton and the USFWS will reexamine the current funding and management strategies aimed at achieving the program goals.

1.4. Ecosystem Boundaries

Camp Pendleton recognizes that the ecosystem habitats observe no specific delineation, tending to merge together in a very fluid and continuous manner, and that whatever ecosystem boundaries it designates are artificial. However, to facilitate the consistent mapping, monitoring, assessment and other management activities for each ecosystem, the following artificial boundaries were established in consultation with the USFWS. The riparian ecosystem aboard Camp Pendleton is comprised of those lands lying within the 100-year flood plain of the drainages flowing through the Base to the estuary and beach systems at the stream/river mouths junction with the Pacific Ocean. The estuary ecosystem consists of those coastal areas and associated salt/freshwater marshes between the head of tidal action and the low-tide-line at the beach, which support unique estuarine species. The beaches under this consultation are the coastal beaches with associated dune systems that border estuary and riparian regions of the Base and along the coast. The uplands ecosystem consists of the remaining undeveloped areas of Camp Pendleton.

1.5. Programmatic Instructions

The Base has incorporated into this plan a system of "Programmatic instructions" that will be used to avoid and minimize adverse impacts to the ecosystem. If adverse impacts cannot be avoided, appropriate compensation procedures will be implemented, per Section 2.5.2. Activities will be scheduled during the non-breeding season where possible. Military training units will follow guidance given in the Programmatic Instructions to avoid incidental take and adverse impacts. Construction sites will be selected to impact the least amount of riparian habitat possible.

1.6. General Goals

Camp Pendleton, in consultation with the USFWS has developed habitat acreage goals and species population numbers. Additionally, Camp Pendleton established enhancement actions specified within the Riparian Ecosystem Conservation Plan.

2. RIPARIAN ECOSYSTEM CONSERVATION PLAN

This Riparian Ecosystem Conservation Plan is designed to maintain and enhance the biological diversity of the riparian ecosystem on Camp Pendleton. The conceptual approach behind this conservation plan is to sustain and restore riparian ecosystem dynamics, so that natural plant and animal communities on the Base are sufficiently resilient to coexist with current and future military training activities.

The success of this plan will be primarily measured by the abundance and distribution of endangered species, and an increase in ecosystem health and value.

This plan identifies the major riparian habitats and quantifies a baseline (as present in 1994) acreage for each. This plan also assigns values to habitat types based on their suitability, for currently listed threatened and endangered species. These values were qualitatively developed based on information related to the distribution and abundance of sensitive species and what is currently known about their life history requirements.

The riparian ecosystem conservation plan demonstrates a commitment to promote an increase in the quantity of riparian woodland and riparian scrub habitat throughout all Camp Pendleton watersheds, beyond the baseline established through the Santa Margarita River Memorandum of Understanding (MOU). Further, it promotes the maintenance of the open water/gravel areas and marsh areas within the baseline. Conservation efforts will be focused on the eradication of exotics from various habitat categories and conversion of this acreage to riparian woodland, riparian scrub or open gravel areas in pursuit of the goal of promoting growth in sensitive species (primarily vireo, flycatcher, and arroyo toad) populations.

2.1. Background

Throughout the recent past, Camp Pendleton and the USFWS have collaborated in protecting riparian habitats from the impacts of many types of activities. Much of this collaboration was based on the Santa Margarita River MOU related to the least Bell's vireo. This MOU provided protection for this species through the Bases commitment to maintain 1200 acres of suitable habitat in the Santa Margarita River Basin for least Bell's vireo. This resulted in the *de facto* establishment of an endangered species management area on the Base that was largely off-limits to military training. This policy of avoidance, in conjunction with an aggressive monitoring and cowbird control program, led to a dramatic increase in the least Bell's vireo population on Base. The increasing vireo population in the Santa Margarita River basin (the focus of the MOU) has overflowed into other drainages on Camp Pendleton that were not addressed in the MOU.

2.2. Goals

The primary goals of the Riparian Ecosystem Conservation Plan are to:

2.2.1. With Regards to Base Management:

1) Facilitate greater latitude in conduct of training activities.
2) Provide a framework for consistency in mitigation related to current and future riparian impacts resulting from Base activities.
3) Preclude the need for designation of critical habitat and supersede the existing least Bell's vireo MOU.
4) Establish partnerships for ecosystem conservation. Conduct enhancement activities and studies off-Base that benefit regional habitat conservation. Studies (both on and off Base) will also be used to guide habitat enhancement. The USFWS will continue to be Camp Pendleton's advocate on a regional basis.

2.2.2. With Regards to Ecosystem Management:

1) Provide a framework for managing riparian habitats from an ecosystem perspective.

2) Supersede the single-drainage focus of the MOU by explicitly promoting the maintenance and enhancement of riparian habitats Basewide.

3) To eliminate Arundo (and other exotic riparian species) on Base in partnership with jurisdictions upstream.

4) Provide for viable riparian corridors.

5) Provide for largely unimpeded hydrologic and sedimentary floodplain dynamics, so that the physical template is available to support the maintenance and enhancement of biota throughout the Base.

6) Maintain natural flood plain processes and area extent by avoiding and minimizing the further permanent loss of floodplain habitats. As a federal entity, the Base is obligated to adhere to EOs 11988 and 11990 of 1977 concerning floodplain development and maintenance of ecosystem integrity.

7) Flood regimes on Base will be maintained to as close to natural a condition as possible. Artificial influences on flooding regimes shall be avoided and minimized to the maximum extent possible, necessary to protect life and property;

8) Stream and river flows needed to support riparian (and estuarine) habitats shall be maintained to the extent practicable. Riparian water quality and quantity shall be in conformance with approved Regional Water Quality Control Board basin plans. The USFWS will support the Base by monitoring upstream water withdrawals and discharges, to enable maintenance of a viable water balance within the watershed riparian ecosystems both on and off of the Base.

9) Groundwater levels shall be monitored and basin withdrawals managed to avoid loss and degradation of habitat quality, to the extent practicable. Where vegetation monitoring programs demonstrate effects on habitat, compensation will be implemented, based on the best available hydro-geochemical and biological modeling available. The Base will not be penalized for upstream development, use and their (upstream) over-withdrawals from the Basin.

10) Promote land conservation practices to effectively reduce unnatural sedimentation and siltation resulting from the activities on Base. The USFWS will promote the same practices for upstream users in the basins that flow through Camp Pendleton.

2.2.3. With Regards to Habitat Management:

It is Camp Pendleton's intent to manage riparian habitats to preclude long-term damage and degradation. Habitat management will continue toward exceeding the habitat goals established under this plan. Camp Pendleton seeks to:

1) Manage native vegetation to promote optimal community succession for ecosystem integrity with focus on sensitive species. Native riparian plant communities shall be maintained by natural processes and not be artificially manipulated, except as needed to

restore depleted natural resources, or where areas are isolated from natural dynamics of the ecosystem.

2) Promote connectivity of native riparian habitats through project avoidance of currently constrained areas and enhancement procedures.

3) Enhance the value of the ecosystem by targeting mitigation towards eradication of exotic plant communities (*Arundo* and *Tamarix* spp.) and promotion of successional stages of riparian scrub and riparian woodland habitat.

4) Eliminate/control exotic plants whenever practical, including after flood, fire, construction, or other disturbance. Control existing exotic vegetation by: aerial or ground herbicide application followed by cutting, or cutting followed by herbicide application. Additional herbicide application during the original treatment growing season plus herbicide treatment of regrowth, for an additional 2 growing seasons.

5) Prevent new weed introductions in riparian zones and to control/eliminate aggressive invasive exotic plants already established on Base. Camp Pendleton is willing to mitigate for projects on Base through removal of exotic vegetation off Base.

6) Restore areas to their original condition after disturbance through a combination of exotic vegetation control and vegetation management (including replanting if necessary) that will permit native species to regenerate. This method is to be implemented on areas that are temporarily disturbed during project construction or by other temporary impacts such as fire damage. The compensation program for temporary impacts, exclusive of those effects resulting from fires, includes exotic plant control measures such as weeding and monitoring of affected areas for 5 years, in addition to compensation per Section C.2.5.2. Whenever practical, the original topsoil will be restored to areas of native vegetation which have been disturbed by construction.

7) Minimize occurrence of unnatural fires in riparian zones caused by Base activities. Riparian zones subjected to unnatural fires shall be managed for improvement of native habitat values and prevention of soil erosion. This should mainly include the immediate control of invasive exotic species as appropriate. However, controlled burns, as part of Camp Pendleton's Fire Management Plan, are essential to preventing runaway destruction of significant quantities of riparian habitat.

8) Conserve habitat assigned to "Base" and "Bank" categories.

9) Distribute vireo quality habitat across all Basins, while maintaining the maximum amount of habitat per the spirit of the MOU.

10) Achieve the riparian ecosystem habitat goals of eliminating exotic vegetation and increasing riparian vegetation with at least 50% being riparian woodland/riparian scrub.

2.2.4. With Regards to Species Management:

1) Achieve greater biological diversity and distribution of sensitive species populations in the three other principal drainages (San Mateo, San Onofre, and Las Flores) on the Base.

2) Promote long-term increase in singing male vireos beyond the 300 singing males (718 singing males in 2006) stipulated in the MOU and flycatchers beyond the 22 singing

males detected during the 1994 Base survey within ecosystem through continuation of Base management efforts. The vireo population on Camp Pendleton has previously increased significantly because of the Base's commitment to reduce activities in riparian habitat during the breeding season and trap brown-headed cowbirds in the lower Santa Margarita River Basin. The Base will continue to minimize impacts to riparian habitats through use of programmatic instructions to guide activities and through control of brown-headed cowbirds on all drainages.

3) Establish self-sustaining populations of listed species that require little human intervention for maintenance. Animal Damage Control efforts will be focused toward management of "problem" species and minimization of the disruption of natural native animal population dynamics.

4) Minimize periods of excessive continuous noise levels (an average, hourly, continuous noise level above 60 DBA L_{eq} as measured over the entire daylight period) to which sensitive species are subjected.

5) Minimize effect of direct and indirect night time lighting in riparian areas (exclusive of ongoing night firing activities associated with existing range and training usage) year-round.

6) Promote increased arroyo toad populations in watersheds, where found, through perpetuation of natural ecosystem processes and programmatic instruction application for avoidance and minimization of impacts.

7) Evaluate habitat suitability for potential reintroduction of the red-legged frog.

8) Examine Base for habitat qualities necessary to support steelhead runs and determine feasibility of establishing such runs.

2.3. Riparian Ecosystem Baseline

2.3.1. Habitat Components

Riparian Woodland: characterized by dense, broad leafed, winter-deciduous riparian thickets, with greater than 70% constituted by several species of willow, including Gooding's (Black) willow (*Salix goodingii*), sandbar willow (*S. hindsiana*), and arroyo willow (*S. lasiolepis*). Other species that may be present are scattered individuals of Fremont's cottonwood (*Populus fremontii*), oaks (*Quercus* spp.), and California sycamore (*Platanus racemonsa*). This habitat was once extensive along major rivers of coastal southern California, but its extent has been greatly reduced by entities exclusive of Camp Pendleton, urban flood control, agriculture and development (Holland, 1986). This habitat is crucial for support of three federally endangered species, least Bell's vireo, the southwestern willow flycatcher and the arroyo toad. Under a habitat value ranking system, this habitat is assigned the numerical score of five (5) for comparison to other habitat types, in recognition of its principle use by currently listed species.

Riparian Scrub: characterized as being dominated by mulefat (*Bacharris glutinosa*), and often represents an early stage in the establishment of cottonwood- or sycamore-dominated riparian forests or woodlands (Holland, 1986). Other characteristic species include Mexican elderberry (*Sambucus mexicana*), sandbar willow, arroyo willow, and stinging nettle (*Urtica holosericea*). This habitat type is considered an early succession stage that will grow to riparian woodland,

eventually, given the right environmental conditions. The least Bell's vireo and southwestern willow flycatcher use this habitat for foraging and, in the more well-developed (mature) stands, for nesting. Under the habitat ranking system this habitat is assigned a score of three (3).

Open Water/Open Gravel: encompasses non-vegetated or very sparsely vegetated areas. Included here are sand and gravel washes, mud banks, and open water. This habitat type may be used by least Bell's vireos and southwestern willow flycatchers when it is within close proximity of riparian habitats supporting these species. This habitat may be used by arroyo toads when sandy or gravely substrates are present. Assigned a habitat ranking system value of four (4), due to its utility to the arroyo toad.

Freshwater Marsh: wetlands that are permanently flooded by standing freshwater lacking a significant current (Holland, 1986). Characteristic species include woolly sedge (*Carex lanuginosa*), yellow nutsedge (*Cyperus esculentus*), cattail (*Typhia* spp.), bulrush (*Scirpus* spp.), and southern mudwort (*Limiosella aquatica*). The light-footed clapper rail could potentially utilize coastal areas of this habitat type. Juvenile and adult California Least Terns may use this community type for feeding through the breeding season, when it is near their nesting areas. Least Bell's vireos and southwestern willow flycatchers will use this habitat type as foraging habitat when it is in close proximity to other riparian habitats. Assigned a habitat ranking system value of three (3).

Mixed Woodland: characterized by riparian woodlands containing less than 70% willows and low occurrence of exotic vegetation (arundo and tamarisk). Plant species included in this community are sycamores, oaks, willows, and Mexican elderberry. Least Bell's vireos and southwestern willow flycatchers are not commonly found using this habitat type aboard Camp Pendleton, but areas with little understory vegetation may support arroyo toads. Assigned a habitat ranking system value of two (2).

Sycamore Grassland: grasslands containing sycamore. Primarily associated with drier ephemeral washes and generally consists of a fairly open canopy. This habitat type is not expected to solely support any of the species of interest, but could be utilized to a limited extent when associated with other riparian habitats. Assigned a habitat ranking system value of two (2).

Grass-Forb Mix: includes such species as the exotic, mustard (*Brassica* spp.), and sweet fennel (*Foeniculum vulgare*); annual grasses (*Bromus* spp., *Vulpia* spp., etc.), goldenbush (*Isocoma menziesii*), and others. This habitat type may be used by least Bell's vireos and southwestern willow flycatchers when it is within close proximity to riparian habitats supporting these species. Assigned a habitat ranking system value of one (1).

Arundo: characterized as having greater than 70% giant reed. This exotic species has established itself in large stands along the watersheds of southern California and out competes native vegetation, thereby reducing habitat for several listed species. Assigned a habitat ranking system value of zero (0), as being unsuitable for listed species management efforts.

Tamarisk: characterized as having stands of greater than 70% tamarisk. This habitat type, like *Arundo*, is of no benefit to the targeted species and will be targeted for eradication as a high

priority under any management mitigation efforts. Assigned a habitat ranking system score of value (0), as being unsuitable for listed species management efforts.

Mixed Willow-Exotic: characterized as containing less than 70% willows with large percentages of exotic plants. Other plant species associated with this group include arundo, tamarisk, Mexican elderberry and mulefat. This habitat may support the least Bell's vireo, southwestern willow flycatcher, and arroyo toad, but at lower densities than could be expected for "pure" stands of riparian woodland or well developed mature riparian scrub. This habitat may be cleared of exotics under the riparian conservation plan mitigation compensation actions to upgrade it to a higher habitat quality. Assigned a habitat ranking system value of one (1), as it is of marginal utility to listed species.

Disturbed/Developed Lands: land on which the native vegetation has been significantly altered by agriculture, construction, or other land clearing activities is termed "neutral". Such habitat is typically found in vacant lots, roadsides, construction staging areas, and abandoned agricultural fields, and is dominated by non-native annual and perennial broadleaf plant species. This habitat generally includes few native plant species that support the species of interest. Assigned a habitat ranking system value of zero (0), as being of no use to listed species.

2.3.2. Habitat Baseline

This was based on a photographic (1:12,000) survey, digitized using the Camp Pendleton's Geographic Information System (GIS) and delineated by field surveys in 1994.

The riparian ecosystem was determined in 1994 to contain the mix of habitat types tabulated in Table 1. This is considered the benchmark for initiation of the Riparian Ecosystem Conservation Plan. An analysis of Camp Pendleton habitat acreages concerning the status of habitat and changes in the habitat mix will be accomplished using photographic analysis digitized to be compatible with the Camp Pendleton Geographic Information System every five years by the Base in partnership with the USFWS. The periodicity of such analysis may be modified, depending upon circumstances and when mutually agreed to.

2.3.3. Increasing Ecosystem Value

The plan is designed to achieve an increase in the relative value of the riparian ecosystem resulting from the gradual elimination of exotic plant species from the system. The assumption is that if exotics are removed, the riparian plant community will offer more suitable habitats for listed species. The plan proposes a formula (Equation 1) for qualitatively measuring progress toward achievement of this goal. The purpose of the formula is simply to provide a descriptive indicator. The numeric values assigned to each habitat type are not intended to denigrate the value of those assigned lesser value versus higher value. Habitat numeric value assessment is dependent upon the overall management objectives at a given point in time. At initiation of the ecosystem management plan these values were assessed based on the goal of enhancing Vireo, Flycatcher and Arroyo Toad populations within this ecosystem.

Equation 1: Ecosystem Value = 5 x (riparian woodland acres) +
4 x (open area/open water acres) +
3 x (riparian scrub acres) +

3 x (freshwater marsh acres) +
2 x (mixed woodland acres) +
2 x (sycamore grassland acres) +
1 x (grass-forb mix acres) +
1 x (mixed willow exotic acres)

TABLE 1. 1994 BENCHMARK SURVEY FOR RIPARIAN HABITAT

Habitat Type	1994 Benchmark (Acres)	Percent of Ecosystem (%)	Habitat Ranking System Value (Points/Acre)	Ecosystem Health Value (Points)
Riparian Woodland	1467	15	5	7335
Open Water/ Gravel	1160	11.80	4	4640
Riparian Scrub	2020	20.60	3	6060
Fresh Water Marsh	254	2.60	3	762
Mixed Woodland	651	6.60	2	1302
Sycamore Grassland	172	1.80	2	344
Grass/Forb Mix	1236	12.60	1	1236
Mixed Willow Exotic	982	10.00	1	982
Arundo	283	2.90	0.00	0
Tamarisk	13	0.10	0.00	0
Disturbed/ Developed	1565	16.00	0.00	0
TOTAL	9803	100.00		22661

2.4. Management Accounting

The least Bell's vireo (LBV) MOU goal of 1,200 acres of "suitable LBV habitat" was used as a "Base" (conservation category) for Camp Pendleton's regional participation in recovery plans for the LBV, and other listed species which share similar riparian habitat. This 1,200-acre "Base" consists of a mix of 600 acres of riparian woodlands habitat and 600 acres of riparian scrub habitat that the Base intends to maintain and distribute in all of its basins in order to create corridors of suitable riparian habitat and encourage species distribution beyond the Santa Margarita River basin. When this plan was established Camp Pendleton had an additional inventory of 2,287 acres of riparian woodlands and scrub habitat that was suitable for neotropical migratory birds such as the vireo and the willow flycatcher. Of these 2,287 acres, the Riparian Management Plan initially designated 1,000 acres (600 acres of riparian woodlands and 400 acres of riparian scrub) as an additional conservation bank ("bank"). The balance of habitat in this "bank" does not represent a habitat "line of credit", as compensation for actual or future destruction of the remainder of the habitat in the ecosystem. Rather, the "bank" balance serves as an entry argument in the calculation of mitigation ratios for compensation for unavoidable impacts resulting from current and future actions that may affect the remainder of the riparian ecosystem.

This "bank" was not created to be depleted, but rather to be used to determine/generate in-place mitigation compensation ratios and to provide an accounting mechanism, which will graphically

measure and depict the results and status of the Base's mitigation and management efforts within the riparian ecosystem. The "bank" is planned to be maintained or to grow, not to be reduced.

This plan has assigned the remaining 5,038 acres of riparian ecosystem to a conservation ledger account designated as a "flexibility" account. The purpose of the "flexibility" account is to provide habitat areas (of all types) that may be used for facilitating the Base's mission. When impacts to the riparian ecosystem, resulting from activities and projects associated with the Base's mission, are unavoidable, these activities and projects will be targeted in habitat areas on the Base in the following order: 1) exotic dominated; 2) "other" riparian; 3) riparian scrub; and 4) riparian woodland habitats. When this plan was established there were 1,278 acres of exotic dominated habitat, 3,473 acres of "other" habitat (habitat other than exotic, riparian woodland or scrub), 820 acres of riparian scrub, and 267 acres of riparian woodland habitat assigned to this "flexibility" account.

As projects or actions within the ecosystem are planned, Camp Pendleton intends to continue to emphasize avoidance and then minimization of impacts to the remaining habitat types within the ecosystem, primarily through the habitat management system above and through programmatic instructions. When impacts are unavoidable, mitigation compensation will be targeted, consistent with USFWS guidance, to eradicate exotic plants in the riparian ecosystem. The assumption of this plan is that as exotic habitat is cleared, that area will gradually be converted into other habitat types of the riparian ecosystem. Riverine dynamics and vegetative succession result in habitats ranging from open pool/gravel habitats to riparian scrub and woodland type habitats. As the amount of riparian woodland and scrub habitats increase in the "flexibility" account, habitat may be added to the "bank" balance in order to facilitate lower mitigation ratios for Camp Pendleton.

This base-bank-flexibility arrangement was established in consultation with the USFWS in light of Camp Pendleton's past accomplishments in enhancing the value of the ecosystem for endangered species. It has also been designed to provide management direction and incentives.[1] It is intended that this plan will provide Camp Pendleton planning personnel with a tool to evaluate impacts and associated costs of future actions. It should encourage the targeting proposed actions at lower value habitat and discourage actions or impacts to that of higher value to sensitive species. Finally, Camp Pendleton intends that it will provide consistent mitigation compensation ratios for programmatic application in future informal and formal consultations between the Base and the USFWS.

In other words, it is intended that the in-place mitigation "bank" will provide incentives for conservation and exert "self-discipline" on Camp Pendleton in its application, so that the overall habitat value of the ecosystem progresses in an increasing fashion. Should an occasion arise, though not envisioned, that will necessitate use of the habitat assigned to the "bank", the Base will re-initiate formal consultation with the USFWS. The Commanding Officer of MCB Camp

[1] Were this bank not in place, higher mitigation ratios would likely ensue (on the order of 5:1 for riparian woodland habitat, 3:1 for riparian scrub habitat, and 2:1 for other quality habitat).

Pendleton is designated as the approving official for use of the in-place mitigation bank and flexibility categories.[2]

Camp Pendleton will develop a ledger to account for habitat quantities and impacts thereon. This ledger will start with the 1994 habitat baseline (Table 1). An annual report, submitted by the Base to the USFWS, provides a year-to-date balance based on debits associated with project impacts and mitigation actions (credits). As previously mentioned the ledger balances will be realigned based on the periodic riparian ecosystem analysis.

2.5. Plan Implementation

2.5.1. Avoidance and Minimization

This plan places a premium on avoiding and minimizing destruction or disturbance of sensitive species and their habitat. A major component of this plan is the "programmatic instructions" that are followed during the planning and implementation of projects and activities. These instructions are aimed at assuring the avoidance and/or minimization of adverse effects to sensitive species and habitats within the riparian ecosystem. The programmatic instructions direct that projects must first try to avoid impacts and then focus on minimizing unavoidable impacts. Siting priorities for projects that must occur in riparian habitat are in descending order: 1) exotic infested habitat; 2) "other" habitat; 3) riparian scrub; and 4) riparian woodland (from the "flexibility" account).

2.5.2. Mitigation

With respect to mitigating for unavoidable impacts, this plan focuses, at least initially, on exotic plant control because eradication of exotic invasive plant communities is considered crucial to maintaining the health of the overall ecosystem. The actual implementation of eradication efforts will be based on individual (future) project impacts or on-going activity impacts, and conservation enhancement programs, funds permitting in the latter case. It is expected that eradication operations will occur annually in significant, cost-effective blocks, and will not be tied to the timing or location of individual projects (other than their aggregate contribution to the annual total of mitigation requirements).

Compensation for activities that do not fit within the Riparian Conservation Plan (e.g. Riparian Resources Floodplain Goals) or Programmatic Instructions shall be subject to informal or formal consultation with the USFWS.

To determine the amount of mitigation compensation acreage associated with any project, this plan incorporates a sliding mitigation scale to enable determination of mitigation ratios. These ratios are keyed to the size of the current "bank" balance. This will exert further discipline in the exercise of land use management planning within the riparian ecosystem, through imposition of penalties (increasing mitigation ratios) for maintenance of a relatively small bank and incentives (decreasing mitigation ratios) for increasing the bank balance. In essence, the lower the available bank balance, the higher the mitigation compensation that will be required. Conversely, the higher the bank balance, the lower the mitigation ratio that will be used.

[2] These actions will fall into the Class 1 category, as discussed in Section E.3.4.

2.5.3. Permanent Impact Compensation

The plan establishes a set of exponential functions that will be used to determine mitigation compensation ratios. These are indexed relative to the acreage retained within the bank. With a bank balance of zero (0), mitigation ratios would be on the order of 5:1 for high quality, 3:1 for medium quality, and 2:1 for low quality habitat. Given the Base's initial base and bank balance of 2200 acres of habitat, lower mitigation ratios on the order of 2.0:1 (two acres of arundo eradication for loss of 1 acre of habitat) for Riparian Woodland and Open/Gravel area habitat; 1.5:1 for Riparian Scrub, Freshwater Marsh, Mixed Woodlands, and Sycamore Grassland habitat; and 1.1:1 for all other habitat types (to include *Arundo* and *Tamarix*, were established by the plan. The function was developed to significantly increase compensation requirements should the bank balance decrease from its current level and to gradually decrease mitigation ratios as the bank balance increases.

Mitigation compensation ratios will be accomplished for projects sited in riparian habitat on the basis of the following equations:

Equation 2: (for riparian woodland and open water/open gravel area habitat type impacts)
$CRH2\ (bb) = 3.40\ e^{-bb/450} + 1.60$

Equation 3: (for riparian scrub, fresh water marsh, mixed woodland, and sycamore grassland habitat type impacts)
$CRM2\ (bb) = 1.7\ e^{-bb/450} + 1.3$

Equation 4: (for all other quality habitat type impacts [3])
$CRL2\ (bb) = 1.00e^{-bb/450} + 1.0$

where e = Inverse natural logarithm
where bb = In-place conservation bank balance

Appropriate mitigation compensation ratios are determined (based on the annual bank balance); mitigation compensation costs (in acreage) will be determined by the following equations:

Equation 5: (for riparian woodland and open water/open gravel habitat type impact)
$Cost_{RW} = (Impact_{RW})\ CRH2\ (BB)$

Equation 6: (for riparian scrub, freshwater marsh, mixed woodlands, and sycamore grassland habitat type impacts)
$Cost_{RS} = (Impact_{RS})\ CRM2\ (BB)$

Equation 7: (for other quality habitat impacts)
$Cost_{Other} = (Impact_{Other})\ CRL2\ (BB)$

[3] Although the USFWS does not generally consider habitat dominated by exotic invasive vegetation to be suitable for support of sensitive wildlife, compensation calculated using this function will also be applied to include *Arundo* and *Tamarix* categories of habitat, as compensation for loss of floodplain acreage.

The total compensation required (Equation 8) for permanent impact associated with a project would be the sum of the costs calculated through Equations 5, 6, and 7.

Equation 8: (for total costs)

$$Compensation = Cost_{RW} + Cost_{RS} + Cost_{Other}$$

2.5.4. Temporary Impact Compensation

Temporary impacts are impacts associated with a project that does not result in the permanent removal of habitat from the ecosystem (impacts other than fire), but are temporary (0-4 years) in nature. Compensation for temporary impacts is based on length of the effect of the impact relative to the time of the vireo breeding season (Table 2).

TABLE 2. TEMPORARY IMPACT COMPENSATION

Temporary Effect Period (Breeding Season [X] of Vireo)	Compensation Percentage of Permanent Effect Value (Of Equations 6, 7, & 8)
X < 1.0	0%
1.0 <= X < 2.0	25%
2.0 < = X < 3.0	50%
3.0 <= X < 4.0	75%
X => 4.0	100%

2.5.5. Alternative Mitigation Methods

This plan also incorporates some flexibility into its mitigation strategy by allowing up to 20% of future mitigation requirements to be fulfilled by conservation actions other than exotic plant control. These other actions will also promote the maintenance of riparian ecosystem integrity. This flexibility is not intended to reduce the scope of current conservation efforts on the Base.

In partnership with the USFWS or other entities, Camp Pendleton may elect to focus compensation actions elsewhere within the ecoregion that promote recovery efforts of endangered and threatened species or their habitat. Such off-Base compensation efforts could occur with the caveat that species population and habitat goals continue to be met on Camp Pendleton.

This plan proposed that the expenditure of $12,000[4] for other conservation measures be considered comparable to performing an acre of exotic plant eradication. Such other measures considered to benefit wildlife and habitat in general would include: 1) cowbird trapping; 2) predator management; 3) fencing; 4) biological studies (as approved by the USFWS to fill voids in knowledge concerning species); 5) signs for conservation areas; 6) biological monitoring; 7) erosion control; 8) surveys of candidate species; and 9) habitat mapping. The mix of compensation measures proposed for any particular mitigation requirements will be based on the goal of achieving and maintaining a healthy riparian ecosystem.

[4] In 1994 dollars or other mutually agreed upon index.

2.5.6. Balancing the Habitat Ledger

The final phase of mitigation calculations is the task of balancing the books based on the actual mitigation transactions that have occurred during the previous fiscal year. This plan proposes to accomplish this in the following manner:

1) Debit the project direct impacts from the appropriate habitat accounts.
2) Credit the appropriate accounts with whatever habitat enhancement was accomplished.[5]
3) Determine appropriate non-exotic control compensation measures required to complement conservation plan goals (to fulfill the remaining 20% of compensation required).

2.5.7. Habitat Goals through Time

Using the procedures in the preceding paragraphs, this plan assumes that over time the balance of habitat for the respective accounts will increase from the 1994 Baseline successively to the goal whereby exotic plant communities have been eradicated from the riparian ecosystem.

2.5.8. Monitoring

Sound management of species and their habitats requires accurate and current data regarding their status and trends. In order to acquire and maintain this data, this plan proposed to:

1) Finish a two year herpetological inventory; identify additional toad sites. Use data from above surveys to establish long-term arroyo toad population/habitat goals in consultation with the USFWS.
2) Share all applicable digital GIS data for biological resource mapping on Base (existing survey, topography, vegetative layers, etc.) in with the USFWS.
3) Inventory the Bases riparian, habitat within 3 years of issuance of the riparian BO (Oct 1995) using aerial photography. Thereafter, the habitat inventory will be updated as necessary, but not more frequently than once every 5 years. However, the periodicity of such analysis may be modified to a more or less frequent basis depending upon circumstances and when mutually agreed to.
4) Continue ongoing surveys of listed species, provided funding remains available.
5) Pursue funding to conduct surveys/studies of candidate and other sensitive species to determine their status on Base.

2.6. Programmatic Instructions

The following programmatic instructions have been developed in order that on-going and planned actions will avoid and minimize adverse effects on listed and other sensitive species to the maximum extent practical.

[5] Target eradication toward 80% (the minimum allowable amount) of the mitigation compensation acreage required (Equation 8) in the exotics category and subtract this amount from the exotics ledger. Transfer a "credit" of this acreage total to the appropriate habitat type created in either the Bank or Flexibility categories as management determines.

2.6.1. General Instructions

1) All actions which "take (develop)" habitat or degrade riparian habitat shall be compensated for pursuant to the program activity classifications identified in Section C.3.
2) Avoid and minimize impacts as much as possible.
3) All activities shall comply with NEPA.
4) Conduct enhancement activities and studies that will benefit regional habitat conservation. Appropriate compensation credit will be given to the Base for these activities and studies.

2.6.2. Instructions for Military Training Activities

1) All units must follow Fire Danger Rating System (FDRS).
2) Vehicle movement in riparian areas shall remain on existing roads.
3) Helicopters shall operate at an altitude in excess of 200 feet AGL over riparian areas except when landing or taking off between 15 March and 31 August.
4) Helicopter use is to be minimized between 0600 and 1100 during the breeding season at the TALA.
5) Ground troop movements in riparian areas are authorized year-round only on existing roads, trails and crossings. Reduce or eliminate troop maneuvers and tank traffic in riparian areas during Least Bell's Vireo breeding season, 15 March to 15 August.
6) Foot traffic shall remain outside of all fenced or posted sensitive areas during the breeding season. Foot traffic in the beach and estuary areas is authorized year-round outside fenced or posted areas.
7) No bivouacking or trenching is allowed in riparian areas.
8) No vegetation may be cut except exotic plant species, in consultation with AC/S ES.
9) No engineering, grading, or filling activities in riparian areas without prior approval from AC/S ES.
10) Small boats are authorized in riparian/estuarine areas outside breeding season.
11) Foot traffic associated with small boats activities is authorized in the riverbed.

2.6.3. Instructions for Facilities Maintenance Activities

1) No tree trimming in natural areas during breeding season. Trimming of landscape trees may occur all year in compliance with MBTA.
2) Tree trimming shall avoid entire trees except exotics or landscape plantings.
3) Exotic species shall be removed.
4) Tree trimming equipment shall be operated from roads only.

5) No maintenance vehicles shall operate in riparian areas without approval from AC/S ES.

6) Trimming shall extend no more than 10 feet from communication/power lines.

7) Trimming for improved road safety shall extend no more than 10 feet from road edge.

8) No road/culvert repairs shall be scheduled during breeding season.

9) Water bars on roads and firebreaks are required to the extent practical.

10) Exotic vegetation shall be thoroughly dried and properly disposed.

11) Sediment runoff shall be contained on construction sites.

12) Proper erosion control on slopes shall be implemented.

2.6.4. Instructions for New Construction

1) NEPA planning and review process shall be followed.

2) New construction sites will be identified in following priority: 1) previously disturbed; 2) Exotic dominated habitat; 3) Other habitat; 4) Riparian Scrub, mixed woodlands, or sycamore grassland habitat; and 5) Riparian Woodland habitat. Impacts to Freshwater marsh and open water/gravel areas will be minimized to the extent practical.

3) New construction sites will avoid already severely constricted riparian habitat.

4) Funding for habitat compensation will be identified as part of construction cost during planning process. To the maximum extent possible, funds for habitat compensation will be secured before contracts are awarded.

5) The NEPA process will be used to assess biological impacts.

6) Conservation goals addressing habitat protection shall be met.

7) Compensation formulae shall be followed.

8) No construction shall occur in occupied riparian habitat during the breeding season to the maximum extent practical.

9) No habitat shall be cleared during breeding season. Cutting or mowing will be used in place of blading or uprooting vegetation whenever practical.

10) Temporarily affected habitat will be treated for a minimum of five years for weed control; compensation is required for impacts extending beyond one breeding season.

2.6.5. Instructions for Recreation Activities

1) No motor vehicles are authorized off-road or off-trail.

2) No off-road vehicles, all-terrain vehicles, motorcycles or other vehicles are authorized in riparian areas except on existing roads.

3) Foot and vehicular traffic is prohibited from posted or fenced areas during breeding season.

4) No littering.

5) No cutting of vegetation.

6) No fishing with live bait fish or amphibians.

7) No gasoline powered motorized watercraft except on Lake O'Neill.

3. ACTIVITY CLASSIFICATION SYSTEM FOR FUTURE CONSULTATION

This Conservation Plan established a system to manage the conduct of future consultations between the USFWS and the Base. The purpose of this system is: 1) to reduce staffing requirements; 2) to provide a systematic approach to deal with future proposed projects, activities and operations; 3) to increase the Base's mission flexibility; 4) to satisfy Section 7(e)20 of the ESA requirements for future programmatic consultations; 5) to define activities which require formal consultation with the USFWS.

This "activity class" system is not intended to negate the requirement for consultation in the future. On the contrary, it is intended to define activities whose consultation requirement is programmatically covered by the BO covering this management plan or those for which no further consultation is required. This system establishes an annual reporting procedure for newly initiated Base activities, the effects of which are relatively minor and easily covered under the conservation plan. Further, the system defines types of activities for which an expedited consultation process can be implemented.

This plan sorts Base activities into the following four categories: Class IV, III, II and I.

3.1. Class IV

3.1.1. Definition

Class IV activities are defined as any activity that does not have the potential to affect listed or proposed species. No Section 7 consultation is required for such activities.

3.1.2. Examples

1) Foot traffic on existing roads during all seasons.

2) Light foot traffic (movement by individuals) off of existing roads during the non-breeding season outside of posted nesting areas.

3) Vehicle operations on existing paved and dirt roads, including established creek crossings, during all seasons.

4) Vehicle operations off of existing roads in habitat assigned to the flexibility category in the riparian ecosystem and outside the Tern/Plover Management Zone in the estuarine/beach ecosystem during the non-breeding season.

5) Aircraft operations over riparian habitat during the breeding season above 300 feet AGL, to include take-offs and landings at designated LZ's, CAL sites and VSTOL pads.

6) Live firing on established ranges.

7) New construction within cantonment areas that do not result in additional habitat degradation.

8) Vegetation management during the non-breeding season:

- Limb Trimming of all vegetation within 10 feet of roads or aboveground transmission cables.
- Exotic Plant Control in all areas.

9) Maintenance activities during the breeding season:

- Use of existing facilities and ranges, that do not result in take of occupied habitat.
- Culvert clearing of all vegetation within 15 feet of culvert entry and exit points.
- Road Maintenance of existing roads.
- Desilting of inlet and outlet channels for Lake O'Neill and infiltration ponds.
- Night-time Lighting including lighting from existing facilities and indirect illumination from pyrotechnics to the extent the Fire Danger Rating System allows.
- Exotic Plant Control in areas greater than 100 feet from occupied habitat during the breeding season.
- Recreational Access pursuant to Marine Corps Order P5090, Base Order P5000 and programmatic instructions.
- Vehicle traffic on existing roads.
- Foot traffic during state authorized hunting seasons.
- Maintenance activities that do not remove native vegetation within 100 feet of occupied habitat.
- Hunting of game during authorized seasons, except posted or fenced areas.
- Hiking, running, and bird watching along established trails.
- Fishing within waterways, along designated beaches and within lakes or ponds.

3.2. Class III

3.2.1. Definition

Class III activities are those discrete projects that "may affect" listed or proposed species. Potential effects to the species and their habitat are limited and considered offset by the on-going implementation of this conservation plan. An annual report of activities occurring under this class is sent to the USFWS at the end of each fiscal year.

Class III activities are those which may potentially result in adverse effects to species in the riparian ecosystem that:

1) Are temporary ($\leq$12 months) disturbance regardless of species: individual activity: less than 150 acres of Arundo, Tamarix, or Grass Forb Mix habitat, less than 30 acres of Freshwater Marsh or Open/gravel habitat areas; less than 10 acres of Mixed Willow Exotic habitat; less than 10 acres of Riparian Scrub, Sycamore Grassland, Mixed Woodlands or Riparian Woodlands habitat.

2) Result in less than 10 acres of disturbance of arroyo toad habitat per year.

3) Cumulative temporary disturbance per year less than 200 acres.

4) Permanent disturbance regardless of species: less than 10 acres of Grass Forb Mix, Arundo, Tamarix; less than 3 acres of Freshwater Marsh, Mixed Willow Exotic, Sycamore Grassland, Mixed Woodlands, Open water/gravel habitat; less than 2 acre Riparian Scrub or Riparian Woodland habitat.

5) Cumulative permanent disturbance per year of less than 15 acres.

3.2.2. Examples

1) Aircraft overflights below 300 feet AGL over occupied territories of listed species during the breeding season along established Terrain flight (TERF) routes.

2) Small boats in the Santa Margarita River during the non-breeding season (military training and hunting).

3) Off-road troop movement (large groups) during the non-breeding season.

4) Indirect lighting of habitat during breeding season.

5) Weed control activities:

   - That result in the use of power tools during the breeding season within 100 feet of occupied habitat.
   - That result in affecting native vegetation of occupied habitat.
   - That use Rodeo or equivalent cut-stump or aerial spraying in occupied habitat.

6) Controlled burns conducted for habitat enhancement and protection during the non-breeding season.

7) Temporary sustained noise levels above 80 dBA L_{eq} hourly as measured over a 7 day period during the breeding season.

8) Vehicle access for enhancement activities.

3.3. Class II

3.3.1. Definition

Activities that may affect listed species and for which impacts may or may not be offset by the conservation plan with associated compensation measures and that require concurrence from the USFWS via a separate project concurrence letter. Concurrence letter will specify the project description for the proposed action; avoidance and minimization measures effected; programmatic instructions recommended for implementation; assessment of the impact to listed species and associated habitat for direct and indirect effects (with the exception of dust and noise); annual bank balance; compensation requirements using Equation 9; and mitigation compensation measures proposed.

- Temporary ($\leq$12 months) disturbance regardless of species individual activity: more than 150 acres of Arundo, Tamarix, or Grass Forb Mix, more than 30 acres of Freshwater Marsh or Open water/gravel habitat; more than 10 acres of Mixed Willow Exotic habitat; more than 10 acres of Riparian Scrub, Sycamore Grassland, Mixed Woodland or Riparian Woodland habitat.
- Cumulative temporary disturbance per year that exceeds 200 acres.

- Permanent disturbance regardless of species: more than 10 acres of Grass Forb Mix, Arundo, Tamarix; more than 3 acres of Freshwater Marsh, Mixed Willow Exotic, Sycamore Grassland, Mixed Woodland, Open water/gravel habitat; more than 2 acre Riparian Scrub, Riparian Woodland habitat.
- Cumulative permanent disturbance per year that exceeds 15 acres.

3.3.2. Examples

General

1) Aircraft overflights below 300 feet AGL over occupied territories of listed species during the breeding season.
2) Results in lighting of habitat during breeding season that directly affects listed species.
3) Weed control activities that occur during the peak of the breeding season (March through June).
4) Aerial spraying of pesticides between March through August.
5) Result in more than 10 acres of disturbance of arroyo toad habitat per year.
6) Result in permanent sustained noise levels above 80-dBA l_{eq} hourly calculated over a 7 day period during the breeding season.
7) Aircraft overflights below 300 feet AGL over nesting sites of listed species during the breeding season.

Project Examples

1) Levee modification from that of BA and repair of existing levee.
2) Desilting activities in the riverbed, in addition to those identified in the BA submitted for this plan.
3) Major utility installation exceeding Class III acreages.
4) New road construction exceeding Class III acreages.
5) New facilities, structures or habitat modification that affects significant quantities of habitat (exceeds Class III acreages).
6) Construction of new nesting island in Santa Margarita Estuary.
7) Design changes to Basilone Bridge (P-030), Compass Calibration Pad and Hot Fuel Pits for MCAS.

3.4. Class I

3.4.1. Definition

Activities whose impacts are not offset by this Conservation Plan and/or additional mitigation not agreed upon through informal consultation. These activities will trigger the requirement to enter into formal consultation and require preparation of a separate BA by the Base, and consequent issuance of a BO by the USFWS. Reference may be made to measures within this Plan and its BO as guidelines for avoidance or minimization measures. However, credit for

conservation plan activities conducted under this plan will not accrue to this "new consultation" and for which significant, separate compensation will be required (using guidelines of the opinion).

- Activities that result in the potential to lower groundwater greater than 5 feet from existing conditions (1995) for vegetation demonstrated to be groundwater dependent.
- Activities that result in permanent cutoff of riparian habitat from the effects of scour and aggregation caused by flood effects.
- New flood control levees.
- New roads in previously undisturbed riparian areas.

3.4.2. Examples

1) Major increases (beyond historical withdrawals) in groundwater extraction, and major changes in groundwater basin management plans.
2) Projects that significantly affect the floodplain dynamics, and destroy wetlands (beyond the criteria previously established).
3) Projects that will extirpate or will have a significant effect on a species in a single drainage.
4) Maneuver corridors through the San Mateo Basin.

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Appendix M

Riparian and Estuarine/Beach Biological Opinion: Reasonable and Prudent Measures and Terms and Conditions

APPENDIX M

RIPARIAN AND ESTUARINE/BEACH BIOLOGICAL OPINION: REASONABLE AND PRUDENT MEASURES AND TERMS AND CONDITIONS

The following sections are excerpted from the USFWS Riparian and Estuarine/Beach Biological Opinion (1-6-95-F-02). Page and section references referred to in the text correspond to pages and sections within that document unless otherwise noted.

REASONABLE AND PRUDENT MEASURES (PAGES 31-32)

The following reasonable and prudent measures are necessary and appropriate to minimize the impact of incidental take. The measures below are nondiscretionary and must be undertaken by the Marine Corps.

1. The Marine Corps will adopt and implement the Riparian Habitat Conservation Plan, as specified in Section 4.1 of the BA and in the Project Description (Appendix 1) of this Opinion, including the programmatic instructions to regulate all training and other mission-related operations, Base infrastructure maintenance, and recreational activities, in and adjacent to riparian habitats to help ensure that the population and habitat goals are achieved and the impact of incidental take is avoided and minimized to the maximum extent practicable.

2. The Marine Corps will adopt and implement the Estuarine/Beach Ecosystem Conservation Plan, as specified in Section 4.2 of the BA and in the Project Description (Appendix 1) of this Opinion, including the programmatic instructions to regulate all training and other mission-related operations, Base infrastructure maintenance, and recreational activities, in and adjacent to estuarine/beach habitats to help ensure that the population and habitat goals are achieved and the impact of incidental take is avoided and minimized to the maximum extent practicable.

3. The Marine Corps will institute a monitoring program to assess the effectiveness of the programmatic ecosystem conservation plans based on high resolution aerial photography, GIS maps/data, and ground-truthing techniques, and reliable population censusing methods. The elements of this monitoring program are specified in Appendix 4. This monitoring program should accommodate an adaptive management approach.

4. The Marine Corps will take measures to assess threats to the survival and recovery of the tidewater goby and arroyo toad on Base.

5. The Marine Corps will continue to examine the least environmentally damaging alternative in the further planning stages of the SMR Flood Control - Construction

Flood Levee/Wall Project and all other activities and construction projects involving the permanent loss of riparian and estuarine/beach habitat.

6. The Marine Corps will develop and implement a monitoring program that tracks compliance with the levels of take, and the measures and terms and conditions of the Incidental Take Section of this Opinion.

TERMS AND CONDITIONS (PAGES 32-37)

To be exempt from the prohibitions of Section 9 of the Act, the following terms and conditions, which implement the reasonable and prudent measures described above, must be complied with in their entirety.

1. To assure the implementation of reasonable and prudent measure #1 above, the Marine Corps shall:

   (a) Adopt and implement the Riparian Ecosystem Conservation Plan, as specified in Section 4.1 and 4.3 of the BA and outlined in the Project Description (Appendix 1) of this BO, and as modified in Appendix 5, including the programmatic instructions to regulate all training & other mission-related operations, infrastructure maintenance, and recreational activities which affect riparian habitats on Base.

   (b) Obtain concurrence from the Service that impacts are adequately offset by the Riparian Ecosystem Conservation Plan for any activity not specifically addressed in the Programmatic Instructions or otherwise covered herein.

   (c) Develop and implement mitigation measures (e.g., habitat enhancement) for future proposed training and maintenance actions (i.e., those not addressed in this Opinion) that may affect listed species or riparian habitat. Funding for measures that minimize (mitigate) the potential adverse impacts on the riparian and estuarine/beach ecosystems shall be identified as part of these future proposed actions during the planning process and shall be secured prior to initiation of such actions.

   (d) Restore riparian and estuarine/beach areas temporarily disturbed due to non-routine maintenance and construction activities to original or better condition, including: A combination of exotic vegetation control and vegetation management (including replanting if necessary) that will permit native species to regenerate in a timely manner (approximately 3-8 years). This method is to be implemented on areas temporarily disturbed during project construction, or affected by non-routine maintenance, fire, or other activity. This restoration shall include weeding and monitoring of affected areas for a minimum of 3 years. Rehabilitation of natural (non-weedy) areas disturbed by construction shall use the original topsoil to the maximum extent practical. Salvaging of native vegetation shall be implemented where feasible. In addition the Base shall mitigate for the disruption and temporary loss of habitat function by

performing habitat enhancement per the compensation formula specified in the Base's Riparian Ecosystem Conservation Plan (Section 11.5.4 of Appendix 1).

(e) Once exotic vegetation has been removed from the floodplain as a mitigation measure, the Base shall assure that the enhanced area remains free of recolonization by exotic vegetation for a minimum period of 5 years. Thereafter the Base shall make a reasonable effort to maintain the enhanced status of the area consistent with the goals of the ecosystem conservation plans.

(f) Treat any future action which is not described in the Project Description and which may result in a permanent loss of riparian wetland, no matter its quality, as a Class II or Class I activity[1] requiring informal consultation with written concurrence from the Service or initiation of formal consultation with the Service pursuant to Section 7 of the Act.

2. To assure the implementation of reasonable and prudent measure #2 above, the Marine Corps shall:

(a) Adopt and implement the Estuarine/Beach Ecosystem Conservation Plan, as specified in Section 4.2 and 4.3 of the BA and outlined in the Project Description (Appendix 1) of this BO, and as modified in Appendix 5, including the programmatic instructions to regulate all training & other mission-related operations, Base infrastructure maintenance, and recreational activities that affect estuarine/beach habitats on Base.

(b) Obtain concurrence from the Service that impacts are adequately offset by the Estuarine/Beach Ecosystem Conservation Plan for any activity not specifically addressed in the Programmatic Instructions or otherwise covered herein.

3. To assure the implementation of reasonable and prudent measure #3 above, the Marine Corps shall:

(a) Institute a monitoring program to assess the progress toward the accomplishment of the ecosystem, habitat and species goals specified in the Base's riparian and estuarine/beach habitat conservation plans. The monitoring program shall be based on high resolution aerial photography, GIS maps/data, and ground-truthing techniques, and reliable population censusing methods. The minimum requisite elements of this monitoring program are specified in Appendix 4.

(b) Identify and notify by way of periodic correspondence proposed program and monitoring adjustments (adaptive management) needed to achieve the goals and meet management objectives. These adjustments shall be submitted to the Service on at least an annual basis during the fourth quarter of each calendar year. A follow-up meeting shall occur between the Base and the Service within 60 days of receipt of the notification but no later than January 31.

(c) The Base shall informally consult with the Service in developing the monitoring program to track the effectiveness of the exotic vegetation control program. At a minimum, this program shall employ aerial photography and ground surveys.

Transects and monitoring control plots shall be used where deemed necessary for specific projects.

4. To assure implementation of reasonable and prudent measure #4 above, the Marine Corps, with assistance of the Service, shall assess the severity of threats to tidewater goby and arroyo toad posed by green sunfish, bullfrog, and other likely predators/competitors. If mutually deemed a threat of sufficient magnitude that may preclude attainment of recovery objectives on Base for these listed species, the Base shall implement specific control programs for invasive non-native plants and predatory animals.

5. To assure implementation of reasonable and prudent measure #5 above, the Marine Corps shall:

   (a) Continue to examine with the Service and other appropriate regulatory agencies the environmentally (biologically) least damaging alternative in the further planning stages of all proposed activities considered herein potentially resulting in the permanent loss of riparian and estuarine/beach habitats, including the SMR Flood Control - Construction Flood Levee/Wall Project.

   (b) Assure that whichever alternative is selected is designed to reduce loss of endangered species habitat and wetlands/floodplains to the maximum extent feasible. The Service shall review and concur with the final SMR flood control structure design and construction footprint prior to initiation of construction in order to design management capability and assure the maintenance of endangered species habitat isolated behind the flood control structure.

   (c) Assure that the extent of any clearing of riparian woodland/scrub outside the footprint of the flood control structure is minimized to the maximum extent feasible. The Service shall review and approve any clearing or other modification of riparian vegetation associated with the maintenance and operation of the flood control structure prior to any such disturbance.

   (d) Restore the functional value of wetland habitat currently dominated by Arundo to offset the permanent loss of listed species habitat resulting from all activities covered in the proposed action at a 3:1 ratio; and adopt any additional habitat replacement requirements deemed necessary through applicable Federal wetlands policies and the U.S. Army Corps of Engineers 404 regulatory program. The area from which the Arundo is removed shall be revegetated to a point that it replaces the endangered species value of the permanently disturbed area. The restoration effort shall begin before or immediately upon approval of the individual activity/project and avoid the breeding season of the vireo and flycatcher. Since habitat dominated by Arundo is considered “wetland,” creation of wetland is not being required. Consequently a grading and irrigation plan will not be necessary. However, a planting, monitoring and maintenance plan shall be required. These plans shall be approved by the Service.

   The latter revegetation effort may be substituted by additional Arundo control; in this case the acreage of Arundo removed shall be at a 10:1 ratio.

(e) Once exotic vegetation has been removed from the floodplain as a mitigation measure, the Base shall assure that the enhanced area remains free of recolonization by exotic vegetation for a minimum period of 5 years. Thereafter the Base shall make a reasonable effort to maintain the enhanced status of the area consistent with the goals of the ecosystem conservation plans.

6. To assure the implementation of reasonable and prudent measure #6 above, the Marine Corps shall develop and implement a monitoring program that includes the minimum requisite elements described in Appendix 4. The monitoring program shall track and document:

   (a) Compliance with the provisions of the Base's ecosystem programmatic instructions.

   (b) Compliance with the authorized take, measures and terms and conditions of the Incidental Take Section of this Opinion.

Unless otherwise specified herein, incidents of non-compliance shall be reported in writing to the Service within one working day.

MONITORING PROGRAM (APPENDIX 4)

The following guidelines shall be used to develop a monitoring program:

1. The monitoring program will be designed to determine:

   - Attainment of management objectives in the programmatic ecosystem conservation plans.
   - Compliance with the provisions of the Base's ecosystem programmatic instructions, and the Service's reasonable and prudent measures and incidental take statement.
   - Adjustments needed to achieve management objectives and compliance with terms and conditions of this Opinion.

2. The monitoring program will be based on high resolution aerial photography, GIS maps/data, and ground-truthing techniques, and reliable population census methods.

3. The monitoring program will:

   - Track plant community distribution, habitat function and value, listed and candidate species' distribution and status.
   - Provide Service with all applicable digital GIS data for biological resource mapping on Base [existing survey, topography, vegetative layers, etc.] for input onto the Service GIS system in 1995.

- Monitor habitat status by providing the Service color aerial photography at appropriate scale and quality of all drainages on Base, including coastal areas, every 2 years (or as mutually modified in the course of annual program review), starting in 1996. The Base will supply copy prints of the September 1994 photos used for the current vegetation mapping done on Base.
- The Base will continue its groundwater monitoring in all drainages where groundwater is extracted to determine and manage the potential effect on listed species habitat.
- The Base will monitor stream water quality, flood regimes, and storm event frequency.
- The Base will monitor the effects of sedimentation in SMR Estuary and coastal lagoons which are subject to upstream disturbance from programmatic and construction activities addressed in this Opinion.
- The Base will continue to monitor the SMR Estuary for water quality and tide level and document the periods when the other coastal lagoons are subject to tidal influence.
- The Base will provide annual surveys for the vireo and flycatcher. Annual population levels will be calculated and locations mapped. Vireos and flycatchers will be surveyed for by detecting singing males.
- The Base will provide an annual report of animal damage control, predator management, and cowbird control activities on Base. This report will note the species, both native and exotic, affected by these management activities. In addition, the location by drainage, the numbers trapped or dispatched or translocated will be noted. Exotics noted will include brown-headed cowbird, bullfrog, green sunfish, bluegill, mosquito fish, largemouth and smallmouth bass, and others as appropriate for purpose of adaptive management of riparian and estuarine/beach ecosystems.
- The Base will monitor the population status of the tidewater goby on Base at least every three years.
- The Base will provide breeding population estimates and reproductive success of tern and plover on the Base on an annual basis.
- Provide for submission to the Service annual reports involving each of the monitoring activities.

4. The monitoring program will:

- Track the occurrence of accidents and unauthorized activities in riparian and estuarine/beach ecosystems on Base. These events will be reported to the Service within 24 hours.
- Develop a tracking system that records the level of ongoing programmatic activities in order to document trends in the frequency, magnitude, and extent of these activities on an annual basis.
- Track the early planning phases of future activities, including major training exercises, and construction projects in order to assure the implementation and

compliance with programmatic instructions and early consultation with the Service if appropriate.

TERMS AND CONDITIONS - DETAIL (APPENDIX 5)

The following terms and conditions have been developed in order to implement the reasonable and prudent measures set forth in the Incidental Take section of this Opinion. Several of these terms and conditions enhance or otherwise add to the basic elements of the Base's ecosystem conservation plans described in the BA and Appendix 1 of this Opinion, including the goals, programmatic instructions and mitigation protocol.

General

- The Base shall assure that project proponents consult with AC/S ES staff early in the planning process, and that priority is given to the siting of proposed projects in areas that are not in riparian or estuarine/beach habitats.
- Where there are discrepancies between the project description, including the ecosystem conservation plan, as specified in the BA and the project as described in the Project Description section and Appendix 1 of this Opinion, the description in the latter shall take precedence. The Project Description section and Appendix 1 of this Opinion were developed mutually between the Base and the Service and reflect in many instances a modification and refinement of the project as originally described in the BA.
- Excessive noise (above 60 dBA leq hourly) related to all Base activities in or adjacent to riparian areas shall be avoided and minimized year round, but particularly during the breeding season. Noisy activities shall be concentrated spatially and temporally, particularly during the breeding season, to the maximum extent practical.

On-going and Planned Training

- The Base shall comply with the programmatic instructions enumerated in Section 4.1.3.1 of the BA.
- Vehicle traffic occurring at night on roads in potential arroyo toad habitat during the period of 15 March through 1 July shall be minimized to the maximum extent possible.
- Vehicle traffic in undeveloped crossings in potential arroyo toad habitat during the period of 15 March through 30 August shall be minimized.
- Dust produced in or adjacent to riparian areas shall be minimized to the maximum extent practical.
- The Base shall assure that aircraft operations shall be conducted not lower than an altitude of 300 feet AGL over vireo and flycatcher occupied riparian areas, to the maximum extent practical. The following aircraft operations are exceptions:

    - When landing and take-off from designated CAL, LZ, VSTOL, TALA/HOLF and air station runways.
    - When operating under the control of the tower in an airport traffic area.
    - When complying with regulations related to operations, weapons delivery profiles, emergencies, special visual flight rule (VFR) conditions.
    - Low-level flight (100-200 feet AGL) operations required by the mission and when operating, training or exercising contour and map of the earth tactics (0-100 feet AGL) along designated TERF routes.
- The Base shall assure that helicopter use at TALA is minimized between 0600 and 1100 during the breeding season to the maximum extent practical.

Infrastructural Maintenance

- The Base shall comply with the programmatic instructions enumerated in Section 4.1.3.2 of the BA.
- The Base shall assure that no engineering, grading, or filling activities in riparian areas occur without prior approval from the AC/S ES.
- Secondary roads shall be maintained to the extent practical in order to avoid ponding of water on the road surface in and adjacent to potential arroyo toad habitat.

Proposed and New Construction

- The Base shall comply with the programmatic instructions specified in Section 4.1.3.3 of the BA.
- Sediment runoff shall be contained on construction sites through the use of siltation fences, hay bales, sand bags, silt ponds, or other methods as determined by AC/S ES.
- Dust produced in or adjacent to riparian areas shall be minimized. Measures (such as chemical treatment) used on the ground surface to minimize dust shall be biologically sound.
- All riparian and estuarine/beach areas temporarily disturbed by construction activities will be treated for a minimum of 3 years post-construction to control the establishment of exotic vegetation within the cleared or otherwise disturbed area.
- The Base shall assure the implementation of biological monitoring and reporting during construction activities occurring in or adjacent to riparian and estuarine/beach areas.
- The Base shall assure the placement of signs indicating the necessity for all activities to be strictly confined to the project site.
- The Base shall assure that construction site boundaries are clearly delineated on the ground by flagging, survey lath or wooden stakes.

- The Base shall assure that all construction project personnel are briefed by the prime contractor(s) during all project phases regarding the potential presence of listed species, the requirements and boundaries of the project, the importance of complying with measures designed to avoid and minimize adverse effects to listed species potentially resulting from project activities, and problem reporting and rectification.

Recreational Activities

- The Base shall comply with the programmatic instructions specified in Section 4.1.3.4 of the BA.
- The Base shall assure that recreational activities are designed, organized, implemented, and regulated in such as way, so as to avoid and minimize impacts to listed species to the maximum extent possible. All proposals for new recreation (and modifications of existing program activities) shall be reviewed by AC/S ES personnel for compliance with this term and condition. Ongoing activities that may result in take of listed species shall be reviewed on an annual basis.

Ecosystem Conservation Program

Riparian Plan

- The breeding season for the vireo and the flycatcher shall be designated from 15 March to 31 August. The non-breeding season shall be defined as 1 September to 14 March.
- The breeding season for the arroyo toad shall be designated from 15 March to 15 June. Juvenile maturation shall be designated to extend an additional 8 weeks, that is, until 15 August. The non-breeding/non-maturation period shall be designated from 16 August to 14 March.
- The Base shall comply with the programmatic instructions specified in Section 4.1.3.5 of the BA and section 11.6 of Appendix 1 of this Opinion.

Monitoring

- The Base shall share data from the ongoing herpetological inventory with the Service as it becomes available.
- The Base shall monitor habitat status by providing the Service color aerial photography at Service approved scale and quality for vegetation mapping of all drainages on Base every 2 years (1996, 1998, etc.).
- The Base (or the Base in partnership with the Service) shall facilitate the annual monitoring of species population levels for vireo, flycatcher, and arroyo toad on Base. Determinations of species population trends shall be an integral part of the overall monitoring program.

- The Base (or the Service in partnership with the Base) shall facilitate the monitoring of floodplain and habitat acreage within the major drainages on Base. Determinations of achievement of acreage goals shall be an integral part of this monitoring.
- The Base shall prepare and submit to the Service for review and comment an annual report. This report shall include:
- A general summary of all projects that have been initiated on Base within the one year reporting period and will include:
    - A list of projects which implemented the provisions of this biological opinion.
    - The total acreage of listed species habitat lost or disturbed.
    - A summary of the effectiveness of take minimization measures.
    - A discussion of any problems encountered.
- A specific summary of each project undertaken. This report will detail:
    - Project name.
    - Project description.
    - Project location (map).
    - Total acreage of the project.
    - Acreage of listed species habitat lost and its relative condition.
    - Measures taken to ensure that "take" has been minimized or eliminated.
    - Total number of listed species that were taken, through injury, mortality, or harassment.
    - Data on take, if it occurs.
    - Any problems encountered with respect to implementing the provisions of the management plan.

Estuarine/Beach Plan

- The Base shall develop additional programmatic instructions designed to minimize to the maximum extent practical the take of western snowy plover potentially resulting from activities in the French Creek and Aliso Creek Lagoon areas.
- The breeding season for the snowy plover and least tern shall be designated 1 March through 15 September. The non-breeding season shall be defined 16 September to 28 February.
- The management actions specified in section 12.4.2 of Appendix 1 shall be implemented within a reasonable time frame. The implementation status of these proposed actions shall be reviewed on an annual basis.
- The Base shall adjust the Estuarine/Beach Ecosystem Conservation Plan to reflect the findings resulting from the multi-year study of the effects of tern management on snowy plovers.

- The Base shall implement the following strategies to maintain the beach/estuary ecosystem and support viable, expanding populations of sensitive species:
- New activities that could cause degradation to coastal wetlands, including reductions in water quality, and sensitive dune areas shall be considered a Class 2 activity.
    - Conservation measures currently in place as a result of the LCAC FEIS shall continue including the "off-limits" status of the Santa Margarita River Estuary (except as modified by this Opinion), and the protection and management of the Cockleburr sensitive area.
    - The conservation plan shall be updated as recovery plans for listed species are published so conservation efforts are consistent with recovery goals.
    - Information to Base personnel regarding sensitive species and restricted areas along the coastal areas shall be provided by publishing Base notices and establishing an interpretive kiosk for the Del Mar Beach recreational area.
    - Least terns and snowy plovers shall be monitored on an annual basis to determine number of pairs, hatching success, and reproductive success in order to assess the effectiveness of the conservation plan.

The Base shall assure that the following instructions shall be complied with to avoid and minimize impacts to estuarine ecosystems and listed species:

Military Training Activities

- During the tern and plover nesting season, the Base shall publish instructions which restrict aircraft from operating at an altitude below 300 feet AGL over the SMR plover management zone and the White Beach nesting area (see paragraph 12.4 of Appendix 1), except operations involving landing or taking off from LZ21, manuevering to avoid aircraft flying in FAA controlled airspace not subject to the restrictions of Airspace Restricted Areas R-2503A and B, and complying with regulations related to operations, emergencies, special visual flight rule (VFR) conditions (i.e., when weather conditions dictate a lower altitude must be flown for safe flight of the aircraft).
- Helicopter landings at Del Mar (LZ21) shall be minimized during the least tern/snowy plover breeding season to the maximum extent practical.
- Foot traffic in coastal lagoons and the Santa Margarita River Estuary shall be minimized to the maximum extent possible.
- Military and recreational activities will be kept to a minimum within the management zone during the non-breeding season in order to minimize disturbance to wintering snowy plovers.

New Construction Projects and Activities

- Future proposed construction projects that could result in the permanent loss of coastal wetland and major changes to current training activities that may affect listed species along the beach/estuary shall require informal or formal consultation with the Service (as a Class II or Class I activity).

Recreation Activities

- The Base shall develop programmatic instructions and measures to assure that recreational foot traffic, including fishermen, remain outside the nesting and foraging areas of the SMR management zone during the breeding season.
- Recreational activities shall be kept to a minimum within the management zone during the non-breeding season.
- Litter shall be deposited in proper disposal bins.

USFWS Ammendments Issued

Please see: USFW 1998h – n; USFWS 1999h – l; USFWS 2000e – g; USFWS 2001d – j; USFWS 2002f – h; USFWS 2003d – g; USFWS 2004l – p; USFWS 2005k – p; USFWS 2006i – j; USFWS 2007n – p; USFWS 2008m – t; USFWS 2009q – x; USFWS 2010i – m; & USFWS 2011m.

Appendix N

Species Accounts and Management Information

APPENDIX N
SPECIES ACCOUNT AND MANAGEMENT INFORMATION

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FIGURES

APPENDIX N LIST OF ACRONYMS AND ABBREVIATIONS

°C	degrees Centigrade
°F	degrees Fahrenheit
AFA	Artillery Firing Area
AMEC	AMEC Earth and Environmental, Inc.
BLM	Bureau of Land Management
BO	Biological Opinion
BPG	Biogeographic Population Group
CCA	Candidate Conservation Agreement
CDFW	California Department of Fish and Wildlife
cm	centimeter(s)
CNDDB	California Natural Diversity Data Base
CPIF	California Partners in Flight
DPS	distinct population segment
ECOS	Environmental Conservation Online System
ESA	Endangered Species Act
FDRS	Fire Danger Rating System
GIS	geographic information system
ha	hectare(s)
HCP	Habitat Conservation Plan
I-5	Interstate 5
INRMP	Integrated Natural Resources Management Plan
km	kilometer(s)
m	meter(s)
m^2	square meter(s)
MBTA	Migratory Bird Treaty Act
MCAS	Marine Corps Air Station
mm	millimeter(s)
mph	miles per hour
NCCP	Natural Community Conservation Plan
OHV	off-highway vehicle
PBDE	polybrominated diphenyl ether
PCB	polychlorinated biphenyl
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey

Federally Listed Wildlife Species

N.1. QUINO CHECKERSPOT BUTTERFLY (*EUPHYDRYAS EDITHA QUINO*)

The Quino checkerspot butterfly is a subspecies of the widespread Edith's checkerspot butterfly (*Euphydryas editha*). It is a medium-sized butterfly with a wingspan of about 1.5 inches (4 centimeters [cm]). The top of the wings have a patchwork of brown, red, and cream colored spots in a checkered pattern, and this species tends to be darker and redder than similar subspecies. Adult Quino checkerspot butterflies live from 10 to 14 days and emerge, mate, and selectively lay eggs on annual host plants during a 4- to 6-week flight period beginning from late January to early March and continuing as late as early May, depending on weather conditions (USFWS 2003a).

FIGURE N-1. QUINO CHECKERSPOT BUTTERFLY

The preferred host plant for Quino checkerspot butterfly is dwarf plantain (*Plantago erecta*), which occurs within scrub, chaparral, and grassland communities. About a week and a half after laying, the eggs hatch and the larvae begin feeding until the host plants die over the summer, at which point the larvae enter a period of diapause (physiological inactivity). In the late winter and early spring as the plants reappear, the larvae begin feeding again and enter a chrysalis phase before they emerge as adults during the next flight season completing the life cycle. Quino checkerspot butterfly populations often display a metapopulation structure and require conservation of temporarily unoccupied patches of habitat for population resilience (USFWS 2003a).

N.1.1. Status

The Quino checkerspot butterfly is federally listed as endangered and the U.S. Fish and Wildlife Service (USFWS) has approved a recovery plan for the species (USFWS 2003a). Designated critical habitat for Quino checkerspot butterfly was revised and finalized in 2009: no critical habitat was designated within the Base boundary. A full species profile is available at the USFWS Environmental Conservation Online System (ECOS) website (https://ecos.fws.gov/ecp0/profile/speciesProfile?spcode=I00P), which includes all Federal Register publications related to the listing history, recovery plan documents, critical habitat designations, and applicable Habitat Conservation Plans (HCPs).

No special status has been assigned to the Quino checkerspot butterfly in the state of California.

N.1.2. Distribution and Occurrence

The historic range of the Quino checkerspot butterfly included much of coastal California south of Ventura County and inland valleys south of the Tehachapi Mountains. More than 75 percent of this historic range has been lost and the Quino checkerspot butterfly is currently known to occur in western Riverside County, southern San Diego County, and northern Baja California, Mexico. There are no records of Quino checkerspot butterfly having occurred on-Base and a historical analysis revealed that no individuals of this subspecies have been collected from Marine Corps Base Camp Pendleton (MCBCP) and deposited into museums.

A 2-year general survey for Quino checkerspot butterfly was conducted on MCBCP from November 1996 through June of 1998 (Redak, Blua, and Burger 1998). The general survey identified 17 potential sites on-Base that could reasonably be assumed to support this animal. All 17 sites supported stands of the Quino's preferred host plant, dwarf plantain, and adult nectaring plants. In addition to the basewide survey, specific sites proposed for development were also surveyed during 1998–1999. No Quino checkerspot butterfly larvae or adults were found on any of the survey sites. Although MCBCP supports suitable habitat, no Quino checkerspot butterflies have been detected on-Base.

N.1.3. Threats

The distribution and abundance of the Quino checkerspot butterfly have been dramatically reduced during the past century as a result of agricultural and urban development and other land use changes in southern California. The Quino populations appear to have decreased in number and size by more than 95 percent rangewide, primarily due to habitat loss and fragmentation, invasion of nonnative plant species, and disrupted fire regimes associated with development and changes in land use (USFWS 2003a). In addition, climate change has been identified as a potential threat to Quino checkerspot butterfly. With the southwestern region of San Diego County predicted to become hotter and drier, climate change may cause drier winter-spring cycles, reducing host plant density and altering the critical timing of host plant availability (USFWS 2003a).

N.1.4. Recovery Strategy Goals

The recovery plan for the Quino checkerspot butterfly indicates its survival and recovery depend on protection, restoration, and management of habitat within occupied areas, expansion of existing populations, and reintroduction or discovery of new populations in areas not known to be currently occupied. Because this species is highly endangered, it is anticipated that ongoing management of all populations will be required into the foreseeable future. The plan identifies major units for managing recovery efforts; however, none of the units occur on or near MCBCP.

The plan does not propose any delisting criteria due to insufficient data; therefore, adaptive management and monitoring will be key aspects of recovery. Additional research will be needed before appropriate delisting criteria are identified. In the meantime, the plan proposes the following interim goals: (1) protecting habitat supporting known current population distributions and landscape connectivity between them; (2) maintaining or

creating resilient populations; and (3) conducting research necessary to refine recovery criteria.

N.1.5. Management and Monitoring

The Quino checkerspot butterfly has not been documented on-Base and is not known to occupy the surrounding area. However, the Base is located in the USFWS Recommended Quino Survey Area and MCBCP conducts site assessments for all Base projects in accordance with USFWS Quino Checkerspot Butterfly Survey Protocol (USFWS 2014). Any occurrences that are observed on-Base will be addressed on a case-by-case basis with avoidance and minimization measures implemented as necessary and in consultation with USFWS. In addition, MCBCP anticipates conducting another basewide survey for Quino in early 2015.

N.2. RIVERSIDE FAIRY SHRIMP (*STREPTOCEPHALUS WOOTTONI*)

The Riverside fairy shrimp is a small freshwater crustacean approximately 0.5 to 1.0 inch (1.27 to 2.54 cm) in length. Like all fairy shrimp, this species has stalked compound eyes and no hard outer shell (carapace). The shrimp are translucent, and as they mature to reproductive age, the females develop prominent ovisacs while the males' second antennae become modified for clasping the females during mating. Riverside fairy shrimp generally occur in seasonal (vernal) pools, ponds, swales, and occasionally in depressions (road ruts and ditches) that support suitable habitat. They hatch from dormant cysts once hydrated under specific environmental conditions. Large cyst banks of viable resting fairy shrimp eggs within the soils of vernal pools is well documented (USFWS 2005a).

FIGURE N-2. RIVERSIDE FAIRY SHRIMP

N.2.1. Status

The Riverside fairy shrimp is federally listed as an endangered species. A recovery plan has been approved for the listed species of southern California vernal pools, which includes the Riverside fairy shrimp (USFWS 2005a). Designated critical habitat for Riverside fairy shrimp was revised and finalized in 2012. MCBCP was exempted from critical habitat designation under Section 4(a)(3)(B) of the federal Endangered Species Act (ESA) because USFWS determined that conservation efforts identified in the Base Integrated Natural Resources Management Plan (INRMP) provide a benefit to the Riverside fairy shrimp and its habitat (USFWS 2005a. A full species profile is available at the USFWS ECOS website (https://ecos.fws.gov/ecp0/profile/speciesProfile?spcode=K03F), which includes all Federal Register publications related to the listing history, recovery plan documents, critical habitat designations, and applicable HCPs.

No special status has been assigned to the Riverside fairy shrimp in the state of California.

N.2.2. Distribution and Occurrence

Riverside fairy shrimp are currently presumed to occupy 60 or fewer pool complexes throughout southern California (USFWS 2005a). The species is restricted to a subset of vernal pools and vernal pool complexes in Ventura, Orange, Riverside, and San Diego Counties, and in northern Mexico (USFWS 2005a). With the exception of the Riverside County population, all populations are within approximately 15 miles (24 kilometers [km]) of the coast. Within southern California, Riverside fairy shrimp range in distance approximately 163 miles (262 km) from north to south and occupy pools that range in elevation from 46 to 2,076 feet (14 to 633 meters [m]).

Initial reconnaissance surveys for Riverside fairy shrimp were conducted in 1993; they began at the bluffs and small mesa southwest of the Interstate 5 (I-5) southbound rest stop (White Beach) and radiated outward from there. The greatest numbers of occupied pools were found near the White Beach rest stop on both sides of I-5. A survey conducted during the 1997–1998 and 1998–1999 wet seasons identified the coastal mesas on MCBCP as supporting one of the largest known populations of this species, with at least 83 pools occupied (75 with Riverside fairy shrimp and eight with both Riverside and San Diego fairy shrimp) (RECON 2001a). Inventory surveys conducted in five study areas from 2006 through 2009 detected 53 Riverside fairy shrimp occupied pools in Cocklebur Mesa, a portion of Edson Range, MASS 3, Oscar Two, and Red Beach.

N.2.3. Threats

The Riverside fairy shrimp has the most limited range of any endemic California fairy shrimp and is currently threatened by habitat loss and degradation due to military, urban, and agricultural development; off-road vehicle use; trash dumping; trampling; military maneuvers; competition and predation by nonnative species; drainage or watershed alterations; and drought (USFWS 2008). Fragmentation and destruction of isolated vernal pool groups can have subtle, but significant, adverse effects. Zedler (1987) found that species diversity within vernal pools and genetic diversity within a single species are evenly distributed throughout a given group of pools and between groups of pools. Thus, preservation of fewer pools may reduce the overall genetic-diversity of the species, conceivably affecting its long-term survivability.

In addition, climate change has been identified as a potential threat to Riverside fairy shrimp. With the southwestern region of San Diego County predicted to become hotter and drier, climate change may cause changes in vernal pool inundation patterns, and drought may decrease or terminate fairy shrimp reproduction if pools fail to flood or if pools dry up before reproduction is complete (USFWS 2005a). However, the information currently available on the effects of climate change and increasing temperatures does not adequately predict the location and magnitude of climate change effects to Riverside fairy shrimp.

N.2.4. Recovery Strategy Goals

The recovery strategy for the Riverside fairy shrimp is to conserve and enhance southern California vernal pool ecosystems, with specific emphasis on stabilizing and protecting

existing populations of Riverside fairy shrimp, San Diego fairy shrimp (*Branchinecta sandiegonensis*), San Diego button-celery (*Eryngium aristulatum* var. *parishii*), San Diego mesa mint (*Pogogyne abramsii*), Otay mesa mint (*Pogogyne nudiuscula*), and California Orcutt grass (*Orcuttia californica*), so that these species may be reclassified from endangered to threatened status (USFWS 2005a).

Before reclassification of Riverside fairy shrimp from endangered to threatened can be considered, the species must first be stabilized by conducting surveys and research essential to the conservation of the species. MCBCP vernal pool complexes and associated species have been identified as necessary to stabilize the Riverside fairy shrimp and several other listed vernal pool species. The vernal pool complexes that are identified as necessary to stabilize these listed species are Cocklebur Mesa, San Mateo, Las Pulgas, Stuart Mesa, State Park Lease Area, and Wire Mountain.

Once the species is stabilized, reclassification of Riverside fairy shrimp to threatened status may be considered when the following criteria are met: (1) existing vernal pools and their associated watersheds are secured; (2) where necessary, reestablish vernal pool habitat to the historical structure; and (3) manage and monitor habitat and listed species (USFWS 2005a). The Basilone and O'Neill vernal pool complexes occurring on MCBCP are identified as necessary to reclassify the Riverside fairy shrimp to threatened.

N.2.5. Management and Monitoring

The U.S. Marine Corps is currently in consultation with USFWS regarding programmatic basewide management of upland habitats including vernal pool habitat occupied by Riverside fairy shrimp. Until consultation is complete and a Biological Opinion (BO) is issued, the Riverside fairy shrimp benefits from current basewide management practices such as invasive, nonnative vegetation control; erosion control; resource conservation awareness and education programs; investigative research (e.g., to examine pool and group enhancement, pool creation, fairy shrimp dispersal/translocation, and impact of signing and/or fencing); and avoidance and minimization of impacts from projects and Base activities including training.

The Base has instituted measures for avoidance and minimization of impacts to vernal pool habitat and species. These measures are specified in MCBCP Base Order P3500.1 (*Range and Training Regulations*), which prescribes regulations and general precautions for range and training area users that limit impacts to vernal pool species (including Riverside fairy shrimp) by restricting activities in and adjacent to vernal pool habitat. Restrictions specific to vernal pools are as follows:

- Foot traffic is authorized year-round. Digging, including construction of fighting positions, is prohibited in vernal pools.
- Vehicle/equipment operations near known vernal pool areas shall be kept on existing roads year-round. Contact Environmental Security (ES) prior to conducting activities involving soil excavation, filling, or grading.
- Bivouac/command and post/field support activities shall be kept at least 50 m (164 feet) from identified vernal pools.

N.3. SAN DIEGO FAIRY SHRIMP (BRANCHINECTA SANDIEGONENSIS)

FIGURE N-3. SAN DIEGO FAIRY SHRIMP

The San Diego fairy shrimp is a small, delicate freshwater crustacean with large stalked compound eyes, no hard outer shell (carapace), and 11 pairs of swimming legs. Mature San Diego fairy shrimp range in length from 0.4 to 0.6 inch (1.0 to 1.5 cm). This species can be distinguished from other fairy shrimp by the shape of the second antenna in males, or the shape and length of the brood sac and the presence of paired abdominal spines in females (USFWS 1997a). Fairy shrimp are presumed to feed on algae, bacteria, protozoa, rotifers, and detritus (USFWS 2003b).

The San Diego fairy shrimp is a habitat specialist found in smaller-shallow vernal pools and ephemeral (temporary) basins that range in depth from approximately two to 12 inches (5.1 to 30.5 cm), have water ranging from 50 to 68 degrees Fahrenheit (°F8l). However, the species occasionally occurs in ditches and road ruts that can support suitable conditions.

N.3.1. Status

The San Diego fairy shrimp is federally listed as an endangered species. A recovery plan has been approved for the listed species of southern California vernal pools, which includes the San Diego fairy shrimp (USFWS 1998a). Designated critical habitat for San Diego fairy shrimp was revised and finalized in 2007. MCBCP was exempted from critical habitat designation under Section 4(a)(3)(B) of the ESA because USFWS determined that conservation efforts identified in the Base INRMP provide a benefit to the San Diego fairy shrimp and its habitat (USFWS 2003). A full species profile is available at the USFWS ECOS website (https://ecos.fws.gov/ecp0/profile/speciesProfile?spcode=K049), which includes all Federal Register publications related to the listing history, recovery plan documents, critical habitat designations, and applicable HCPs.

No special status has been assigned to the San Diego fairy shrimp by the State of California.

N.3.2. Distribution and Occurrence

San Diego fairy shrimp are restricted to vernal pools in coastal southern California south to extreme northwestern Baja California, Mexico, with San Diego County supporting the largest number of remaining occupied vernal pools (USFWS 2000). USFWS estimated at the time of listing that fewer than 200 acres (81 ha) of occupied vernal pool habitat remained in San Diego County, of which approximately 70 percent is thought to occur on Department of Defense lands (USFWS 2000).

The San Diego fairy shrimp is found in San Diego County from MCBCP; inland to Ramona; and south through Del Mar Mesa, Kearney Mesa, Proctor Valley, and Otay Mesa, and into northwestern Baja California, Mexico. In Baja California, it has been recorded at two localities: Valle de las Palmas, south of Tecate; and Baja Mar, north of Ensenada. Small populations occur in Orange County, and a single isolated female was reported from a vernal pool in Isla Vista, Santa Barbara County, California (USFWS 2000).

On MCBCP, the San Diego fairy shrimp shares the same coastal strip distribution as the Riverside fairy shrimp. However, within this limited range, especially in the southwestern part of the Base, the San Diego fairy shrimp occurs more often than either Lindahl's fairy shrimp (*Branchinecta lindahli*) or Riverside fairy shrimp. On Base, the San Diego fairy shrimp appears to be locally abundant in natural vernal pools and in human-made pools that have not been disturbed in several seasons (Moeur 1998). Generally speaking, vernal pools of high natural quality will be occupied by San Diego fairy shrimp while more degraded pools have a greater likelihood of containing Lindahl's fairy shrimp. San Diego fairy shrimp occur primarily in the Victor, Oscar One, and Oscar Two Training Areas, as well as the Wire Mountain housing area.

Survey efforts conducted during the 1997–1998 and 1998–1999 wet seasons detected a total of 219 pools occupied by San Diego fairy shrimp in the following 11 study areas: San Mateo, the State Park Lease Area, Las Pulgas, Tango Training Area, Las Flores, Edson Range, Cocklebur Mesa, Stuart Mesa, Wire Mountain, Basilone, and Lake O'Neill (RECON 2001a). Inventory surveys conducted in five study areas between 2007 and 2009 detected 184 San Diego fairy shrimp occupied pools in Cocklebur Mesa, a portion of Edson Range, MASS 3, Oscar Two, and Red Beach.

N.3.3. Threats

Regionally, the most pressing threat to San Diego fairy shrimp is habitat loss and degradation from military, urban, and water development; off-road vehicle use; trash dumping; trampling; military maneuvers; competition and predation by nonnative species, drainage, or watershed alterations; and drought. In addition, climate change has been identified as a potential threat to San Diego fairy shrimp. With the southwestern region of the county predicted to become hotter and drier, climate change may cause changes in vernal pool inundation patterns, and drought may decrease or terminate fairy shrimp reproduction if pools fail to flood or if pools dry up before reproduction is complete (USFWS 1998a). However, the information currently available on the effects of climate change and increasing temperatures does not adequately predict the location and magnitude of climate change effects to San Diego fairy shrimp.

N.3.4. Recovery Strategy Goals

The recovery strategy for the San Diego fairy shrimp is to conserve and enhance southern California vernal pool ecosystems, with specific emphasis on stabilizing and protecting existing populations of Riverside and San Diego fairy shrimp, San Diego button-celery, San Diego mesa mint, Otay mesa mint, and California Orcutt grass so that these species may be reclassified from endangered to threatened status (USFWS 1998a).

Before considering reclassification of San Diego fairy shrimp from endangered to threatened, the species must first be stabilized by conducting surveys and research essential to the conservation of the species. MCBCP vernal pool complexes and associated species have been identified as necessary to stabilize the San Diego fairy shrimp and several other listed vernal pool species. The vernal pool complexes identified as necessary to stabilize these listed species are Cocklebur Mesa, San Mateo, Las Pulgas, Stuart Mesa, State Park Lease Area, and Wire Mountain.

Once the species is stabilized, reclassification of San Diego fairy shrimp to threatened status may be considered when the following criteria are met: (1) existing vernal pools and their associated watersheds are secured; (2) where necessary, reestablish vernal pool habitat to the historical structure; and (3) manage and monitor habitat and listed species (USFWS 1998a). The Basilone and O'Neill vernal pool complexes occurring on MCBCP are identified as necessary to reclassify the San Diego fairy shrimp to threatened.

N.3.5. Management and Monitoring

The U.S. Marine Corps is currently in consultation with USFWS regarding programmatic basewide management of upland habitats, including vernal pool habitat occupied by San Diego fairy shrimp. Until consultation is complete and a BO is issued, the San Diego fairy shrimp benefits from current basewide management practices such as invasive, nonnative vegetation control; erosion control; resource conservation awareness and education programs; investigative research (e.g., to examine pool and group enhancement, pool creation, fairy shrimp dispersal/translocation, and impact of signing and/or fencing); and avoidance and minimization of impacts from projects and Base activities, including training.

The Base has instituted measures for avoidance and minimization of impacts to vernal pool habitat and species. These measures are specified in MCBCP Base Order P3500.1 (*Range and Training Regulations*), which prescribes regulations and general precautions for range and training area users that limit impacts to vernal pool species (including San Diego fairy shrimp) by restricting activities in and adjacent to vernal pool habitat. Restrictions specific to vernal pools are as follows:

- Foot traffic is authorized year-round. Digging, including construction of fighting positions, is prohibited in vernal pools.
- Vehicle/equipment operations near known vernal pool areas shall be kept on existing roads year-round. Contact ES prior to conducting activities involving soil excavation, filling, or grading.
- Bivouac/command and post/field support activities shall be kept at least 50 m from identified vernal pools.

N.4. SOUTHERN CALIFORNIA STEELHEAD (*ONCORHYNCHUS MYKISS*)

The southern California steelhead is an anadromous sea-run rainbow trout with a speckled dark-olive back, silvery-white underside, and distinct pink-striped sides. Adults average 20 to 30 inches (51 to 76 cm) in length and can reach up to 45 inches (120 cm). Mature

steelhead weigh approximately 8 to 9 pounds (3.6 to 4.1 kg) on average; however, they can be as much as 55 pounds (25 kg) (NMFS 2012). Steelhead migrate to the ocean after spending 1 to 4 years in freshwater. Adults spawn between December and June in southern California when seasonal streams have adequate flow volumes to enable them to migrate upstream to their natal sites. Steelhead are capable of spawning multiple times up to a maximum age of 11 years old (NMFS 2012).

FIGURE N-4. SOUTHERN CALIFORNIA STEELHEAD

N.4.1. Status

The southern California steelhead distinct population segment (DPS) is federally listed as an endangered species. A recovery plan for the species was finalized in 2012 (NMFS 2012), and designated critical habitat for steelhead in California was finalized in 2005. MCBCP was exempted from critical habitat designation under Section 4(a)(3)(B) of the ESA because USFWS determined that conservation efforts identified in the Base INRMP provide a benefit to the steelhead and its habitat (NMFS 2005). A full species profile is available at the USFWS ECOS website (https://ecos.fws.gov/ecp0/profile/speciesProfile?spcode=E08D), which includes all Federal Register publications related to the listing history, Special Rule publications, recovery documents, critical habitat designations, and applicable HCPs.

The southern California steelhead DPS is state listed as a Species of Special Concern. A Steelhead Restoration Management Plan for California has been prepared and approved by the California Department of Fish and Wildlife (CDFW) (McEwan and Jackson 1996). Steelhead are not included in any regional habitat conservation or multiple species planning efforts in southern California.

N.4.2. Distribution and Occurrence

Southern steelhead were formerly found in streams and rivers of Los Angeles, Orange, and San Diego Counties (McEwan and Jackson 1996), and were reported from San Mateo, San Onofre and San Juan Creeks, and in the San Luis Rey and Tijuana Rivers in 1946 (McEwan and Jackson 1996). The southern California steelhead DPS distribution extends from the Santa Maria River in San Luis Obispo County to at least San Mateo Creek on MCBCP (NMFS 1999).

The most recent confirmed observations of steelhead on-Base include one individual within San Mateo Creek in 2003; additionally three were captured in the upper Santa Margarita River in 2009 off-Base. Freshwater fish surveys were conducted in San Mateo Creek in 1995, 1996, and 1997 but failed to detect any steelhead. Likewise, surveys in the Santa Margarita watershed were conducted in 1997, 1998, and 1999 both on- and off-Base resulting in no detection of steelhead. The portions of San Mateo Creek and Santa Margarita River within Base boundaries serve only as a migration corridor (December

through March) to spawning habitat off-Base, so the persistent presence of steelhead on-Base is not expected.

N.4.3. Threats

Major threats to steelhead include freshwater and estuarine habitat loss and degradation resulting from water and land development and management practices contributing to inadequate stream flows, blocked access to historic spawning and rearing areas, and discharge of sediment and debris into watercourses (McEwan and Jackson 1996). Additional threats include impacts from recreational activities (e.g., off-road vehicles), introduction of nonnative species, and inadequacy of existing planning or regulatory and enforcement (NMFS 2012). Climatic shifts over the last decade appear to have resulted in decreased ocean productivity, which may exacerbate degraded freshwater habitat conditions (NOAA 2009).

N.4.4. Recovery Strategy Goals

The goal of the Southern California Steelhead Recovery Plan (NMFS 2012) is to recover anadromous steelhead and ensure the long-term persistence of self-sustaining wild populations across the DPS by addressing factors limiting the species within a set of core watershed populations distributed across the recovery planning area. The recovery planning area is divided into five Biogeographic Population Groups (BPGs). MCBCP is located within the Santa Catalina Gulf Coast BPG, which includes the following priority actions:

- develop and implement plans to modify or remove barriers to fish movement;
- develop and implement operating criteria to ensure water release from the O'Neill diversion dam provides essential habitat functions to support steelhead; and
- develop and implement management plans to restore suitable habitat and eliminate nonnative species.

N.4.5. Management and Monitoring

The southern California steelhead is not covered by the Estuarine and Beach Ecosystem Conservation Plan, Riparian Ecosystem Conservation Plan, or the Riparian BO; however, the Base implements a conservation measure provided in the Riparian BO to examine the Base for habitat qualities necessary to support steelhead runs and determine feasibility of establishing such runs. In addition, the Base has instituted measures for avoidance and minimization of impacts to Endangered Species Management Zones, including San Mateo Creek and the Santa Margarita River. These measures are specified in MCBCP Base Order MCIWEST-MCB CAMPENO 3500.1 Ch 1 (*Range and Training Regulations*), which prescribes regulations and general precautions for range and training area users that limit impacts to natural resources.

The Base is participating in a watershed-wide program to manage the southern steelhead in the San Mateo Creek system. The planning group consists of state, local, and federal agencies, as well as other watershed stakeholders including private citizens and conservation organizations. The Base also continues to cooperate with CDFW personnel in conducting steelhead surveys and exotics control measures on MCBCP. Since 2003, a

fisheries biologist has been on staff to manage the complex steelhead, tidewater goby (*Eucyclogobius newberryi*), and other fisheries issues aboard MCBCP. Base representatives regularly attend meetings to coordinate local efforts to address steelhead issues with federal and state agencies and other interested organizations.

N.5. TIDEWATER GOBY (EUCYCLOGOBIUS NEWBERRYI)

FIGURE N-5. TIDEWATER GOBY

The tidewater goby is a small fish rarely exceeding two inches (50 millimeters [mm]) in length. It is characterized by an elongated body, large pectoral fins, ventral fins joined below the chest and belly, and two dorsal fins with slender spines set very close together. Males are nearly transparent with a mottled brownish upper surface. Females are darker and often have a black body and fins. Tidewater gobies primarily feed on small benthic invertebrates including aquatic insect larvae, snails, shrimp, and other crustaceans.

The tidewater goby lifespan is generally 1 year. Reproduction occurs at all times of the year with peak spawning periods during the spring and late summer. Males excavate breeding burrows in relatively unconsolidated, clean, coarse sand in April or May after lagoons naturally close to the ocean (USFWS 2007a). Spawning normally takes place when water temperatures are between 48 to 77°F (9 to 25°C). Fluctuations in reproductive success are attributed to adult mortality that occurs during early summer and also colder temperatures or hydrological disruptions in winter.

N.5.1. Status

The tidewater goby is currently federally listed as endangered and USFWS has approved a recovery plan for the species (USFWS 2005b). However, in March 2014, the USFWS published their finding on a petition to reclassify the tidewater goby as threatened, that the reclassification is warranted (79 Federal Register 14340). As of December 2016, no final rule had been published. Designated critical habitat for the tidewater goby was revised and finalized in 2013. MCBCP was exempted from critical habitat designation under Section 4(a)(3)(B) of the ESA because USFWS determined that conservation efforts identified in the Base INRMP provide a benefit to tidewater goby and its habitat (78 Federal Register 8745). A full species profile is available at the USFWS ECOS website (https://ecos.fws.gov/ecp0/profile/speciesProfile?spcode=E071), which includes all Federal Register publications related to the listing history, recovery plan documents, critical habitat designations, and applicable HCPs. A study, published in July 2016 (Swift et al. 2016), classifies the southern populations of tidewater goby as a new species, the southern tidewater goby (*Eucyclogobius kristinae*) from the northern tidewater goby (*Eucyclogobius newberryi*). Southern tidewater goby has only been observed in nine intermittently occupied lagoonal systems in northern San Diego County; it currently persists in only three sites. The publication is under review, no formal recognition of southern tidewater goby as a separate species has been published by the USFWS. Implications of separating the two species include the proposed reclassification of the northern species and classification of

the southern species. If USFWS recognizes the tidewater goby as two separate species, listing and recovery actions pertaining to the southern species will be led by the Carlsbad USFWS field office.

The tidewater goby is state listed as a Species of Special Concern. It is not included in any regional habitat conservation or multiple species planning efforts in southern California.

N.5.2. Distribution and Occurrence

Tidewater gobies are endemic to California and historically ranged from Tillas Slough (mouth of the Smith River) in Del Norte County near the Oregon border south to Agua Hedionda Lagoon in northern San Diego County, and are found today entirely within the original known range of the species. The known localities are discrete lagoons, estuaries, or stream mouths separated by mostly marine conditions. Tidewater gobies are absent from areas where the coastline is steep and streams do not form lagoons or estuaries. Inhabited localities are separated by as little as a few hundred meters, and up to tens of kilometers. When all known historical and currently occupied sites are considered, tidewater gobies have been documented at 135 localities. Of these localities, gobies have been extirpated from 21 (16 percent), for a total of 114 localities that are known to be currently occupied (78 Federal Register 8746). Approximately 55 to 70 (45 to 55 percent) localities are naturally so small, or have been so significantly degraded over time, that long-term persistence is uncertain (USFWS 2005b). The proposed southern species of tidewater goby currently under review by USFWS is restricted to nine localities in northern San Diego County from San Mateo Creek near the Orange County line southward to the mouth of the San Luis Rey River (Swift et al. 2016). All but one population occur on MCBCP.

On MCBCP, the extirpation and recolonization of gobies annually fluctuates between lagoons (Swift and Holland 1998). At the time of listing in 1994, the species was thought to be present in only three of the eight drainages on Base; however, the number of estuaries with detectable tidewater goby populations changes in response to water levels, sedimentation, and other natural and anthropogenic events (USGS 2013), For example, tidewater gobies were not detected in French Creek estuary in 2002-2004, were detected 2005-2006, absent in 2007, detected years 2008-2013, and absent up to 2016. As some of these years represent drought conditions when the estuary was not open to the ocean, it seems possible that gobies have found refuge in the estuary where detection is problematic.

San Mateo Creek estuary populations were steady until 2007; however, since that time detections have fluctuated with the latest detection occurring in 2011. This estuary is highly impacted by recreation, non-native species introduced upstream, and poor water quality (high coliform). San Mateo Creek estuary has an abundance of refugia and goby may persist in this water body.

Tidewater gobies have not been observed in the Santa Margarita River since 2001. The mouth of the river was closed in 2004 and fall 2010 and opened in 2002, 2003, and 2005–2009 (USGS 2013). The lack of a persistent sand bar most likely precludes the long-term persistence of tidewater gobies at this location; however, it is also possible that they are present but remain undetected.

In 2010, an extirpation of tidewater gobies in Aliso Creek was associated with a high-density monoculture of mudsuckers (USGS 2013). Mudsuckers are a potential competitor and predator of tidewater goby and these two species often do not coexist. The absence of mudsuckers at this site in October 2011 may have allowed for recolonization of gobies in 2012.

Gobies had not been seen in the San Luis Rey since 2002; however, in June 2010, gobies were observed just south of Oceanside Harbor. Though they were found in 2010, tidewater gobies were not observed at this location again in 2011 (USGS 2013).

The Cocklebur, Hidden, San Onofre, and Las Flores Creek populations have been the most persistent populations of tidewater gobies remaining in the region, which potentially serve as important source populations for dispersal into suitable waterbodies in the area (e.g., Buena Vista Lagoon and Agua Hedionda Lagoon). Gobies were not detected in Las Flores Creek in 2014 or 2015 which caused some concern, but they were detected in 2016. It is possible that detection success for gobies is relatively low in the larger estuaries where they are present.

The Base implements programmatic instructions and habitat enhancement measures specified in the Estuarine and Beach Ecosystem Conservation Plan and the Riparian BO for protection and management of tidewater goby. The population goal for tidewater goby, as stated in the description of the proposed action consulted on in 1994, is to maintain three to four populations on Base. The conservation plan describes estuarine management zones for the specific protection of this species. The Base also conducts monitoring of tidewater goby in accordance with the conservation plan and BO. Although goby monitoring is only required once every 3 years, MCBCP has been monitoring annually since 2002. Monitoring was not funded in 2014 or 2015. In addition, MCBCP Base Order MCIWEST-MCB CAMPENO 3500.1 Ch 1 (*Range and Training Regulations*) prescribes regulations and general precautions for range and training area users that limit impacts to this species by restricting activities in and adjacent to estuarine habitat.

N.5.3. Threats

The primary threats to the tidewater goby are loss and modification of habitat, water diversions, habitat channelization, degraded water quality, and predatory and competitive introduced fish species (USFWS 2005b), including sunfish (*Centrarchidae*), largemouth bass (*Micropterus salmoides*), striped bass (*Morone saxatilis*), channel catfish (*Ictalurus punctatus*), mosquitofish (*Gambusia affinis*), and yellowfin gobies (*Acanthogobius flavimanus*) (Holland 1992). Since tidewater gobies are known to migrate upstream into freshwater and often spawn in near-freshwater conditions, they are vulnerable to predation by both estuarine and riverine nonnative species.

From 2013 to 2016 drought reduced fish habitat in coastal estuaries and may have impacted goby populations by concentrating non-native predators and competitors where tidewater gobies breed and forage. In 2015 USFWS was petitioned by University of California, Los Angeles (UCLA) to salvage gobies on Base in order to protect against drought and potential El Nino flooding in winter months. Drought concerns were unrealized, but in February 2016 USFWS, MCBCP, UCLA and Scripps and Santa Monica Pier Aquarium

staff removed over 300 gobies from Hidden, Cocklebur and San Onofre Creek estuaries with the intent of holding them at the aquaria until El Nino rains passed. Rains were not destructive to the habitat, and gobies were released back to estuaries in May, 2016. It is likely that tidewater gobies are genetically equipped to withstand El Nino rains; no salvages are planned for 2017.

The tidewater goby is also threatened by modification and loss of habitat as a result of coastal development, habitat channelization, water flow diversions and alterations, and groundwater overdrafting. Other potential threats to the tidewater goby include discharge of agricultural and sewage effluents, increased sedimentation due to cattle grazing and feral pig activity, summer breaching of lagoons, upstream alteration of sediment flows into the lagoon areas, habitat damage, and watercourse contamination resulting from vehicular activity in the vicinity of lagoons.

N.5.4. Recovery Strategy Goals

The recovery strategy for the tidewater goby is to preserve suitable habitat throughout the range of the species, preserve the natural process of recolonization and population exchange, and preserve genetic diversity (USFWS 2005b). The recovery plan identifies six management units that are further divided into 26 subunits; MCBCP is located in Subunits SC1 and SC2 of the South Coast Management Unit. The recovery of the tidewater goby and its habitat will require implementation of four primary tasks: (1) monitor, protect, and enhance current habitat conditions for extant populations; (2) conduct research to acquire additional information needed for management; (3) restore degraded habitats to suitable conditions and reintroduce or introduce gobies to those habitats; and (4) develop and implement an information and education program.

In accordance with the recovery plan for the tidewater goby (USFWS 2005b), the tidewater goby may be considered for downlisting when specific threats to each metapopulation have been addressed through development and implementation of management plans that cumulatively cover the full range of the species. A metapopulation viability analysis will need to determine that each recovery unit is viable. Reclassification from endangered to threatened was proposed in 2014 (78 Federal Register 70104); however, no final rule on the reclassification has been published. Delisting may be considered when downlisting criteria are met and the viability analysis projects that all subunits have a 95 percent chance of persistence for 100 years (USFWS 2005b).

N.5.5. Management and Monitoring

Guidelines for management and monitoring of tidewater goby and its habitat are provided in the Estuarine and Beach Ecosystem Conservation Plan and the Riparian BO. The Base implements the following programmatic instructions and habitat enhancement measures specified in the conservation plan and BO for the protection and management of the species and the estuarine/beach ecosystems:

- manage estuarine zones to maintain wetland values of coastal lagoons;
- restrict access to estuary wetlands and salt flats unless specifically authorized;
- post signs in strategic locations to deter unauthorized entry;

- conduct invasive, nonnative vegetation control;
- conduct annual nonnative aquatic species control; and
- maintain occupied tidewater goby habitat as well as historic locations for recolonization.

The Base has instituted measures for avoidance and minimization of impacts to Endangered Species Management Zones to protect tidewater goby and other species. These measures are specified in MCBCP Base Order P3500.1 (*Range and Training Regulations*), which prescribes regulations and general precautions for range and training area users that limit impacts to natural resources. Restrictions specific to the Endangered Species Management Zones that apply to tidewater goby are as follows:

- Obtain authorization from ES before entering any lagoon or estuary, marsh, mud/salt flat, or posted nesting area. Bivouacking and digging of fighting positions are prohibited in the vicinity of the Estuarine/Beach Endangered Species Management Zones during the period of 1 March to 15 September.
- Unit hikes shall remain on the hard packed sand, as close to the ocean water edge as possible.
- Vehicle and equipment operations in the management zones shall be kept to a minimum between 1 March and 15 September. All vehicles shall travel on hard packed sand and shall not exceed 25 miles per hour. Tracked vehicles shall travel as close to the water (upper few inches of waves) as possible, year-round, in the Santa Margarita Management Zone.
- Engineering operations outside of approved landing exercise support shall be coordinated with ES prior to the initiation of activities.
- Boat operations are not authorized in lagoons and estuaries. Landing Craft Air Cushions (LCACs) shall not enter the management zones between 1 March and 15 September, except when entering or exiting seaward; and on return, shall exit the ocean heading directly up to the facility access ramp. Small boats may be permitted in the Santa Margarita estuary between 16 September and 1 March, with prior approval from ES.

The Base also conducts monitoring of tidewater goby in accordance with the conservation plan and BO. Although goby monitoring is only required once every 3 years, MCBCP has been monitoring annually since 2002 in an effort to detect trends associated with occupation at specific sites. In 2004, MCBCP expanded water quality monitoring from the Santa Margarita River to all eight of the lagoons/estuaries on-Base that could provide habitat for the tidewater goby. In 2016, estuarine habitat monitoring parameters were revised to include more biotic variables, including benthic sampling. Data collected during water quality and goby presence/absence monitoring contribute to goby research efforts and is essential to understanding how water quality parameters correlate with tidewater goby life history parameters.

These management and monitoring measures have been implemented on-Base since the completion of the conservation plan in 1995 and were incorporated in and have been

managed through this INRMP since 2001. The results of the monitoring efforts are used to develop adaptive management strategies for tidewater goby on-Base and are reported annually to USFWS.

N.6. ARROYO TOAD (ANAXYRUS CALIFORNICUS)

The arroyo toad is a small 2- to 3-inch-long (5.6- to 8.4-cm-long) toad. Adult arroyo toads have a light-olive green or gray to tan back with dark spots and warty skin, and are white or buff underneath. A light-colored, V-shaped stripe crosses the head and eyelids, and the oval parotoid glands behind the eyes are pale. Juvenile arroyo toads are white-gray-tan with small dark spots and gray reticulations on the back with a white underside. The enlarged parotoid glands of adult toads are not evident on young juveniles, but the V-shaped light mark that crosses the eyelids is prominently visible and diagnostic of this species.

FIGURE N-6. ARROYO TOAD

The arroyo toad breeding season extends from 15 March to 15 August. They breed in the low-flow margins and side channels of open streams that lack emergent aquatic vegetation. Suitable spawning substrates are most often gravel and sand. Female arroyo toads produce a single clutch of four to five thousand eggs per breeding season. Arroyo toad tadpoles hatch in 4 to 5 days and require about 10 to 12 weeks to reach metamorphosis. Juveniles remain on stream banks for up to 16 weeks, or until they have grown large enough to burrow into sandy substrates. Maturity is reached in 1 year for males and 2 years for females. Adult arroyo toads generally occupy the channel floodplain and will move into adjacent upland habitats for overwintering or to travel between drainages. Arroyo toads feed on a variety of small insects but specialize on native ants.

N.6.1. Status

The arroyo toad is federally listed as endangered and USFWS has approved a recovery plan for the species (USFWS 1999a). Designated critical habitat for the arroyo toad was revised and finalized in 2011. MCBCP was exempted from critical habitat designation under Section 4(a)(3)(B) of the ESA because USFWS determined that conservation efforts identified in the Base INRMP provide a benefit to the arroyo toad. A full species profile is available at the USFWS ECOS website (https://ecos.fws.gov/ecp0/profile/speciesProfile?spcode=D020), which includes all Federal Register publications related to the listing history, critical habitat designation, recovery plans, and applicable HCPs.

The arroyo toad is state listed as a Species of Special Concern.

N.6.2. Distribution and Occurrence

The arroyo toad is endemic to the coastal plains and mountains of central and southern California and northwestern Baja California and occurs principally along coastal drainages and also several locations on the desert slopes of the Transverse and Peninsular Mountain

ranges south of the Santa Clara River, Los Angeles County (USFWS 1999a). In southern California, arroyo toads occur on the coastal plain and on a few desert slopes.

On MCBCP, the arroyo toad occurs in Talega Creek, Cristianitos, San Mateo Creek, San Onofre Creek, De Luz Creek, and Roblar Creek and in the Santa Margarita River. Surface water availability is highly variable along these freshwater streams, yet the overall extent of breeding toads in wetted areas on-Base has remained relatively stable from 2003 through 2012 (77 to 95 percent of wet areas on a given year) with no significant change over this 10-year period. The population in the lower Santa Margarita River drainage is the largest and most stable on-Base; however, in 2014, a negative population trend was observed, most likely in response to severe drought. The lower portions of the San Mateo Creek, San Onofre Creek, and the Santa Margarita River on MCBCP are the only remaining coastal drainages in southern California where the arroyo toad occurs within 6 miles (10 km) of the coastline down to the coastal marsh zone (USFWS 1999a). These populations have phenotypic characteristics that are now limited in representation within the overall range of the arroyo toad in California.

N.6.3. Threats

The arroyo toad's decline is largely attributed to extensive habitat loss, hydrological modifications, and the introduction of nonnative plants and predators. Channelization of drainages increases flow rates and modifies natural sediment distribution, which serves to significantly reduce the availability of suitable habitat within riparian ecosystems for the arroyo toad. Disturbances such as agriculture and road construction can increase sedimentation in arroyo toad breeding pools, rendering them unusable. Arroyo toads can also be killed by vehicular traffic and road maintenance activities.

Nonnative, invasive plants, such as giant reed (*Arundo donax*), directly and indirectly affect the condition and formation of ideal breeding pools. Bullfrogs (*Lithobates catesbeiana*) are considered the most serious threat of all nonnative species to the arroyo toad. They are voracious predators that eat adult toads and are suspected of eating larvae and metamorphs, and since they are more tolerant to a variety of environmental conditions it allows them to colonize and dominate modified stream habitats more readily (e.g., percolation ponds within the lower Santa Margarita River).

Global climate change was recently identified as a new threat to the species. Current climate change predictions for terrestrial areas in the Northern Hemisphere indicate warmer air temperatures, more intense precipitation events, and increased summer continental drying. However, predictions of climatic conditions for smaller subregions such as California remain uncertain. It is unknown at this time if climate change in California will result in a warmer trend with localized drying, higher precipitation events, or other effects. It is recognized that climate change is an important issue with potential effects to listed species and their habitats; however, there is a lack of adequate information to make accurate predictions regarding its effects to particular species at this time (USFWS 2009a).

N.6.4. Recovery Strategy Goals

The strategy for recovery of the arroyo toad is focused on providing sufficient breeding and upland habitat to maintain self-sustaining populations of arroyo toads throughout the

historic range of the species in California, and minimizing or eliminating impacts and threats to arroyo toad populations (USFWS 1999a). Self-sustaining populations are those documented as having successful recruitment (i.e., inclusion of newly matured individuals into the breeding population) equal to 20 percent or more of the average number of breeding adults in 7 of 10 years of average to above average rainfall amounts with normal rainfall patterns.

The arroyo toad will be considered for reclassification from endangered to threatened status in each recovery unit once management plans have been approved and implemented on federally managed lands. This will help secure the genetic and phenotypic variations of the arroyo toad in each recovery unit by conserving, maintaining, and restoring the riparian and upland habitats used by arroyo toads for breeding, foraging, and wintering habitat. The downlisting goal for the Southern Recovery Unit, which encompasses arroyo toad populations and habitat in the coastal drainages of Orange, San Bernardino, Riverside, and San Diego Counties, is 10 populations or metapopulations. A minimum of two of these 10 metapopulations are needed in the San Mateo and San Onofre Creeks, and the Santa Margarita River (USFWS 1999a).

N.6.5. Management and Monitoring

Guidelines for management and monitoring of arroyo toad and its habitat are provided in the Riparian Ecosystem Conservation Plan, and the Riparian BO. The Base implements the following programmatic instructions and habitat enhancement measures specified in the conservation plan and BO for the protection and management of this species and the riparian ecosystem:

- avoid riparian areas for project and training activities;
- restrict movement through riparian areas to existing roads, trails, and crossings;
- compensate for unavoidable impacts through invasive, nonnative vegetation control (e.g., giant reed removal); and
- conduct annual invasive, nonnative aquatic species control.

The U.S. Marine Corps is currently in consultation with USFWS regarding programmatic basewide management of upland habitats including areas of nonbreeding habitat occupied by arroyo toad. Upon completion of this consultation, it is expected that additional measures benefitting arroyo toad will be implemented.

In addition, the Base has instituted measures for avoidance and minimization of impacts to arroyo toad. These measures are specified in MCBCP Base Order P3500.1 (*Range and Training Regulations*), which prescribes regulations and general precautions for range and training area users that limit impacts to natural resources. Restrictions specific to arroyo toad are as follows:

- Extreme caution beyond that required by the Fire Danger Rating System (FDRS) is necessary when using pyrotechnics, and when conducting other activities likely to cause a fire.

- Foot traffic is authorized year-round on existing roads, trails, and creek crossings. Consult with ES prior to cutting/removing vegetation.
- Vehicles operating in the vicinity of creeks, rivers, or drainages shall use existing roads, trails, and established creek/river crossings. Vehicle traffic on roads in arroyo toad habitat between 15 March and 30 August shall be minimized to the maximum extent practical.
- Consult with ES prior to bivouacking, cutting/removing vegetation, trenching, grading, filling, or conducting engineering operations in or adjacent to creek/river bottom areas.
- Dust produced in or adjacent to creeks and rivers shall be minimized to the maximum extent practical.

The Base also conducts annual monitoring of arroyo toads in accordance with the conservation plan and BO. Arroyo toad surveys are conducted seasonally in the Santa Margarita River, San Mateo Creek, and San Onofre Creek watersheds. Since 2003, these surveys have used a Percent Area Occupied methodology, which tracks the presence of breeding populations by documenting the presence of eggs and larvae, in order to detect trends. The results of this monitoring are used to develop adaptive management strategies for arroyo toads on-Base and are reported annually to USFWS.

These management and monitoring measures have been implemented on-Base since the completion of the conservation plan in 1995 and were incorporated in and managed through this INRMP since 2001. USFWS has determined that efforts identified in the INRMP provide conservation benefit to the arroyo toad.

N.7. CALIFORNIA LEAST TERN (STERNULA ANTILLARUM BROWNI)

Least terns are the smallest members of North American terns, measuring approximately 9 inches (22.9 cm) long with a 20-inch (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 primary feathers is prominent, as well as the short, deeply forked tail. It has a yellow beak with a black tip, and orange-yellow legs. The sexes are similar except the loral stripe is wider in the male. The California least tern breeding season extends from 1 March to 15 September.

FIGURE N-7. CALIFORNIA LEAST TERN

N.7.1. Status

The California least tern is federally listed as endangered. A USFWS-approved recovery plan for the least tern has been revised several times (USFWS 1985a), but no critical habitat has been designated. The California least tern is protected by the Migratory Bird Treaty Act (MBTA). A full species profile is available at the USFWS ECOS website (https://ecos.fws.gov/ecp0/profile/speciesProfile?spcode=B03X), which includes all Federal Register publications related to the listing history, recovery plans, and applicable HCPs.

The California least tern is state listed as endangered and fully protected by CDFW.

N.7.2. Distribution and Occurrence

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. The largest concentrations of breeding pairs nest in Los Angeles, Orange and San Diego Counties, typically between 1 March and 15 September. 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.

California least tern populations have declined since the early 1900s. At least 1,000 nesting pairs of least terns were reportedly observed along a 3-mile-long section of coastline in San Diego County from Pacific Beach to Mission Bay in the early 1900s (Foster 2002). By 1969, the statewide tern population was down to 182 pairs (Patton 2002). In cooperation with the Department of Interior, the Base set aside a portion of the beach near the mouth of the Santa Margarita River as a tern nesting area. Signs were posted designating the area as a refuge and to discourage vehicles and personnel from entering the area.

When the species was federally listed in 1973, the statewide tern population totaled 625 breeding pairs (Caffrey 1993). Since then, intensive management practices have resulted in an increase in the tern population; in 1992 the statewide tern population was up to 2,106 breeding pairs (Caffrey 1993) and in 2005 a statewide record-high of 7,100 pairs was reported, which represents more than twice the average annual breeding population size observed during the mid-1990s (USFWS 2006a). Breeding surveys in 2011 estimated approximately 4,826 to 6,108 breeding pairs at 40 nesting sites. The six most populous sites were MCBCP, Naval Base Coronado, Batiquitos Lagoon, Huntington Beach, Point Mugu, and Alameda Point, which represented 79 percent of the breeding pairs.

The California least tern was first documented nesting on-Base in 1969, and it has been documented on-Base annually since. Typically, terns arrive in mid-April and depart by September. On MCBCP, California least tern nesting sites are located on the beaches and salt flats at the mouth of the Santa Margarita River (Blue Beach), and at the mouths of French and Aliso Creeks (White Beach). Since 2003, nesting sites have also been observed at the mouth of Las Flores Creek (Red Beach). Between 2007 and 2014, the tern colony on

MCBCP represented a significant portion (approximately 18 percent) of the total tern population breeding in California (Boylan et al. 2015), with the peak occurring in 2010. Despite a recent decline from the 2010 peak (1,691 pairs), the breeding population on MCBCP has grown from 363 to 1,317 pairs between 1995 and 2014, which is growth of more than 360 percent (Boylan et al. 2015). However, rates of nest success and fledgling productivity remain low and highly variable.

N.7.3. Threats

The decline in the California least tern population is largely attributable to loss of nesting and foraging habitat from coastal and marine development; modification of nest site habitat by invasive plant species; predation of eggs and chicks; disturbance to nesting colonies; reduction in food availability due to climate cycles (e.g., El Niño) and global climate change; flooding of nest sites due to sea level rise; oil spills; and increased predators due to urbanization (Boylan et al. 2015). Presently, nest sites are restricted to a few, defined locations, some of which are artificial and most of which persist only because of active management such as fencing, signage, education, and predator control (Boylan et al. 2015). However, in some cases, colony predators themselves may be sensitive species (e.g., gull-billed terns), which may impose a management conflict.

N.7.4. Recovery Strategy Goals

The Revised Recovery Plan for the California Least Tern (USFWS 1985a) indicates that recovery for the annual breeding population in California must increase to at least 1,200 pairs distributed in at least 20 secure coastal management areas throughout their 1983 breeding range before delisting can be considered. Each of the 20 secure management areas must have a minimum of 20 breeding pairs with a 5-year mean reproductive rate of at least one young fledged per breeding pair. Four of those colonies should be in San Francisco Bay, six in Mission Bay, and six in San Diego Bay.

The recovery plan requires the development and implementation of least tern management plans/programs for secure nesting habitat (secure land is defined as land under public ownership or control that is actively managed for its resource values emphasizing endangered species) at Aliso Creek and the Santa Margarita River mouth. Protection of important nonnesting, feeding, and roosting habitats from detrimental land or water use changes, including the Santa Margarita River and Lake O'Neill, is also required. MCBCP's Estuarine and Beach Ecosystem Conservation Plan and this INRMP provide the required site-specific management, and ensure implementation of those plans and actions. The status and results of the Base's management and actions in the estuarine and beach areas of the Base are reported annually to USFWS.

N.7.5. Management and Monitoring

Active management practices for protecting and enhancing least tern breeding habitat and minimizing disturbance to the species, when present on-Base, were established as early as 1984 when MCBCP established protective fencing around the Santa Margarita River nesting colonies and posted warning signs to minimize human disturbance. Since then, a temporary fence has been installed along all known breeding locations to protect the colonies from military training on the beach during the breeding season. During the

nonbreeding season, the fences between the ocean and nesting colonies are removed to allow access to the beach for wildlife and Base operations.

Current guidelines for management and monitoring of California least tern and its habitat are provided in the Estuarine and Beach Ecosystem Conservation Plan and the Riparian BO. The Base implements the following programmatic instructions and habitat enhancement measures specified in the conservation plan and BO for the protection and management of the species and the estuarine/beach ecosystems:

- keep military and recreational activities within the Santa Margarita Management Zone and other utilized nesting areas to a minimum during the breeding season;
- install and maintain permanent/temporary fencing around nesting areas;
- post signs in strategic locations to deter unauthorized entry;
- enhance nesting areas through vegetation removal/control and sand mobilization;
- conduct predator control;
- prohibit all activities in nesting colonies during the breeding season;
- prohibit all activities involving smoke, pyrotechnics, loud noises, blowing sand, and large groups of personnel (14 or more) within 300 m of nesting areas;
- prohibit all traffic within 15 feet of posted nesting areas during the breeding season;
- restrict aircraft from landing within 300 m of nesting areas; and
- restrict aircraft to 300 feet above ground level or more above nesting areas.

In addition, the Base has instituted measures for avoidance and minimization of impacts to Endangered Species Management Zones to protect California least terns and other species. These measures are specified in MCBCP Base Order P3500.1 (*Range and Training Regulations*), which prescribes regulations and general precautions for range and training area users that limit impacts to natural resources. Restrictions specific to the Endangered Species Management Zones that apply to terns are as follows:

- Obtain authorization from ES before entering any lagoon or estuary, marsh, mud/salt flat, or posted nesting area. Bivouacking and digging of fighting positions are prohibited in the vicinity of the Estuarine/Beach Endangered Species Management Zones during the period of 1 March to 15 September.
- Between 1 March and 15 September, all activities involving smoke, pyrotechnics, loud noises, blowing sand, and large groupings of personnel (14 or more) shall remain at least 300 m away from fenced or posted nesting areas. All other activities shall be kept at least 5 m from these areas.
- Foot traffic involving fewer than 14 personnel shall be kept as far away as possible, and approach no closer than 5 m to posted nesting areas between 1 March and 15 September. Unit hikes shall remain on the hard packed sand, as close to the ocean water edge as possible. When passing nesting areas, minimize all noise.

- Vehicle and equipment operations in the management zones shall be kept to a minimum between 1 March and 15 September. All vehicles shall travel on hard packed sand and shall not exceed 25 mph (40.2 km/hour). Tracked vehicles shall travel as close to the water (upper few inches of waves) as possible, year-round, in the Santa Margarita Management Zone. Vehicle operations inside fenced areas on the edge of the bluff between Aliso and French Creeks (White Beach) are not authorized between 1 March and 15 September.
- Engineering operations outside of approved landing exercise support shall be coordinated with ES prior to the initiation of activities.
- Boat operations are not authorized in lagoons and estuaries. LCACs shall not enter the management zones between 1 March and 15 September, except when entering or exiting seaward; and on return, shall exit the ocean heading directly up to the facility access ramp. Small boats may be permitted in the Santa Margarita estuary between 16 September and 1 March, with prior approval from ES.

The Base also conducts annual monitoring of California least tern in accordance with the conservation plan and BO. California least tern surveys are conducted seasonally in fenced nesting areas to characterize the temporal and spatial distribution of nests, pair numbers, and reproductive success of terns on-Base. The results of this monitoring are used to develop adaptive management strategies for California least terns on-Base and are reported annually to USFWS.

The majority of these management and monitoring measures were being implemented on-Base prior to the completion of the conservation plan in 1995 and all have been incorporated in and managed through this INRMP since 2001.

N.8. WESTERN SNOWY PLOVER (CHARADRIUS NIVOSUS NIVOSUS)

The western snowy plover is a small shorebird with pale brown to gray upperparts; gray to black legs and bill; and dark patches on the forehead, behind the eyes, and on either side of the upper breast. The Pacific coast population is a distinct population segment of the western snowy plover and is defined as those individuals nesting adjacent to tidal waters of the Pacific Ocean. Pacific coast western snowy plovers typically forage for small invertebrates in open areas consisting of wet or dry beach sand, tide-cast kelp and driftwood, low foredune vegetation, and near water seeps in saltpans.

FIGURE N-8. MALE WESTERN SNOWY PLOVER

The breeding season for the western snowy plover extends from 1 March to 15 September. Clutches normally consist of three eggs laid in a shallow depression scarped in the sand by the male. Western snowy plovers tend to nest in relatively higher densities near freshwater or brackish wetlands such as river mouths, estuaries, and tidal marshes.

N.8.1. Status

The western snowy plover is federally listed as threatened, and USFWS has approved a recovery plan for the species (USFWS 2007b). Designated critical habitat for the western snowy plover was revised and finalized in 2012. MCBCP was exempted from critical habitat designation under Section 4(a)(3)(B) of the ESA because USFWS determined that conservation efforts identified in the Base INRMP provide a benefit to western snowy plover and its habitat. The snowy plover is also listed as a Bird of Conservation Concern by USFWS and is protected by the MBTA. A full species profile is available at the USFWS ECOS website (https://ecos.fws.gov/ecp0/profile/speciesProfile?spcode=B07C), which includes all Federal Register publications related to the listing history, Special Rule publications, recovery plan documents, critical habitat designations, and applicable HCPs.

The western snowy plover is state listed as a Species of Special Concern.

N.8.2. Distribution and Occurrence

The western snowy plover breeds on the Pacific coast from southern Washington to southern Baja California, Mexico, and in interior areas of Oregon, California, Nevada, Utah, New Mexico, Colorado, Kansas, Oklahoma, and north-central Texas, as well as coastal areas of Texas, and possibly northeastern Mexico. The Pacific coast population of the species is genetically isolated from western snowy plovers that breed in the interior (USFWS 1993a). The Pacific coast breeding population extends from the State of Washington to Baja California, Mexico, with the majority of breeding birds found in California (USFWS 2004a).

The coastal population of the western snowy plover consists of both resident and migratory birds. Some birds winter in the same areas used for breeding, while other birds migrate north or south to wintering areas. Plovers occasionally winter in southern coastal Washington (USFWS 2004a). Wintering plovers occur in widely scattered locations on both coasts of Baja California, and significant numbers have been observed on the mainland coast of Mexico at least as far south as San Blas, Nyarit (USFWS 1993a).

Within San Diego County, the majority of snowy plover nests are located on military bases and other federal properties (USFWS 2001). In 1998, 42 percent of all the snowy plovers in San Diego County were breeding on MCBCP (Collier and Terp 2001). On MCBCP, western snowy plover typically occurs in the Santa margarita River estuary salt flats and along open beaches and dunes from Del Mar Recreation Beach to just north of Aliso Creek. The breeding population of plovers on MCBCP increased steadily from a total of 36 breeding pairs in 1994 to a high of 94 pairs in 2012; however, nest pair estimation methods have varied over the years. In 2014, there were minimally 69 breeding pairs based on counting the maximum active nests at one time during the season; this methodology provides the most accurate trend data. San Diego County hosted approximately 60 percent of the population, with MCBCP having approximately 18 percent of the entire breeding population. Only eight sites have greater than 200 breeding pairs (Boylan et al. 2014).

N.8.3. Threats

The decline in the western snowy plover population is attributed to human disturbance, predation, and loss of nesting habitat to encroachment of invasive, nonnative plant species and urban development (USFWS 1993a). Beach cleaning activities that remove kelp and rake sand can harm plover foraging success (USFWS 2004a). Both clutches and broods may be lost due to predators, tides, storms, and human recreational activities. Examples include both repeated flushings of nesting plovers and direct damage to nests or to young resulting from humans, dogs, horses, or vehicles that either approach plover nests too closely or actually overrun plovers and nests (USFWS 2004a).

N.8.4. Recovery Strategy Goals

The recovery strategy for the Pacific coast population of the western snowy plover is to increase the population across its range; eliminate threats to the species and its habitat; and monitor and refine management actions for the species (USFWS 2007b). The recovery plan identifies six recovery units that cover the full range of the Pacific coast population; MCBCP is located in Recovery Unit 6 (Los Angeles to San Diego Counties). The recovery criteria for snowy plover include numeric subpopulation targets, reproductive productivity targets, and management actions for each recovery unit.

The first criterion is to maintain the snowy plover Pacific coast population at 3,000 birds, of which 500 breeding adults are to be located in Recovery Unit 6. Criterion 2 requires a yearly average productivity of at least one fledged chick per male for a total of 5 years in each recovery unit. Once these are achieved, mechanisms must be developed to ensure the long-term protection and management of the species to maintain the subpopulation sizes and average productivity. (Appendix B of the draft recovery plan identifies three locations on MCBCP: San Onofre Beach, Aliso/French Creek Mouth, and Santa Margarita River Estuary.)

Within Recovery Unit 6, MCBCP manages identified breeding locations at Aliso/French Creek and Santa Margarita River Estuary. The recovery plan identifies population targets for these locations of 40 and 160 breeding adults, respectively. Management measures identified for these locations are the following: (1) prohibit/restrict public access, boats, off-highway vehicles (OHVs), pets, horses, development, and military uses; (2) conduct population monitoring during breeding and/or wintering seasons; (3) conduct predator control; (4) conduct exotic plant control; (5) use exclusionary signs; (6) visually segregate or fence nesting areas; (7) provide public information and education; and (8) enforce protective rules and regulations. MCBCP's management program as described in this INRMP accomplishes all management measures for both locations on-Base.

N.8.5. Management and Monitoring

Guidelines for management and monitoring of western snowy plover and its habitat are provided in the Estuarine and Beach Ecosystem Conservation Plan and the Riparian BO. The Base implements the following programmatic instructions and habitat enhancement measures specified in the conservation plan and BO for the protection and management of the species and the estuarine/beach ecosystems:

- keep military and recreational activities within the Santa Margarita Management Zone and other utilized nesting areas to a minimum during the breeding season;
- install and maintain permanent/temporary fencing around nesting areas;
- post signs in strategic locations to deter unauthorized entry;
- enhance nesting areas through vegetation removal/control, and sand mobilization;
- conduct predator control;
- prohibit all activities in nesting colonies during the breeding season;
- prohibit all activities involving smoke, pyrotechnics, loud noises, blowing sand, and large groups of personnel (14 or more) within 300 m of nesting areas;
- prohibit all traffic within 15 feet of posted nesting areas during the breeding season;
- restrict aircraft from landing within 300 m of nesting areas; and
- restrict aircraft to 300 feet above ground level or more above nesting areas.

The Base has instituted measures for avoidance and minimization of impacts to Endangered Species Management Zones to protect western snowy plover and other species. These measures are specified in MCBCP Base Order P3500.1 (*Range and Training Regulations*), which prescribes regulations and general precautions for range and training area users that limit impacts to natural resources. Restrictions specific to the Endangered Species Management Zones that apply to snowy plovers are as follows:

- Obtain authorization from ES before entering any lagoon or estuary, marsh, mud/salt flat, or posted nesting area. Bivouacking and digging of fighting positions are prohibited in the vicinity of the Estuarine/Beach Endangered Species Management Zones during the period of 1 March to 15 September.
- Between 1 March and 15 September, all activities involving smoke, pyrotechnics, loud noises, blowing sand, and large groupings of personnel (14 or more) shall remain at least 300 m away from fenced or posted nesting areas. All other activities shall be kept at least 5 m from these areas.
- Foot traffic involving fewer than 14 personnel shall be kept as far away as possible, and approach no closer than 5 m to posted nesting areas between 1 March and 15 September. Unit hikes shall remain on the hard packed sand, as close to the ocean water edge as possible. When passing nesting areas, minimize all noise.
- Vehicle and equipment operations in the management zones shall be kept to a minimum between 1 March and 15 September. All vehicles shall travel on hard packed sand and shall not exceed 25 mph (40.2 km/hour). Tracked vehicles shall travel as close to the water (upper few inches of waves) as possible, year-round, in the Santa Margarita Management Zone. Vehicle operations inside fenced areas on the edge of the bluff between Aliso and French Creeks (White Beach) are not authorized between 1 March and 15 September.

- Engineering operations outside of approved landing exercise support shall be coordinated with ES prior to the initiation of activities.
- Boat operations are not authorized in lagoons and estuaries. LCACs shall not enter the management zones between 1 March and 15 September, except when entering or exiting seaward; and on return, shall exit the ocean heading directly up to the facility access ramp. Small boats may be permitted in the Santa Margarita estuary between 16 September and 1 March, with prior approval from ES.

The Base also conducts annual monitoring of western snowy plover in accordance with the conservation plan and BO. Western snowy plover surveys are conducted seasonally along occupied beaches to characterize the temporal and spatial distribution of nests, pair numbers, and reproductive success of plovers on-Base. Breeding activity is closely monitored during these surveys so that when plovers nest outside the traditionally fenced nesting areas, individual nests and any young produced shall be afforded the best possible protection by posting and fencing around the immediate vicinity of the nest(s).

The majority of these management and monitoring measures were being implemented on-Base prior to the completion of the conservation plan in 1995 and all have been incorporated in and managed through this INRMP since 2001. Monitoring results are used to develop adaptive management strategies for western snowy plover on-Base and are reported annually to USFWS.

N.9. LIGHT-FOOTED RIDGWAY'S RAIL (*RALLUS OBSOLETUS LEVIPES*)

The light-footed Ridgway's rail is a hen-sized marsh bird that is long-legged, long-toed, and approximately 14 inches (36 cm) long. It has a slightly down-curved beak and a short, upturned tail. Males and females are identical in plumage with a cinnamon breast contrasting their streaked back plumage of grayish-brown, and barred flanks of gray and white. The chin, throat, and a line from the base of the bill to the top of the eye are very light-buff.

FIGURE N-9. LIGHT-FOOTED RIDGWAY'S RAIL

Light-footed Ridgway's rails are omnivorous and opportunistic feeders. Their diet is thought to consist of insects, snails, tadpoles, crayfish, crabs, and California killifish. Preferred marsh vegetation varies from salt marshes heavily dominated by pickleweed (*Salicornia virginica*) to freshwater marshes dominated by cattails (*Typha* spp.) and bulrushes (*Scirpus* spp.) with occasional intermixed willows (*Salix* spp.) (USFWS 1985b). In addition, scattered stands of spiny rush (*Juncus acutus* ssp. *leopoldii*) are critical for rail nest placement (Zembal and Hoffman 2000). The Ridgway's rail breeding season extends from 1 March to 15

September and nests are placed to avoid flooding by tides, yet in dense enough cover to be hidden from predators and to support the relatively large nest.

N.9.1. Status

The light-footed Ridgway's rail is federally listed as endangered. A revised recovery plan for the Ridgway's rail has been approved by USFWS (USFWS 1985b), but no critical habitat has been designated. This species is also protected by the MBTA. A full species profile is available at the USFWS ECOS website (https://ecos.fws.gov/ecp0/profile/speciesProfile?spcode=B04B), which includes all Federal Register publications related to the listing history, recovery plans, and applicable HCPs.

The light-footed Ridgway's rail is state listed as endangered and fully protected by CDFW.

N.9.2. Distribution and Occurrence

The light-footed Ridgway's rail is a nonmigratory bird found in coastal freshwater and saltwater marshes in southern California and northern Baja California, Mexico. The light-footed Ridgway's rail is found in only a fraction of the marshes it once occupied. The rail has been absent from Los Angeles County since 1983 and Santa Barbara County since 2004. The majority of light-footed Ridgway's rails, about 60 percent of California's breeding population, reside in the Upper Newport Bay Ecological Reserve in Orange County (USFWS 2009b).

In San Diego County, the light-footed Ridgway's rail numbers only about 100 pairs and is found in the following sites from north to south: Cocklebur Canyon mouth, Santa Margarita River Estuary, San Luis Rey River mouth, Guajome Lake Marsh, Buena Vista Lagoon, Agua Hedionda Lagoon, Batiquitos Lagoon, San Elijo Lagoon, San Dieguito River Estuary, Los Peñasquitos Lagoon, Kendall-Frost Marsh (Mission Bay), San Diego River flood-control channel, Famosa Slough, Paradise Creek Marsh, Sweetwater River Estuary (including E Street and F Street marshes), J Street marsh, Otay River mouth, South Bay Marine Biology Study Area, Tijuana River Estuary, and the Dairy Mart ponds (Unitt 2004).

Light-footed Ridgway's rails have been recorded on MCBCP since 1982 when two pairs were detected in the Santa Margarita River Estuary, and one pair at the Cocklebur Estuary. Since then, they have been detected in the Santa Margarita River with one or two pair present from 1982 through 1988; and again from 2002 through 2007 (Zembal et al. 2007). In 2008, one pair and a single advertising male were detected within the Santa Margarita River Estuary (RECON 2009), and two pairs of light-footed Ridgway's rails were detected on the north side of the Santa Margarita River in 2011. In addition, one adult Ridgway's rail and three chicks were detected in the Santa Margarita River Estuary during 2009 predator control activities confirming nesting on-Base. In 2015, Ridgway's rails were detected at two locations on the north and south banks of the Santa Margarita River estuary. Because Ridgway's rails had been detected on the north shore in 2011 and on the south shore in 2013, it is likely that each of these rails nested within the area of detection in 2015 (Harris Environmental Group, Inc. 2015).

N.9.3. Threats

The decline of the light-footed Ridgway's rail is attributed to urban development, human disturbance, predation, and a general loss or degradation of feeding and nesting habitat in coastal salt marshes and estuaries (USFWS 2009b). It has also recently become apparent that there is potential for threats to Ridgway's rail habitat from ongoing accelerated climate changes, which was not considered at the time of listing. A risk assessment to evaluate the relative vulnerability or resilience of these birds or their habitat to impacts associated with climate change has not yet been developed. However, this taxon is generally restricted in coastal salt marshes and prefers to nest in the lower marsh areas, much of which is immediately surrounded by urban landscapes with little room to expand if water levels were to rise (USFWS 2009b).

N.9.4. Recovery Strategy Goals

The prime objective of the light-footed Ridgway's rail recovery plan is to increase the breeding population in California to at least 800 pairs by preserving, restoring, and/or creating approximately 10,000 acres (4,000 ha) of adequately protected, suitably managed wetland habitat consisting of at least 50 percent of marsh vegetation suitable for light-footed Ridgway's rail in at least 20 marsh complexes (USFWS 1985b).There are 36 individual areas identified in the recovery plan that are essential to light-footed Ridgway's rail recovery, five of which are identified on MCBCP: San Mateo Creek mouth, Las Pulgas Creek mouth, Las Flores Marsh, Cocklebur Canyon marsh, and the Santa Margarita River lagoon.

The recovery plan identifies management actions for individual habitat areas that need to be initiated or improved to achieve recovery of the species. Management measures identified for Ridgway's rail at San Mateo Creek mouth, Las Pulgas Creek mouth, Las Flores Marsh, and Cocklebur Canyon marsh are to assess the potential to support a population of rails or additional rails, prior to allocating funds to manage and restore these areas. Management measures identified for the Ridgway's rail at the Santa Margarita River lagoon are the following: improve/restore tidal action; create/expand fringing freshwater marsh; create nesting hummocks; create additional salt marsh vegetation with an emphasis on low marsh; enhance pickleweed vigor; improve tidal channel network; control human disturbance; identify and control predators; and develop and implement a program to control or reduce sedimentation.

N.9.5. Management and Monitoring

Current guidelines for management and monitoring of light-footed Ridgway's rail and its habitat are provided in the Estuarine and Beach Ecosystem Conservation Plan and the Riparian BO. The Base implements the following programmatic instructions and habitat enhancement measures specified in the conservation plan and BO for the protection and management of the species and the estuarine/beach ecosystems:

- keep military and recreational activities within the Santa Margarita Management Zone and other utilized nesting areas to a minimum during the breeding season;
- post signs in strategic locations to deter unauthorized entry;

- conduct invasive, nonnative vegetation control;
- conduct predator control; and
- protect last known nesting location of light-footed Ridgway's rails.

The Base has instituted measures for avoidance and minimization of impacts to Endangered Species Management Zones to protect light-footed Ridgway's rail and other species. These measures are specified in MCBCP Base Order P3500.1 (*Range and Training Regulations*), which prescribes regulations and general precautions for range and training area users that limit impacts to natural resources. Restrictions specific to the Endangered Species Management Zones that apply to rails are as follows:

- Obtain authorization from ES before entering any lagoon or estuary, marsh, mud/salt flat, or posted nesting area. Bivouacking and digging of fighting positions are prohibited in the vicinity of the Estuarine/Beach Endangered Species Management Zones during the period of 1 March to 15 September.
- Between 1 March and 15 September, all activities involving smoke, pyrotechnics, loud noises, blowing sand, and large groupings of personnel (14 or more) shall remain at least 300 m away from fenced or posted nesting areas. All other activities shall be kept at least 5 m from these areas.
- Foot traffic involving fewer than 14 personnel shall be kept as far away as possible, and approach no closer than 5 m to posted nesting areas between 1 March and 15 September. Unit hikes shall remain on the hard packed sand, as close to the ocean water edge as possible. When passing nesting areas, minimize all noise.
- Vehicle and equipment operations in the management zones shall be kept to a minimum between 1 March and 15 September. All vehicles shall travel on hard packed sand and shall not exceed 25 mph. Tracked vehicles shall travel as close to the water (upper few inches of waves) as possible, year-round, in the Santa Margarita Management Zone. Vehicle operations inside fenced areas on the edge of the bluff between Aliso and French Creeks (White Beach) are not authorized between 1 March and 15 September.
- Engineering operations outside of approved landing exercise support shall be coordinated with ES prior to the initiation of activities.
- Boat operations are not authorized in lagoons and estuaries. LCACs shall not enter the management zones between 1 March and 15 September, except when entering or exiting seaward; and on return, shall exit the ocean heading directly up to the facility access ramp. Small boats may be permitted in the Santa Margarita estuary between 16 September and 1 March, with prior approval from ES.

In addition, MCBCP conducts monitoring of light-footed Ridgway's rail every 3 years on-Base. Monitoring efforts include a habitat assessment and playback surveys focused in areas known or most likely to support vegetation communities used by Ridgway's rails to detect presence of this species. The most recent surveys were conducted in 2008 and 2011.

The MCBCP also continues to grant access to surveyors for statewide Ridgway's rail surveys.

These management and monitoring measures have been implemented on-Base since before the completion of the conservation plan in 1995, and were incorporated in and have been managed through this INRMP since 2001. The results of the light-footed Ridgway's rail monitoring are used to develop adaptive management strategies for light-footed Ridgway's rail on-Base and are reported to USFWS.

N.10. LEAST BELL'S VIREO (*VIREO BELLII PUSILLUS*)

The least Bell's vireo is a small migratory songbird that is approximately 5 inches (12.7 cm) long with rounded wings, a short straight bill, and faint white eye-rings. Least Bell's vireos are mostly gray in color above and pale below. Least Bell's vireos primarily inhabit low, dense willow-dominated riparian habitats with lush understory vegetation. The least Bell's vireo builds an open-cup nest typically out of pieces of bark, fine grasses, plant down, and mammal hair. The least Bell's vireo breeding season extends from 15 March through 31 August with the peak egg-laying period from May into early June. Average vireo clutch size is three to four eggs and the incubation period is typically 14 days. Both sexes care for young, which usually fledge 11 to 12 days after hatching (CDFG 1997a).

FIGURE N-10. LEAST BELL'S VIREO

N.10.1. Status

The least Bell's vireo is federally listed as endangered and USFWS has prepared a Draft Recovery Plan for the species (USFWS 1998b). Designated critical habitat for the vireo was revised and finalized in 1994. MCBCP was excluded from this designation based on the finding that an existing Memorandum of Understanding between USFWS and the Marine Corps for vireo management is providing an adequate level of protection to the vireo and its habitat (USFWS 1994a). The least Bell's vireo is also a USFWS Bird of Conservation Concern and is protected by the MBTA. Additionally, it is listed as a sensitive species by the Bureau of Land Management (BLM). A full species profile is available at the USFWS ECOS website (https://ecos.fws.gov/ecp0/profile/speciesProfile?spcode=B067), which includes all Federal Register publications related to the listing history, recovery plans, critical habitat designations, and applicable HCPs.

Recent genetic sequencing has identified two distinct clades that are separated in the arid southwestern United States, near the border of the Chihuahuan and Sonoran Deserts. A proposed taxonomic change has been made for populations occurring in San Diego County and including MCBCP from least Bell's vireo (*Vireo bellii pusillus*) to California least

vireo (*Vireo pusillus pusillus*) (Klicka et al. 2016). No formal change has been published in the Federal Register by the USFWS.

The least Bell's vireo is state listed as endangered.

N.10.2. Distribution and Occurrence

The entire range of the least Bell's vireo consists of the southwestern coastline of California below Santa Barbara, extending inland approximately to the edge of the Imperial Valley. The breeding range for this species encompasses greater Los Angeles and other metropolitan areas of southern California. The wintering habitat includes Baja California, Mexico, and the western coastline of northern and central Mexico. In San Diego County, the least Bell's vireo population is concentrated within riparian woodland and scrub habitat along coastal rivers, tributaries, and creeks. Major sites for the least Bell's vireo include the Santa Margarita River, San Luis Rey River, San Dieguito River, San Diego River, Sweetwater River, Windmill and Pilgrim Creeks, and several other smaller drainages throughout San Diego County (Unitt 2004).

On MCBCP, the least Bell's vireo breeds along rivers; creeks; and tributaries of the Santa Margarita River, Cristianitos Creek, San Mateo Creek, San Onofre Creek, Piedra de Lumbre, Las Flores Creek, Aliso Creek, French Creek, De Luz Creek, Fallbrook Creek, Pueblitos Canyon, Windmill Canyon, and Pilgrim Creek. The least Bell's vireo arrives at MCBCP from mid-March to early April and generally migrates to its wintering ground in late September, although they may begin departing by late July (USFWS 1998b). Stragglers have been noted in October and November, and occasionally individuals overwinter in California (USFWS 1998b).

The vireo population in 2009 and 2010 was the largest recorded on-Base over a 15-year period (1,013 and 1,068 territories, respectively), but decreased from 2011 (784 territories) to 2012 (636 territories). In 2014, the number of documented least Bell's vireo territories (634) on MCBCP decreased by 12 percent from 2013. This follows 1 year of vireo population increase on MCBCP and is not consistent with trends seen elsewhere in San Diego County where vireo populations only decreased slightly or continued to increase for the third year. Vireo populations decreased slightly from 2013 to 2014 on the lower San Luis Rey River (3 percent), increased on the middle San Luis Rey River (53 percent), and increased at Marine Corps Air Station (MCAS) on-Base (13 percent). The population decrease on MCBCP in 2014 is likely a response to wildfires in May 2014 that burned large sections of riparian habitat along the Santa Margarita River and Las Flores Creek. The vireos that were detected before the wildfire within its perimeter either perished or were displaced to other vireo habitat, either elsewhere on MCBCP or surrounding drainages off-Base such as the San Luis Rey River (USGS 2014a). In 2016 least Bell's vireo population decreased substantially from the previous year, likely due to effects of recent fires and drought (Sullivan pers. comm. 2016).

N.10.3. Threats

Formerly common and widespread in California and northwestern Baja California, the least Bell's vireo was reduced to about 300 pairs in the mid-1980s. The rangewide decline was attributed to extensive breeding habitat loss and degradation, and brood parasitism by the

brown-headed cowbird (*Molothrus ater*), which continue to be the most serious threats to vireos (USFWS 1998b). Permanent or long-term loss and degradation of breeding habitat and riparian woodlands is primarily due to nonnative invasive plants; watercourse development projects including flood control and water impoundments (dams); and changed hydrology from urban development (USGS 2014a).

In addition, least Bell's vireo is susceptible to predation. A 2000 study (Peterson et al. 2004) of species-specific predators of the least Bell's vireo concluded that coyotes were the most abundant mammal predators of vireos. Other common predators include other birds (e.g., scrub jays), opossums, snakes, and Argentine ants. Expansion of the Argentine ant population in association with ongoing urban development may constitute a previously unrecognized predation threat to the vireo, but further study is needed to determine their significance (USFWS 2006b).

N.10.4. Recovery Strategy Goals

The Draft Recovery Plan for the Least Bell's Vireo (USFWS 1998b) indicates that stable or increasing least Bell's vireo populations, each consisting of several hundred or more breeding pairs, must be protected and managed at several locations, including the Santa Margarita River, for a period of 5 years before being considered for downlisting. Additional goals for delisting include the reduction and elimination of threats so that the least Bell's vireo populations are capable of persisting without significant human intervention, or perpetual endowments are secured for cowbird trapping and exotic plant control in occupied riparian habitat.

The recovery strategy focuses on addressing the two major causes of least Bell's vireo decline: (1) habitat loss and degradation and (2) brown-headed cowbird nest parasitism. This requires habitat restoration, nonnative vegetation control, continuation of brown-headed cowbird removal, and annual monitoring programs. Management plans must also be developed and implemented for each population. Major threats to be addressed for the MCBCP/Santa Margarita River population include fire and fire prevention, channelization, water management, development, military training activities, groundwater pumping and wastewater treatment, flood/sediment control projects, and exotic species.

N.10.5. Management and Monitoring

The Base has implemented focused and specific management practices for protecting the least Bell's vireo and enhancing its breeding habitat. Current guidelines for management and monitoring of least Bell's vireo and its habitat are provided in the Riparian Ecosystem Conservation Plan and the Riparian BO. Under the conservation plan, MCBCP maintains a minimum baseline of 1,200 acres (486 ha) of riparian habitat and an additional 1,000 acres (405 ha) as a conservation bank. The Base implements the following programmatic instructions and habitat enhancement measures specified in the conservation plan and BO for the protection and management of the species and the riparian ecosystem:

- avoid riparian areas for project and training activities, especially during the breeding season;

- compensate for unavoidable impacts to riparian habitat through invasive, nonnative vegetation control (e.g., giant reed removal);
- restrict movement through riparian areas to existing roads, trails and crossings;
- minimize helicopter use between 0600 and 1100, and restrict helicopters to greater than 200 feet above ground level over riparian areas during the breeding season, except when landing and taking off;
- no bivouacking or trenching is allowed in riparian areas; and
- no engineering, grading or filling activities in riparian areas without prior approval.

The Base has also instituted measures for avoidance and minimization of impacts to least Bell's vireo. These measures are specified in MCBCP Base Order P3500.1 (*Range and Training Regulations*), which prescribes regulations and general precautions for range and training area users that limit impacts to natural resources. Restrictions specific to the least Bell's vireo are as follows:

- Extreme caution beyond that required by the FDRS is necessary when using pyrotechnics; and when conducting other activities likely to cause a fire.
- Foot traffic is authorized year-round on existing roads, trails, and creek crossings. Consult with ES prior to cutting/removing vegetation.
- Vehicles operating in the vicinity of creeks, rivers, or drainages shall use existing roads, trails, and established creek/river crossings.
- Consult with ES prior to bivouacking, cutting/removing vegetation, trenching, grading, filling, or conducting engineering operations in or adjacent to creek/river bottom areas.
- Dust produced in or adjacent to creeks and rivers shall be minimized to the maximum extent practical.

In addition, the Base conducts annual cowbird trapping and removal. This program was first initiated in 1983 with five traps on the Santa Margarita River and has since expanded to a total of 40 traps on all major drainages. Since cowbird control began, the number of vireo locations at MCBCP has increased from 62 to over 1,000 in 1998 (Griffith Wildlife Biology 2000). Additionally, the incidence of nest parasitism dropped from 47 percent in 1982 to no known parasitism observed in 1996. Since then, one documented occurrence of nest parasitism was made in 2016 (Lee pers. comm. 2017).

The Base also conducts annual monitoring of least Bell's vireo in accordance with the conservation plan and BO. Vireo surveys are conducted seasonally in all major drainages supporting riparian habitat to determine the size and composition of the population on-Base, characterize habitat used by vireos, estimate survivorship and movement, and assess the short-term effects of giant reed removal on vireo fecundity, nest success, and productivity. Additionally, a study was conducted from 2008 through 2011 to document vegetation and bird responses at Las Flores Creek to the 2007 Horno Fire; a subsequent study was initiated in 2014 in response to the DeLuz and Basilone Complex fires to be

completed in 2018. Vireo survey results were included to assess the status of this species in burned riparian habitat.

The least Bell's vireo management and monitoring measures contained in the Riparian Ecosystem Conservation Plan have been implemented continuously since its completion in 1995 and were incorporated in and have been managed through this INRMP since 2001. The results of least Bell's vireo monitoring are used to develop adaptive management strategies for least Bell's vireo on-Base and are reported annually to USFWS.

N.11. SOUTHWESTERN WILLOW FLYCATCHER (*EMPIDONAX TRAILLII EXTIMUS*)

The southwestern willow flycatcher is a small, Neotropical migratory songbird that is approximately 5.75 inches (15 cm) long with a grayish-green back and wings, whitish throat, light grey-olive breast, and pale yellowish belly. It has two parallel wingbars and a faint or absent eye-ring. The upper mandible is dark and the lower is light with a yellowish tone. The southwestern willow flycatcher breeds in relatively dense stands of riparian trees and other wetlands, including lakes (e.g., reservoirs).

FIGURE N-11. SOUTHWESTERN WILLOW FLYCATCHER

The breeding season for the southwestern willow flycatcher extends from 15 March to 31 August. Southwestern willow flycatchers arrive in their breeding grounds typically during late April to early May and nesting occurs from May through July. Average clutch size is three to four eggs, which hatch in 12 days and fledge within 12 to 15 days. Adults usually depart from their breeding territory in mid-August/early September to their wintering grounds in central Mexico and northern South America.

N.11.1. Status

The southwestern willow flycatcher is federally listed as endangered and USFWS has approved a recovery plan for the species (USFWS 2002). Designated critical habitat for the southwestern willow flycatcher was revised and finalized in 2013. MCBCP was exempted from critical habitat designation under Section 4(a)(3)(B) of the ESA because USFWS determined that conservation efforts identified in the Base INRMP provide a benefit to the flycatcher and riparian habitat. The southwestern willow flycatcher is also protected by the MBTA. A full species profile is available at the USFWS ECOS website (https://ecos.fws.gov/ecp0/profile/speciesProfile?spcode=B094), which includes all Federal Register publications related to the listing history, recovery plan documents, critical habitat designations, and applicable HCPs.

The southwestern willow flycatcher is state listed as endangered.

N.11.2. Distribution and Occurrence

The breeding range of the southwestern willow flycatcher includes southern California, Arizona, New Mexico, extreme southern portions of Nevada and Utah, far western Texas, perhaps southwestern Colorado, and extreme northwestern Mexico (USFWS 2002). Between August and September, the southwestern willow flycatcher migrates to the wintering grounds in Mexico, Central America, and possibly northern South America. The flycatcher occurs from near sea level to over 8,500 feet (2,600 m), but is primarily found in lower elevation riparian habitats. Throughout its range, the flycatcher's distribution follows that of its riparian habitat; relatively small, isolated, widely dispersed locales in a vast arid region.

In San Diego County, the population of the southwestern willow flycatcher is fewer than 90 pairs and fewer than 200 statewide (Unitt 2004). There are two main colonies of southwestern willow flycatchers in San Diego County along 4.6 miles (7.4 km) of the upper San Luis Rey River, and on MCBCP along the Santa Margarita River. Four newer colonies have recently formed and are located at Whelan Lake, Guajome Lake Marsh, Couser Canyon, and Pala (Unitt 2004). Other pairs or unmated individuals are scattered in small numbers throughout the county.

On MCBCP, willow flycatchers are found on the following rivers, creeks, and tributaries: Santa Margarita River, Newton Canyon, Hidden Canyon, Cristianitos Creek, San Mateo Creek, San Onofre Creek, Piedra de Lumbre, Las Flores Creek, Aliso Creek, French Creek, De Luz Creek, Fallbrook Creek, Roblar Creek, Windmill Canyon, and Pilgrim Creek. Transient willow flycatchers cannot be confirmed as the southern subspecies unless they are heard calling; however, it is assumed that many of the transient are southwestern willow flycatchers and therefore nonbreeding transitory habitat is considered for impacts during project planning. In past years, the breeding population of southwestern willow flycatcher on MCBCP has shown a general decline between 2007 (16 established territories) and 2012 (five established territories). The 10 territories in 2012 consisted of two polygynous pairs (two males and 10 females) limited to the lower Santa Margarita River. Despite the decline, nest success (number of nests fledging at least one young/total number of nests found) of flycatchers in 2008 and 2009 was the highest observed in the past 10 years (USGS 2014b). The number of breeding flycatcher territories on the Santa Margarita River in 2014 (five) decreased relative to 2013 (10). As in previous years, resident flycatchers were largely distributed among historic breeding areas, although the number of territories in all areas differed compared to previous years. Among the occupied areas, one area had an increase, and two areas had a decrease.

The northern portion of the Pueblitos breeding area supported a monogamous pair in 2014, an increase of one bird compared to 2013 when one female in this area paired with a polygynous male counted in restored treatment ponds that are east of Pueblitos Canyon in the Santa Margarita River (i.e., MCAS Base Realignment and Closure mitigation site). The treatment ponds breeding area decreased relative to 2013, hosting just two breeding pairs (one male, two females) compared to three breeding pairs (one male, three females) and two nonbreeding floaters in 2013. The MCAS breeding area also decreased, with two breeding pairs (one male, two females), compared to four breeding pairs (one male, four females) and one nonbreeding floater in 2013. The reduction in the number of occupied

territories in the MCAS breeding area was likely a result of the loss of habitat from the Las Pulgas fire, as the majority of previously suitable breeding habitat at the MCAS breeding area was severely burned. The Pump Road breeding area was also affected by the fire, with all previously suitable habitat severely burned. Consequently, the number of territories in the Pump Road breeding area fell to zero, compared to two female territories in 2013 (USGS 2014b). The multi-year decline on MCBCP is not well understood and is consistent with regional decline of this species in southern California. The Base is investigating whether removal of settling ponds and/or implementation of water conveyance improvements that reduce seeps are contributing to decline via loss of access to perennial water through the breeding season.

N.11.3. Threats

Rangewide southwestern willow flycatcher population declines observed in recent years are attributed to human disturbance, nest parasitism by cowbirds, and permanent or long-term loss and degradation of nesting habitat and riparian woodlands (USFWS 2002). Habitat loss and degradation are due to urban, recreational, and agricultural developments, as well as diminished water quality, fires, water projects, livestock grazing, and changes in the riparian plant community caused by invasive, nonnative plant species. In addition, long-term climate trends associated with climate change are expected to have an overall negative effect on the available rangewide habitat for southwestern willow flycatcher.

N.11.4. Recovery Strategy Goals

The overall recovery objective for the flycatcher is to attain a population level, and the quantity and distribution of habitat sufficient to provide for long-term persistence of metapopulations, even in the face of local losses (e.g., extirpation) (USFWS 2002). Due to the broad geographic range and site variation of the southwestern willow flycatcher, recovery is being approached by dividing the flycatcher's range into six recovery units, which are further divided into management units. This provides a strategy to characterize flycatcher populations, structure recovery goals, and facilitate effective recovery actions that should closely parallel the physical, biological, and logistical realities on the ground. The Coastal California Recovery Unit is composed of four Management Units: Santa Ynez, Santa Clara, Santa Ana, and San Diego; MCBCP is located in the San Diego Management Unit.

Per the recovery plan, the minimum number of southwestern willow flycatcher territories needed in the San Diego Management Unit to achieve downlisting is 125 territories from the 101 current territories. Within this management unit, the recovery plan identifies seven rivers and creeks on MCBCP where efforts should be focused: (1) San Mateo Creek, from San Mateo Road crossing to the Pacific Ocean; (2) San Onofre Creek, from below Camp Horno to the Pacific Ocean; (3) Las Flores Creek, from Basilone Road to the Pacific Ocean; (4) Fallbrook Creek, from the Naval Weapons Station boundary to the Santa Margarita River; (5) Santa Margarita River, from confluence with De Luz Creek to the Pacific Ocean; (6) De Luz Creek, from De Luz Road to the Santa Margarita River; and (7) Pilgrim Creek, from Vandergrift Road to the confluence with the San Luis Rey River.

N.11.5. Management and Monitoring

Current guidelines for management and monitoring of the flycatcher and its habitat are provided in the Riparian Ecosystem Conservation Plan and the Riparian BO. Under the conservation plan, MCBCP maintains a minimum baseline of 1,200 acres (486 ha) of riparian habitat and an additional 1,000 acres (405 ha) as a conservation bank. The Base implements the following programmatic instructions and habitat enhancement measures specified in the conservation plan and BO for the protection and management of the species and the riparian ecosystem:

- avoid riparian areas for project and training activities, especially during the breeding season;
- compensate for unavoidable impacts to riparian habitat through invasive, nonnative vegetation control (e.g., giant reed removal);
- restrict movement through riparian areas to existing roads, trails and crossings;
- minimize helicopter use between 0600 and 1100, and restrict helicopters to 200 feet above ground or more above riparian areas during the breeding season;
- no bivouacking or trenching is allowed in riparian areas; and
- no engineering, grading or filling activities in riparian areas without prior approval.

The Base has also instituted measures for avoidance and minimization of impacts to southwestern willow flycatcher. These measures are specified in MCBCP Base Order P3500.1 (*Range and Training Regulations*), which prescribes regulations and general precautions for range and training area users that limit impacts to natural resources. Restrictions specific to the southwestern willow flycatcher are as follows:

- Extreme caution beyond that required by the FDRS is necessary when using pyrotechnics; and when conducting other activities likely to cause a fire.
- Foot traffic is authorized year-round on existing roads, trails, and creek crossings. Consult with ES prior to cutting/removing vegetation.
- Vehicles operating in the vicinity of creeks, rivers, or drainages shall use existing roads, trails, and established creek/river crossings.
- Consult with ES prior to bivouacking, cutting/removing vegetation, trenching, grading, filling, or conducting engineering operations in or adjacent to creek/river bottom areas.
- Dust produced in or adjacent to creeks and rivers shall be minimized to the maximum extent practical.

Additionally, the Base conducts annual cowbird trapping and removal. This program was first initiated in 1983 with five traps on the Santa Margarita River and has since expanded to a total of 40 traps on all major drainages. Since cowbird control began, the incidence of nest parasitism dropped from 47 percent in 1982 to no known parasitism observed since 1996.

The Base also conducts annual monitoring of southwestern willow flycatcher in accordance with the conservation plan and BO. Flycatcher surveys are conducted seasonally in all major drainages supporting riparian habitat to determine the size and composition of the population on-Base, document survivorship and movement of resident flycatchers, document nesting activity, and characterize habitat used by flycatchers.

In addition to the annual monitoring, MCBCP has either hosted or funded the following U.S. Geological Survey (USGS) research efforts aboard the Base that directly or indirectly benefit the southwestern willow flycatcher: (1) flycatcher demographic studies using banded flycatchers; (2) examination of vegetation characteristics at southwestern willow flycatcher nest sites; (3) riparian habitat use by birds with an emphasis on habitat dominated by exotic vegetation; (4) response of southwestern willow flycatcher to removal of exotic vegetation; (5) use of exotic riparian vegetation as nesting substrate; and (6) use of nonlisted birds as indicators of suitable southwestern willow flycatcher habitat.

The southwestern willow flycatcher management and monitoring measures contained in the Riparian Ecosystem Conservation Plan have been implemented continuously since its completion in 1995 and were incorporated in and have been managed through this INRMP since 2001. The results of southwestern willow flycatcher monitoring are used to develop adaptive management strategies for southwestern willow flycatcher on-Base and are reported annually to USFWS.

N.12. YELLOW-BILLED CUCKOO (*COCCYZUS AMERICANUS*)

The yellow-billed cuckoo is a medium-sized, slender migratory bird about 12 inches (31 cm) long with white underparts and rust-colored flight feathers. It has a long boldly patterned black and white tail, an elongated down-curved bill that is blue-black on top and yellow on the bottom, and short bluish-gray legs. Adults have a narrow, yellow eye ring. Juveniles resemble adults, except the tail patterning is less distinct, and the lower bill may have little or no yellow. Adults arrive at their breeding grounds in June and July. Nests are most often constructed on overhanging branches of willows or cottonwoods within a stratified canopy. Average clutches contain two to five eggs. The yellow-billed cuckoo has a short incubation and nestling period of 11 to 12 days with fledging occurring 5 to 8 days later. Adults leave their breeding grounds late July to mid-September.

FIGURE N-12. YELLOW-BILLED CUCKOO

The yellow-billed cuckoo feeds primarily on large insects, but they will occasionally prey on small frogs and lizards. The cuckoo breeds almost exclusively in large blocks or contiguous areas of low to moderate elevation riparian woodlands, particularly cottonwood-riparian woodlands, within arid to semiarid landscapes

(Hughes 1999). Yellow-billed cuckoos are elusive and most easily detected by their distinct "kowlp" call, which is a loud, nonmusical series of notes sounding like "ca-ca-ca-ca-ca-cow-cow-cow" (Halterman 2009). Additional emphasis on identifying and recording yellow-billed cuckoo occurrence in riparian areas was added to the least bell's vireo annual monitoring effort in 2015 following listing.

N.12.1. Status

The western distinct population segment (west of the U.S. Continental Divide) of the yellow-billed cuckoo is federally listed as threatened. The cuckoo is protected by the MBTA, and is listed as a sensitive species by both BLM and the U.S. Forest Service. A full species profile is available at the USFWS ECOS website (https://ecos.fws.gov/ecp0/profile/speciesProfile?spcode=B06R), which includes all Federal Register publications related to the listing history, critical habitat designations, and applicable HCPs.

The yellow-billed cuckoo is state listed as endangered.

N.12.2. Distribution and Occurrence

The yellow-billed cuckoo is a Neotropical migrant bird that winters in South America and breeds in North America. Cuckoos spend the winter east of the Andes, primarily south of the Amazon Basin in southern Brazil, Paraguay, Uruguay, eastern Bolivia, and northern Argentina (Johnson et al. 2008). The breeding range of the western population of cuckoos once extended from northern Mexico to the Canadian border; however, now they only breed in significant numbers in scattered locations where suitable habitat is available throughout California, Arizona, New Mexico, and Texas (Hughes 1999). They are also known or believed to occur in smaller numbers in Colorado, Idaho, Montana, Nevada, Oregon, Utah, Washington, and Wyoming.

In California, the breeding range of the yellow-billed cuckoo once extended through the entire Central Valley, along the southern coast and down to the Mexican border. Breeding cuckoos are now generally restricted to the lower Colorado River, the South Fork of the Kern River, and the Sacramento River, which is believed to be the major population center for the species (Laymon and Halterman 1987). Recent surveys from 2000 through 2012 have also detected cuckoos along the lower Eel River in Humboldt County, which may potentially represent a new breeding site in California. Cuckoos usually arrive in California in June, and depart by late August to mid-September (Gaines and Laymon 1984).

In San Diego, the yellow-billed cuckoo is considered a rare and sporadic summer visitor. The only nesting dates reported from San Diego County are of a female with a brood patch collected at Escondido on 30 June 1915, and egg sets collected at Escondido on 3 July 1915 and 2 July 1932 (Unitt 2004). More recently, there have been a series of recorded sightings of one to two birds along the San Luis Rey River in the vicinity of Bonsall in 2011, 2012, and 2013.

On MCBCP, the yellow-billed cuckoo has been encountered on four occasions since 1980: (1) along the Santa Margarita River at the upper end of Ysidora Basin on 4 and 5 July 1984 (Unitt 2004); (2) again along the Santa Margarita River at the upper end of Ysidora Basin

on 7 through 11 July 2000 (Unitt 2004); (3) a carcass was recovered at the mouth of the Santa Margarita River on 25 June 2005 (Davenport 2012); and (4) yellow-billed cuckoo calls were detected three times during gnatcatcher surveys along the Santa Margarita River at the De Luz Creek confluence on 18 July 2008 (Davenport 2012).

N.12.3. Threats

In California, yellow-billed cuckoos have declined by more than 99 percent from historical levels, and it appears this decline is continuing, especially along the Sacramento River and at isolated sites that previously supported small populations, but are now unoccupied. Much of the substantial decline of the western yellow-billed cuckoo has been attributed to riparian habitat loss and degradation (Hughes 1999). Past riparian habitat losses are estimated to be 90 to 99 percent in California.

The main causes of this riparian habitat loss include land clearing for agriculture, flood control projects, surface water diversions and groundwater pumping, overgrazing by livestock, and increased incidence of wildfire. These types of disturbances also promote the establishment of invasive, nonnative plants, particularly giant reed and tamarisk, which reduces the size and quality of available breeding habitat (Rosenberg et al. 1991). The resulting fragmentation effects include the loss of suitable habitat patches large enough to sustain local populations, potentially leading to local extinctions, and the potential fragmentation or loss of migration routes, affecting the ability of the cuckoo to recolonize suitable areas.

Other threats include West Nile virus, which is spreading throughout portions of the western United States and poses a threat to bird species. The USGS National Wildlife Health Center has identified the yellow-billed cuckoo as a species that may be affected by West Nile virus. Predation is also a potential threat to the cuckoo. Falcons, hawks, jays, grackles, and various snake and mammal species have all been documented depredating adult cuckoos and/or their nests (including eggs and nestlings) (Hughes 1999).

N.12.4. Recovery Strategy Goals

The yellow-billed cuckoo is only proposed for listing at this time and, therefore, no recovery plan or goals have been established. However, if this species is listed, USFWS will be required to develop and implement a recovery plan under subsection 4(f) of the ESA.

N.12.5. Management and Monitoring

Western yellow-billed cuckoo usually occurs in large, dense tracks of riparian habitat: therefore, management and monitoring should focus on maintaining, restoring, and enhancing large tracts of suitable habitat, including controlling invasive species, such as giant reed and tamarisk (Laymon 1998). Since the western yellow-billed cuckoo is considered a transient and infrequent visitor and is unlikely to nest on-Base, it is expected that the programmatic instructions and management measures outlined in the Riparian Ecosystem Conservation Plan for the management of riparian habitat are sufficient to protect and manage optimal habitat and provide conservation benefit to this species. The Riparian Ecosystem Conservation Plan will be revised to include coverage for the yellow-

billed cuckoo if, and when, the species is officially listed. Additionally, any occurrences of yellow-billed cuckoo on-Base will be addressed on a case-by-case basis with avoidance and minimization measures implemented as necessary under the Base's MBTA Program.

N.13. COASTAL CALIFORNIA GNATCATCHER (POLIOPTILA CALIFORNICA CALIFORNICA)

FIGURE N-13. CALIFORNIA GNATCATCHER

The coastal California gnatcatcher is a small, long-tailed bird with dark, blue-gray plumage above and grayish-white below. The tail is mostly black above and below. The male has a distinctive black cap, which is absent during the winter. Both sexes have a distinctive white eye-ring. As its common name implies, the gnatcatcher preys upon arthropods, including insects such as leafhoppers and planthoppers, and spiders (USFWS 2003c). The coastal California gnatcatcher is most numerous in low, dense coastal scrub habitat in arid washes, on mesas, and on slopes of coastal hills. California buckwheat, coastal sage, and patches of prickly pear are particularly favored for roosting, nesting, and foraging (CDFG 1997b). The gnatcatcher breeding season extends from 15 February through 30 August, with peak nesting activities occurring from mid-March through mid-May.

N.13.1. Status

The California gnatcatcher is federally listed as threatened. There is no recovery plan for this species; however, USFWS has prepared a coastal California gnatcatcher Spotlight Species Action Plan. Designated critical habitat for the gnatcatcher was revised and finalized in 2007. MCBCP was exempted from critical habitat designation under Section 4(a)(3)(B) of the ESA because USFWS determined that conservation efforts identified in the Base INRMP provide a benefit to the gnatcatcher and its habitat (USFWS 2007c). The gnatcatcher is also protected by the MBTA. A full species profile is available at the USFWS ECOS website (https://ecos.fws.gov/ecp0/profile/speciesProfile?spcode=B08X), which includes all Federal Register publications related to the listing history, Special Rule publications, critical habitat designations, and applicable HCPs.

The coastal California gnatcatcher is state listed as a Species of Special Concern.

N.13.2. Distribution and Occurrence

The coastal California gnatcatcher is a nonmigratory bird with a range restricted to coastal southern California and northwestern Baja California, Mexico. This subspecies is found from Ventura County south to San Diego County and east to San Bernardino County. The coastal California gnatcatcher occurs widely in San Diego County's coastal lowland. The core population areas capable of supporting 30 or more pairs of coastal California gnatcatcher range along the coast from MCBCP south to the Tijuana River mouth, and inland from Rainbow/Pala to the Jamul Mountains (Unitt 2004). Elevation appears to be

the main factor limiting gnatcatcher distribution in San Diego County, where over 90 percent of locations are below 1,000 feet (305 m) (Unitt 2004).

On MCBCP, the coastal California gnatcatcher's distribution is primarily within coastal sage scrub habitat in the less steeply sloped areas of the Base with concentrations in the northern (State Park), coastal, and southern inland portions of the Base. The Base has been conducting coastal California gnatcatcher surveys every 3 to 4 years since 1989. This basewide study found the third highest number of coastal California gnatcatcher locations as defined by territorial males, pairs, and family groups (436 locations). This total is recorded after the largest decrease between studies was recorded during the last basewide survey. The decrease from the 668 observed in 2006 to 268 documented in 2010 represented the largest decrease recorded for the Base between consecutive surveys; however, the trend data are confounded by the fact that the 2006 surveys were conducted both during breeding season and nonbreeding season. Another large decline was recorded between 1998 (604 locations) and 2003 (311 locations). The results of these survey efforts are evidence that this population is subject to rather dramatic fluctuations.

A habitat assessment conducted in 2013 showed that approximately 19,580 acres (7,924 ha) of suitable gnatcatcher habitat occurs on-Base. In 2014, 436 occupied sites were identified, including 122 territorial males, 283 pairs, and 31 family groups. An additional 53 transient individuals were identified as well, but were not recorded as occupied sites that would be considered during project analysis. Within the 73 family group observations, 119 dependent juveniles were observed. Sixty-four of the family groups were observed with dependent juveniles with an average of 1.86 dependent juveniles per family group. Since 2006, several wildfires have altered large expanses of high-quality coastal sage scrub habitat located in areas that typically supported large numbers of gnatcatchers, which may also be a contributing factor. Surveys in 2014 were interrupted mid-season due to large scale fires on-Base, which may also have disrupted nesting and renesting efforts. Despite the loss of suitable habitat, many areas of vacant unoccupied suitable habitat remain and further investigation is needed to determine why these areas are not being utilized.

N.13.3. Threats

The coastal California gnatcatcher is closely tied to its habitat of coastal sage scrub in the northern portion of its range, and coastal succulent scrub in the southern portion. Although numerous factors were involved in the decline of the coastal California gnatcatcher, habitat loss and fragmentation resulting in habitat type conversion is the principal reason for the subspecies' current threatened status. The most significant stressor leading to habitat type conversion is wildland fire. Wildland fire allows nonnative grasses to outcompete re-growing native shrubs. This leads to an increase in nonnative grasses, which makes the area more susceptible to wildland fire, and facilitates the process to repeat, but with successively fewer native shrubs with each new fire. The number of wildland fires has increased dramatically as urbanization has come into greater contact with wildland areas.

Implementation of regional Natural Community Conservation Plans (NCCPs)/HCPs has greatly reduced the magnitude of rapid destruction of coastal scrub vegetation by directing development toward certain areas, while preserving core and linkage habitat areas. However, recent wildland fires, including the firestorms of 2003 and 2007, have blackened

tens of thousands of acres of gnatcatcher habitat including areas preserved under the regional NCCPs/HCPs. These areas are now at risk of being overrun by nonnative grasses and forbs. Thus, the threat of habitat type conversion has increased throughout San Diego County. Grazing, nest predation, and brood parasitism by brown-headed cowbirds have also adversely impacted the subspecies throughout its range.

N.13.4. Recovery Strategy Goals

Although no recovery plan has been established for the coastal California gnatcatcher, the USFWS Spotlight Species Action Plan provides a goal to increase the size of gnatcatcher populations by improving habitat quality at sites burned since 2003. Proposed actions include selecting sites for habitat restoration and initiating restoration work at these sites.

N.13.5. Management and Monitoring

The U.S. Marine Corps is currently in consultation with USFWS regarding programmatic basewide management of upland habitats including areas of the gnatcatcher's preferred habitat of coastal sage scrub. Until consultation is complete and a BO is issued, the gnatcatcher benefits from basewide management practices such as invasive, nonnative vegetation control; cowbird trapping; and coastal sage scrub habitat restoration.

Since this species was listed, the Base has instituted measures for avoidance and minimization of impacts to the gnatcatcher and its preferred habitat. The USFWS Survey Guidelines for CAGN designate the breeding season as February 15 through August 30, with the peak nesting activity occurring from mid-March through mid-May. After a 14-day incubation period, fledglings are attended by parents for three to four weeks. The following conservation measures are observed on Base:

- Extreme caution beyond that required by the FDRS is necessary when using pyrotechnics and when conducting other activities likely to cause a fire.
- Foot traffic between 15 February and 30 August shall be kept to existing roads, trails, and established facilities to the maximum extent possible. Foot traffic may be authorized in California gnatcatcher habitat areas between 31 August and 14 February; however, care must be exercised to avoid crushing or otherwise destroying brush vegetation.
- Bivouac/command and post/field support activities shall be kept at least 50 m from gnatcatcher habitat areas, year-round.

In addition, the Base has been conducting coastal California gnatcatcher surveys since 1989, and basewide surveys are conducted approximately every 3 to 4 years. This survey effort provides necessary data for gnatcatcher and coastal sage scrub habitat management. The objectives of these surveys are to conduct habitat assessments to identify suitable areas of gnatcatcher occupation; conduct presence/absence surveys and record gnatcatcher locations and breeding status; and monitor 50 randomly selected pairs distributed across multiple survey sites to determine nest success and estimate annual productivity.

N.14. PACIFIC POCKET MOUSE (PEROGNATHUS LONGIMEMBRIS PACIFICUS)

The Pacific pocket mouse is a solitary nocturnal burrowing mouse approximately 5 inches (12.7 cm) long from nose to tip of the tail. It specializes in harvesting and caching seeds for food reserves. Their coat is silky (spineless and bristle-free), and is predominately brown, pinkish-buff above and light brown, pale tawny, buff, or whitish below. Their ears are tipped with a patch of light hairs, the tail is distinctly or indistinctly bicolored, and the soles of the hind feet are hairy.

FIGURE N-14. PACIFIC POCKET MOUSE

The species can be found in hibernation ranging from September to April. Instead of utilizing a fat reserve for sustenance, during hibernation periods they display limited daily activity within their burrows feeding upon seed caches. Periods of dormancy have been found to not have a strictly daily or seasonal pattern, and they may be active during winter months outside of their burrows if seed production is high. The pocket mouse will become torpid if deprived of food for 24 to 36 hours, and hibernate with a body temperature that fluctuates just above ambient air temperature. They typically emerge from hibernation in spring (usually March) once seed availability is prevalent again (USFWS 1998c).

Breeding typically occurs from April through July (USFWS 1998c). Gestation typically lasts 23 days, and young are weaned after 30 days. Sexual maturity is reached within 41 days, and under favorable conditions breeding can occur within their natal year (USFWS 2010). It is speculated that the pocket mouse has a lifespan of 3 to 6 years (USFWS 1998c).

N.14.1. Status

The Pacific pocket mouse is federally listed as an endangered species. A revised recovery plan for the Pacific pocket mouse has been approved by USFWS (USFWS 1998c), but no critical habitat has been designated. A full species profile is available at the USFWS ECOS website (https://ecos.fws.gov/ecp0/profile/speciesProfile?spcode=A0BY), which includes all Federal Register publications related to the listing history, recovery plans, and applicable HCPs.

The Pacific pocket mouse is state listed as a Species of Special Concern.

N.14.2. Distribution and Occurrence

Historically, the Pacific pocket mouse had a rare and patchy distribution along coastal southern California. The majority of records occurred within approximately 2.5 miles (4.0 km) of the coast from Marina Del Rey and El Segundo in Los Angeles County, south to the

vicinity of the Mexican border in San Diego County. Currently, the only known extant populations of this species occur in four locations: the Dana Point Headlands (Orange County), and three locations on MCBCP (USFWS 1994b).

The Pacific pocket mouse has been detected on-Base in the following three areas: the Oscar One and Edson Range Training Areas (Santa Margarita population), east of the San Onofre housing area (South San Mateo population), and in the northwest corner of the Base between the Base boundary with the City of San Clemente and Cristianitos Road (North San Mateo population). In 2012, the Base enlisted USGS to implement the second year of a new monitoring program for the Pacific pocket mouse across all three population sites within the Base to track trends in overall occupancy. The results show that the cover of forbs is the most important predictor of Pacific pocket mouse-occupied habitat across all population sites. In addition, increased forb cover was the most significant predictor of Pacific pocket mouse colonizing previously unoccupied plots from 2012 through 2013 (USGS 2014c). Sandy soils were found not to be a predictor of Pacific pocket mouse-occupied habitat; sandy soils are associated with forb-dominated vegetation communities and therefore are likely indirectly associated with Pacific pocket mouse occupancy (USGS 2014c). The study also showed a strong negative response of Pacific pocket mouse to high nonnative grass cover (USGS 2014c).

Pacific pocket mouse was regularly documented within open sandy areas of the North San Mateo area from 1995 through 2003. Although numerous and extensive surveys and monitoring efforts have been conducted after this time, no Pacific pocket mouse individuals have been detected at this site since 2003. Due to this, it is currently thought that the Pacific pocket mouse has been extirpated from the North San Mateo population area. Theorized impacts to Pacific pocket mouse and habitat at North San Mateo are from recreation, urban edge effects, vegetation succession, and invasion of Argentine ants.

Light military training and movements (as well as biologists) are detrimental to Pacific pocket mouse (USGS 2014c). It is expected that this is much more of a problem for Pacific pocket mouse occupying sandy soils rather than those in the harder clay soils as burrows could be easily crushed.

In 2013, USGS surveyed for Argentine ants across the Pacific pocket mouse survey grids. Argentine ants have been associated with the decline of both small mammal and lizard species (USGS 2014c). They tend to displace native ants and can be relentless predators of native invertebrates and juvenile birds in nests. It is unknown what predatory impact these ants may have on juvenile or adult small mammals, particularly within underground burrows. Because they are not efficient dispersers of seeds, like the harvester ants they displace, their presence can also alter the vegetation community. Therefore, an Argentine ant invasion could have large direct and indirect effects on Pacific pocket mouse and the ecosystem in which they have evolved (USGS 2014c).

N.14.3. Threats

All four known Pacific pocket mouse populations are threatened by habitat fragmentation and small size. Other primary threats to these isolated populations include habitat loss and degradation from development, military training activities, fire, and predation from a suite

of potential predators. Since the listing of the species, climate change and Argentine ants have also been recognized as potential threats (USFWS 2010).

Specifically, heavy use of the San Onofre State Beach area by the adjoining residential community, and unauthorized trail creation and habitat disturbances are degrading the habitat quality of the North San Mateo population. The Oscar One/Edson and South San Mateo populations are located in active military training areas and ongoing military training activities impact habitat quality through increased foot and vehicle traffic, removal or reduction of vegetation, and soil compaction.

N.14.4. Recovery Strategy Goals

The immediate recovery goal for the Pacific pocket mouse is to avert the extinction of the Pacific pocket mouse by focusing on short-term strategies to improve the subspecies' prospects for survival (USFWS 1998c). The recovery strategy for the Pacific pocket mouse consists of two components. The first is to stabilize the existing populations by protecting currently occupied habitat as well as searching for additional populations and providing protection to any that are found. The second component is to establish additional populations through (1) natural colonization/recolonization into nearby and adjacent habitats, coupled with habitat management in these areas; and (2) translocation and/or the release of captive-bred individuals into known suitable habitat (USFWS 1998c).

USFWS may consider downlisting the Pacific pocket mouse to threatened when 10 populations are independently viable and suitable or increasing, and their habitats are secure and fully protected. Populations of the Pacific pocket mouse shall be considered viable if (1) the appropriate analysis of measured population parameters indicates that each population has a 95 percent or greater chance of surviving for 100 years; (2) occupied habitat consists of a minimum of 4,940 acres (2,000 ha) that are secure and fully protected; (3) all populations are managed through a program to maintain genetic diversity for future generations; and (4) all populations and essential habitat are managed, so that current and potential threats are eliminated or minimized to the extent that each population is not at risk of extirpation.

Second, delisting will be considered if and when (1) all actions necessary for reclassification to threatened have been implemented; (2) any necessary protection, restoration, and enhancement activities (on all sites that have been determined essential to the recovery of the subspecies) are successfully completed; and (3) populations of the Pacific pocket mouse are representative of the full (existing) genetic variability and historical geographical range of the subspecies and occur in habitats that collectively represent the full range of parameters observed and described in the past or during prescribed, future research, and monitoring events.

MCBCP implements many of the proposed recovery actions identified in the recovery plan including, but not limited to, the following: conduct surveys to locate unknown populations and identify prospective habitat; monitor population trends and identify potential threats and management needs; develop an adaptive management plan for MCBCP; protect occupied habitat from fire and fire abatement measures; and control exotic plants.

N.14.5. Management and Monitoring

The U.S. Marine Corps is currently in consultation with USFWS regarding programmatic basewide management of upland habitats, including occupied habitat for the Pacific pocket mouse. Until consultation is complete and a BO is issued, the Pacific pocket mouse benefits from current basewide management practices such as invasive, nonnative vegetation control; exotic animal/predator control (free roaming cats); use of native seed stock when conducting post-fire reseeding to enhance habitat; resource conservation awareness and education programs; and the terms and conditions of the consultation and BO for the construction, operation, and maintenance of the Crucible Challenge Course in the Oscar One and Edson Range areas of the Base that was issued on 14 August 1996 (USFWS 1996).

The BO for the Crucible Challenge Course required course elements to be located where the Pacific pocket mouse was determined to be absent or where current habitat conditions (extremely grassy or compacted areas) were likely to support few to no mice. All elements were constructed to ensure that movement of the species throughout the area is not restricted in any significant manner. Construction, operation, and maintenance are restricted to existing roads and personnel are to avoid parking vehicles on roadside berms in the vicinity of Pacific pocket mouse-occupied habitat. The Base implemented a monitoring and adaptive management program that assesses the net effect of the Crucible Challenge Course with the goal of long-term maintenance of the Pacific pocket mouse population in the Oscar One and Edson Range areas (USFWS 1996).

Since this species was listed, the Base has instituted measures for avoidance and minimization of impacts to the Pacific pocket mouse and its habitat. These measures are specified in MCBCP Base Order MCIWEST-MCB CAMPENO 3500.1 Ch 1 (*Range and Training Regulations*), which prescribes regulations and general precautions for range and training area users that limit impacts to this species by restricting activities in and adjacent to pocket mouse-occupied habitat. Restrictions specific to the Pacific pocket mouse are as follows:

- Foot traffic is authorized year-round; however, digging, including construction of fighting positions, shall be avoided.
- Vehicle/equipment operations near known habitat shall be kept on existing roads year-round. Contact ES prior to conducting activities involving soil excavation, filling, or grading.
- Bivouac/command and post/field support activities shall be kept at least 50 m from Pacific pocket mouse habitat areas year-round.

In 2007, MCBCP contracted with (USGS to develop a scientifically valid, effective, and cost-effective monitoring program for the Pacific pocket mouse that would document trends in the population status and identify adaptive management needs. USGS, MCBCP, and a scientific review panel held a workshop in which many independent and agency scientists, consultants, and land managers provided input to help develop short-term studies and long-term goals. In preparation for developing a comprehensive long-term monitoring plan, several preliminary pilot studies were conducted from 2008 through 2010.

The 2008 study assessed the status of the north and south San Mateo populations, compared probabilities of capture and detection with live-trapping, and defined important habitat covariates associated with pocket mouse occurrence (Brehme et al. 2009). The 2009 study assessed and compared both active and passive sampling methodologies (e.g., live-traps, tracking tubes, canine scent detection) (Brehme et al. 2010). In 2010, all potential pocket mouse habitat on-Base was surveyed using canine scent detection to discover new populations and define sampling boundaries for the three Pacific pocket mouse populations.

In 2011, in collaboration with the scientific panel, a relatively simple, multi-scaled, habitat-based, adaptive monitoring program for Pacific pocket mouse was designed (Brehme et al. 2011). This program tracks trends in overall occupancy of Pacific pocket mouse on-Base, as well as within each of the three populations on-Base, and includes a relative density index. Due to contract delays, the protocol for 2011 was reduced to tracking tube monitoring of core plots only. The primary purpose of the 2011 study was to generate phenological data for 2011 (time of torpor) and to identify and correct any issues with sampling prior to the implementation of the full program in 2012 (Brehme et al. 2012).

In addition, the terms and conditions of the consultation and BO for the construction, operation, and maintenance of the Crucible Challenge Course in the Oscar One and Edson Range areas of MCBCP, issued on 14 August 1996, provide monitoring and adaptive management for the Pacific pocket mouse population. The Base is also partnering with Conservation and Research for Endangered Species and USFWS to sponsor a captive breeding program for the eventual establishment of another off-Base population. The Base is also currently conducting a Pacific pocket mouse lighting study to better assess anthropogenic disturbances during the project review process. The Base completed a Pacific Pocket Mouse Management Plan in 2015.

N.15. STEPHENS' KANGAROO RAT (*DIPODOMYS STEPHENSI*)

The Stephens' kangaroo rat is a small, burrow-dwelling rodent. Like other kangaroo rats, 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. The dexterous front paws are frequently used to hold seeds that the animal eats. There are five toes on each of the hind paws, and the crested tail is 1.45 times the length of the head and body. They prefer open habitat on gentle slopes for efficient movement and foraging. The average adult is 11 to 12 inches (27.9 to 30.5 cm) in length and weighs 2.3 ounces (67 grams) (Bleich 1977). This species is nocturnal, spending the day in underground burrows and foraging on the surface at night.

FIGURE N-15. STEPHENS' KANGAROO RAT

Adults are solitary, strongly territorial (one adult per burrow) and characterized by a promiscuous mating system establishing no persistent pair bonds. Reproductive individuals have been observed year-

round, although onset of estrus in females appears to be triggered by the onset of winter rains, and ceases after plants disperse seeds. Average gestation period is 30 days, and the average number of young per litter is 2.5. 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 (USFWS 1997b).

In 1996, Tetra Tech, Inc. estimated that there were approximately 684 acres (277 ha) of occupied Stephens' kangaroo rat habitat on-Base that were roughly grouped into three "core population areas," which are referred to as the western, central, and eastern core population areas (USFWS 2011a).

The western core population area consisted of occupied habitat located within Ranges 115, 225, 227, 407, 408, and 409, and along Roblar Road. Based on surveys conducted in 1996, the western core population area was estimated to contain approximately 470 acres (190 ha) of occupied Stephens' kangaroo rat habitat (USFWS 2011a). The central core population area consisted of occupied habitat located within Artillery Firing Area (AFA) 22 in Kilo One, AFA 23 and Combat Town in Kilo Two, and AFA 24 in south India and was estimated to contain approximately 103 acres (42 ha) (USFWS 2011a). The eastern core population area located in the Juliet Area was estimated to contain approximately 110 acres (44 ha) (USFWS 2011a).

In 2005, USGS estimated that 148 acres (60 ha) of high suitability habitat was occupied by Stephens' kangaroo rat on-Base; in 2006, they estimated 175 acres (71 ha); in 2007, they estimated 323 acres (131 ha); and in 2008, they estimated 364 acres (147 ha). Thus, the greatest amount of occupied Stephens' kangaroo rat habitat estimated by USGS [i.e., 364 acres (147 ha in 2008] is only about half of that estimated by Tetra Tech, Inc. in 1996 (USFWS 2011a). It is possible that Stephens' kangaroo rat were more widely distributed in 1996 than in 2008, but it is also likely that different methods for calculating occupied habitat have generated different estimates.

N.15.1. Status

The Stephens’ kangaroo rat is federally listed as an endangered species. A Draft Recovery Plan for the Stephens’ Kangaroo Rat was prepared by USFWS (USFWS 1997b), but no critical habitat has been designated. A full species profile is available at the USFWS ECOS website (https://ecos.fws.gov/ecp0/profile/speciesProfile?spcode=A08Q), which includes all Federal Register publications related to the listing history, recovery plan documents, and applicable HCPs.

The Stephens’ kangaroo rat is state listed as a threatened species.

N.15.2. Distribution and Occurrence

The geographic distribution of the Stephens’ kangaroo rat includes the San Jacinto Valley and adjacent areas of western Riverside, southwestern San Bernardino, and northwestern San Diego Counties (USFWS 1997b). The species is distributed across a range of approximately 1,108 square miles (2,869.7 square km), in numerous small fragmented populations, where suitable habitat remains (USFWS 1997b). Stephens’ kangaroo rat 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 1997b). Occupied

habitats are usually sparse, slightly disturbed coastal sage scrub or annual grassland on level or low-rolling terrain. Stephens' kangaroo rat is found from approximately 180 to 4,100 feet (55 to 1,250 m) above sea level with most populations occurring below 2,000 feet (610 m). It is not found on extremely hard or sandy soils; gravel is a common component of soils where the animal is found (USFWS 1997b).

Stephens' kangaroo rat occurs at scattered localities on MCBCP. Historically, this species has been found in the following areas: Juliet, Kilo 1, Kilo 2, Range 407-1, Range 407-2, Range 408-1, and Range 409-1. Stephens' kangaroo rat occupancy was estimated at approximately 462 acres (187 ha) from 2011 through 2012 (Brehme et al. 2012).

In 1992, the Base had a project to improve 50 acres (20 ha) of Range 210E for training troops and firing ordnance. The Base was issued a BO by USFWS on 22 September 1992 (1-6-92-F-48), with the terms and conditions to enhance 24.4 acres (9.9 ha) of currently unoccupied, but potentially suitable, Stephens' kangaroo rat habitat occurring in the Juliet maneuver area in the northeast section of the Base. This 24.4-acre (9.9-ha) area has served as a mitigation bank for basewide impacts to Stephens' kangaroo rat habitat since 1992. Since the establishment of the Juliet bank, numerous projects around the Base impacted Stephens' kangaroo rat habitat, resulting in acreage deductions from the bank. On 28 June 1999, a BO was issued for a project to install and upgrade the power distribution system on-Base. For this project, the Base expanded the Stephens' kangaroo rat management area by 28.7 acres (11.6 ha). Past and future projects (e.g., Range 409 Improvements) have resulted in or will result in deductions from the Juliet bank.

Per the numerous BOs for the management of the Stephens' kangaroo rat bank, the Base is to maintain the management area by prescribed burning. In reviewing the monitoring studies by Stephen Montgomery, PhD, going back to 1998, the habitat became overgrown and mostly consisted of thatch composed of native and nonnative grasses and weeds until the base started actively managing vegetation in 2007 (Petersen 2015). The Base had been out of compliance on the maintenance of the habitat since approximately 2000. There was a burn in 1998 that kept the habitat clear until the rains arrived in 1999.

Since the establishment of the Juliet bank, some habitat enhancement and monitoring efforts have occurred at the site with a recommitment of management efforts occurring since 2009. In April 2011, approximately 300 human-made burrows were created followed by a control burn of the entire area in July 2011 (USFWS 2011a). A translocation effort was successfully completed in 2011 from 25A combat town to the Juliet site. This translocated population expanded from 21 individuals to more than 90 as of 2015.

The Base conducts basewide annual monitoring for Stephens' kangaroo rat using a two-phase (habitat assessment and live-trapping) monitoring program. The monitoring protocol was revised in 2012 to remove low-quality habitat based on the previous year's results. In addition, MCBCP Base Order MCIWEST-MCB CAMPENO 3500.1 Ch 1 (*Range and Training Regulations*) prescribes regulations and general precautions that limit impacts to this species by limiting activities in and adjacent to Stephens' kangaroo rat-occupied habitat. The Base is actively reviewing how it can minimize impacts to this species from its operations and training activities. The Base completed a Stephens' Kangaroo Rat Management Plan in 2015.

N.15.3. Threats

Agriculture and urban development have greatly reduced and fragmented the amount of habitat available for Stephens' kangaroo rat. As a result, the species is more susceptible to the effects of grazing, off-road vehicle activity, rodenticide use, decreased genetic diversity, domestic cat predation, and the potential impacts associated with climate change. Additional threats identified since listing include impacts from nonnative plant species and climate change (USFWS 2011b)

N.15.4. Recovery Strategy Goals

The recovery strategy for the Stephens' kangaroo rat focuses on: establishment of reserves to preserve and protect significant populations; protection of conserved populations and their habitat; elimination/minimization of unnatural mortality factors; and development and implementation of an outreach program (USFWS 1997b). Plan requirements for the species have been divided between the Western Riverside County and the San Diego County conservation planning regions. The San Diego County Conservation Planning Region is subdivided into two conservation planning areas: the Western San Diego County Management Area and the Central San Diego Management Area. MCBCP is located in the Western San Diego County Management Area. The MCBCP Stephens' kangaroo rat population is identified in the recovery plan as essential to the recovery of the species because it is large and not isolated from the surrounding biological community, and it represents the most southern distribution of the species.

Recovery criteria for downlisting of Stephens' kangaroo rat include the establishment of four occupied habitat reserves located in western Riverside County, and establishment of one reserve in either western or central San Diego County.

N.15.5. Management and Monitoring

The U.S. Marine Corps is currently in consultation with USFWS regarding programmatic basewide management of upland habitats, including occupied habitat for the Stephens' kangaroo rat. Until consultation is complete and a BO is issued, the Stephens' kangaroo rat benefits from current basewide management practices such as invasive, nonnative vegetation control; exotic animal/predator control; use of native seed stock when conducting post-fire reseeding to enhance habitat; resource conservation awareness; and education programs.

The Base has instituted measures for avoidance and minimization of impacts to the Stephens' kangaroo rat and its habitat. These measures are specified in MCBCP Base Order P3500.1 (*Range and Training Regulations*), which prescribes regulations and general precautions for range and training area users that limit impacts to this species by restricting activities in and adjacent to occupied habitat. Restrictions specific to the Stephens' kangaroo rat are as follows:

- Foot traffic is authorized year-round; however, digging, including construction of fighting positions, shall be minimized.

- Vehicle/equipment operations near known habitat shall be kept on existing roads, year-round. Contact ES prior to conducting activities involving soil excavation, filling, or grading.
- Bivouac/command and post/field support activities shall be kept at least 50 m from Stephens' kangaroo rat habitat areas, year-round.

The Base also maintains a 34-acre Stephens' kangaroo rat management area, established in 1992 to mitigate for impacts to kangaroo rat habitat associated with development activities on-Base. The established management area is located in the north-central portion of the Juliet Training Area adjacent to the boundary of MCBCP and the Fallbrook Naval Weapons Station. This site was chosen based on its history of supporting Stephens' kangaroo rat; however, trapping studies indicate the population declined and may have actually extirpated by 2008. The management area is maintained through prescribed burns, mechanical and chemical vegetation management, and artificial burrow installations. In 2011, a population of Stephens' kangaroo rat was translocated from the 25 Area Combat Town construction site into the management area. The translocated populations are monitored several times a year.

Additionally, MCBCP conducts annual monitoring for Stephens' kangaroo rat. In conjunction with USGS, MCBCP developed a habitat-based, adaptive monitoring protocol in 2004 that is designed to track yearly trends in total area occupied by Stephens' kangaroo rat on-Base. A two-phased approach is utilized for sampling. The first phase involves a complete search for any potential kangaroo rat sign and measurement of habitat and environmental variables. If any potential sign is observed, 2 to 4 days of live-trapping is conducted for the second phase. Live-trapping is necessary to determine if plots are occupied by the Stephens' kangaroo rat and/or the Dulzura kangaroo rat (*D. simulans*) (USGS 2010). The first use of the protocol was in 2005 and the program was revised in 2011. The results of this monitoring are used to develop adaptive management strategies for Stephens' kangaroo rat on-Base and are reported annually to USFWS.

Federally Listed Plant Species

N.16. SAN DIEGO BUTTON-CELERY (*ERYNGIUM ARISTULATUM* VAR. *PARISHII*)

San Diego button-celery is a perennial herb endemic to vernal pool habitats that has a persistent taproot, and is a member of the Carrot family (Apiaceae). The plant has a spreading to erect habit, reaching a height of 40.6 cm or more. The stems and toothed leaves are gray-green with spinose lobes, giving it a prickly appearance. Inflorescences develop from April through June on short peduncles (stalks) with few to many greenish flower-heads varying in length from 0.06 to 0.11 inch (1.7 to 2.8 mm) (ZipcodeZoo 2009).

FIGURE N-16. SAN DIEGO BUTTON-CELERY

N.16.1. Status

San Diego button-celery was listed as state endangered in July 1979 (CDFG 2005), and federally endangered on 3 August 1993 (USFWS 1993b). Critical habitat has not been proposed for this species, but it is included in the approved recovery plan for the listed species of southern California vernal pools (USFWS 2005c). A full species profile is available at the USFWS ECOS website (https://ecos.fws.gov/ecp0/profile/speciesProfile?spcode=Q1W9), which includes all Federal Register publications related to the listing history, recovery plan documents, and applicable HCPs.

N.16.2. Distribution and Occurrence

San Diego button-celery ranges from as far north as the Santa Rosa Plateau, Riverside County, south to the mesas north of Ensenada, Mesa de Colonet, and San Quintin, Mexico (Baja California). It is found in vernal pools on Del Mar Mesa, Mira Mesa, Kearny Mesa, MCAS Miramar, MCBCP, and at sites within the Cities of Tierrasanta, San Marcos, Carlsbad, and Ramona; it was extirpated from a site in the City of La Jolla. The species is also found in the southern portion of San Diego County on Otay Mesa, near the Lower Otay Reservoir and in Proctor Valley. It also was found near the Tijuana Airport, but is believed to be extirpated at this locale. There are no known herbarium collections of the species from the San Diego Mesa (e.g., Normal Heights and San Diego State University). Of the total point localities, 70 percent occur within the preserve planning area of the Multiple Species Conservation Program. In 1979, San Diego button-celery was known from 65 pool groups; by 1986, this species remained in 61 pool groups (USFWS 1993b).

On MCBCP, San Diego button-celery has been found in a total of 78 geographic information system (GIS) mapped vernal pools with 34,785 individuals, comprising nearly 1 acre south of the Santa Margarita River basin, inland near the Wire Mountain housing development. The known locations of San Diego button-celery on-Base are a compilation of multiple survey efforts (some basewide, others site-specific) over many years. The earliest known survey that identified the species on-Base was conducted by Pacific Southwest Biological Services, Inc. in 1986 (PSBS 1986). Dudek & Associates, Inc.

conducted a basewide rare plant survey from 1993 through 1996, and was the first to map San Diego button-celery locations on-Base using Global Positioning System technology (Dudek & Associates 1996). During their basewide surveys in 1997, an additional 44 pools containing San Diego button-celery (included in the total of 78 above) were identified (RECON 2001b).

N.16.3. Threats

San Diego button-celery, as with other vernal pool specific species, is threatened by the loss of habitat. In general, vernal pool habitat in San Diego County has declined approximately 97 percent (from ~23,859 ha to ~838 ha) since the early 1900s. Most of the remaining vernal pools, particularly in San Diego County, face the following increasing threats identified by USFWS: urban development, agricultural and roadway development, off-road vehicular activity, trampling by people and livestock, military activities, and watershed (drainage) alteration.

Per the USFWS 5-Year Review of San Diego button-celery issued on 1 September 2010, loss and modification of vernal pool habitat continue to impact San Diego button-celery. Acquisition of land and conservation easements have preserved vernal pool habitat, but some loss of vernal pool habitat has continued to date. Threats associated with OHVs continue throughout the range of the species, including on preserved and conserved lands. Threats related to mowing and trampling associated with humans and cattle have been reduced. Road construction in urbanized southern California will likely continue to pose some level of threat to vernal pool habitat. Watershed alterations near vernal pool habitat have caused changes in the hydrological structure and function of some vernal pool habitat. While still a threat throughout the range of the species, impacts of hydrological alterations have decreased in some areas due to development standards that control runoff and water use. Although military activities have continued to impact habitat occupied by San Diego button-celery, much vernal pool habitat has been restored through cooperation with MCAS Miramar and MCBCP via provisions in their INRMPs.

Predation was not identified as a threat at listing, but insect herbivory of San Diego button-celery was later considered a disturbance concern in the recovery plan and remains a potential threat to the taxon. Insect herbivory can have considerable effects on plant population dynamics, including damage to roots, leaves, flowers, and developing seeds, which ultimately reduces living plant fitness and reproductive success in the presence of native and nonnative competitors.

According to USFWS, rangewide threats remain for the species and, absent the protections of the ESA, the existing regulatory mechanisms (i.e., California Endangered Species Act, Native Plant Protection Act, California Environmental Quality Act, California Porter-Cologne Act, Natural Community Conservation Planning, National Environmental Policy Act, and Clean Water Act) do not provide adequate regulatory protections to provide for the long-term persistence of San Diego button-celery.

Threats identified since listing include small population size, loss of pollinators, and climate change. Wildfires pose the largest single stochastic/single event risk to the remaining concentrations of San Diego button-celery in southern California.

N.16.4. Recovery Strategy Goals

The recovery strategy for the San Diego button-celery is to conserve and enhance southern California vernal pool ecosystems, with specific emphasis on stabilizing and protecting existing populations of Riverside fairy shrimp, San Diego fairy shrimp, San Diego button-celery, San Diego mesa mint, Otay mesa mint, and California Orcutt grass, so that these species may be reclassified from endangered to threatened status.

According to recent surveys, not all of the vernal pool complexes identified on MCBCP in the September 1998 – Vernal Pools of Southern California Recovery Plan as necessary to stabilize the species are still considered to have the species present. All known occurrences of San Diego button-celery on-Base are now deemed south of the Santa Margarita River, and therefore recovery goals as stated in the recovery plan are no longer achievable, and are anticipated to be revised by USFWS in consultation with the U.S. Marine Corps in the future.

N.16.5. Management and Monitoring

The Base is in consultation with USFWS regarding monitoring intervals and management for uplands habitats basewide, including occupied San Diego button-celery habitat. Current basewide management practices that directly or indirectly benefit San Diego button-celery include exotic vegetation control, erosion control, resource conservation awareness and education programs, investigative research (e.g., to examine pool and group enhancement, pool creation, and impact of signing and/or fencing), and avoidance and minimization of impacts from projects and Base activities, including training. Controls on training activities include the following: (1) keeping bivouac/command post/field support activities at least 300 m from San Diego button-celery habitat year-round; (2) keeping vehicle/equipment on existing roads (foot traffic is authorized year-round); and (3) prohibiting digging (including construction of fighting positions) in San Diego button-celery habitat.

Environmental regulations and restrictions that apply to the San Diego button-celery, its habitat, and other threatened and endangered species on-Base are provided for all users of ranges and training areas to guide training activities and protect these resources. Natural resource, species, and related environmental information for each training area and range is published in Base Order P3500.1 (*Range and Training Regulations*) and depicted on the most current Environmental Operations Map (updated and distributed semiannually).

N.17. SPREADING NAVARRETIA (*NAVARRETIA FOSSALIS*)

FIGURE N-17. SPREADING NAVARRETIA

Spreading navarretia is a member of the Phlox family (Polemoniaceae) that is a low, spreading or ascending, annual herb 4 to 6 inches (10.2 to 15.2 cm) tall, which flowers from May through June. The lower portions of the stems are mostly bare. The leaves are soft and finely divided, 0.4 to 2 inches (1.0 to 5.1 cm) long, and are spine-tipped when dry. The flowers are white to lavender-white with linear petals that are arranged in flat-topped compact leafy-heads. The fruit is an ovoid, two-chambered capsule. This species has evolved mechanisms to self-pollinate (USFWS 2004b). Seeds of this plant are likely dispersed locally by the flow of water throughout the vernal pool or alkali wetlands in which this plant occurs; more distant dispersal is likely primarily accomplished by the spiny flowerheads clinging to the fur of larger mammals, or via mud containing seeds stuck to birds that visit these wetlands (USFWS 2004b).

In San Diego County, spreading navarretia appears endemic in vernal pool complexes. In Riverside County, it occurs in relatively undisturbed and moderately disturbed vernal pools, and in alkali playa habitat near Hemet. The species also occurs in relatively undisturbed and moderately disturbed vernal pools and alkali playa habitats along the San Jacinto River in Riverside County and on MCBCP (USFWS 2005c).

N.17.1. Status

Spreading navarretia was listed as federally threatened on 13 October 1998 (USFWS 1998d). In response to a court order, critical habitat for this species was proposed on 7 October 2004 (USFWS 2004b), with final designation of critical habitat published on 18 October 2005 (USFWS 2005c). USFWS found that the INRMP for MCBCP provides a sufficient benefit for spreading navarretia, and all lands on MCBCP are exempt from critical habitat pursuant to Section 4(a)(3) of the ESA (USFWS 2005c). Spreading navarretia is included in the approved recovery plan for the listed species of southern California vernal pools (USFWS 2005c). A full species profile is available at the USFWS ECOS website (https://ecos.fws.gov/ecp0/profile/speciesProfile?spcode=Q2E7), which includes all Federal Register publications related to the listing history, recovery plan documents, critical habitat designations, and applicable HCPs.

N.17.2. Distribution and Occurrence

Spreading navarretia is known from widely disjunct and restricted populations extending from the Santa Clarita region of Los Angeles County, east to the western lowlands of Riverside County, south through coastal and foothill San Diego County, and even farther

south to San Quintin, Baja California, Mexico. It is found at elevations between sea level and 4,250 feet (1,295.4 m), on flat to gently sloping terrain in vernal pools, alkali grassland, alkali playa, and alkali sink habitats. Occasionally, the species also occurs in ditches and other artificial depressions in degraded vernal pool habitat (USFWS 2004b).

Fewer than 45 populations exist in the United States. Nearly 60 percent of these populations are concentrated in three locations in California: on Otay Mesa in southern San Diego County, along the San Jacinto River in Riverside County, and near Hemet in western Riverside County (USFWS 2005c). The two largest populations occur in Riverside County and have been estimated to support 375,000 and 100,000 individuals, respectively, within 7.4 acres (3 ha) of habitat. Most other populations contain fewer than 1,000 individuals and occupy less than 1.2 acres (0.5 ha) of habitat. USFWS estimates that less than 296.5 acres (120 ha) of habitat in the United States is occupied by the species (USFWS 1998d). In Mexico, spreading navarretia is known from fewer than 10 populations clustered in three areas: along the international border, on the plateaus south of the Rio Guadalupe, and on the San Quintin coastal plain (USFWS 2004b).

On MCBCP spreading navarretia has been found in 24 vernal pools Basewide with 6,820 individuals, comprising 0.33 acre. The known locations of spreading navarretia on-Base are a compilation of multiple survey efforts (some basewide, others site-specific) over many years. During Base surveys in the late 1980s, Pacific Southwest Biological Services, Inc. (1986, 1987, 1988, and 1990) identified only one population of spreading navarretia on the mesa east of Newton Canyon. In 1993, the species was found in at least three additional nearby sites (Dudek & Associates, Inc. 1996). Spreading navarretia was also discovered in a large vernal pool at the edge of a lawn near Camp Del Mar, west of I-5, near the southern end of the Base. During their basewide surveys in 1997, RECON (2001b) identified nine vernal pools with spreading navarretia.

N.17.3. Threats

Spreading navarretia, as with other vernal pool species, is threatened by the loss of vernal pool habitat. In general, vernal pool habitat in San Diego County has declined 97 percent (from 58,957 to 2,070.7 acres [23,859 ha to 838 ha]) since the early 1900s. Spreading navarretia is threatened by habitat destruction and fragmentation from urban and agricultural development, pipeline construction, alteration of hydrology and floodplain dynamics, excessive flooding, channelization, off-road vehicle activity, trampling by cattle and sheep, weed abatement, fire suppression practices (including discing and plowing to remove weeds, and creation of fire-breaks), and competition from exotic plant species (USFWS 1998d).

N.17.4. Recovery Strategy Goals

The recovery strategy for spreading navarretia is to ensure the long-term conservation of this species. The recovery plan states that removal of this species from protection under the ESA should only be considered when populations have secure habitat, populations are stabilized or increasing (and where necessary, new populations are established), and populations are shown to be self-sustaining. The recovery strategy for spreading navarretia is part of the USFWS Recovery Plan for conserving and enhancing southern California vernal pool ecosystems, with specific emphasis on stabilizing and protecting existing

populations of Riverside fairy shrimp, San Diego fairy shrimp, San Diego button-celery, San Diego mesa mint, Otay mesa mint, and California Orcutt grass, so that these species may be reclassified from endangered to threatened status (USFWS 2005c).

The Vernal Pools of Southern California Recovery Plan identifies eight distinct management areas in southern California, and MCBCP is located in the San Diego - North Coastal Management Area. Before delisting of spreading navarretia can be considered, the species must first be stabilized by conducting surveys and research essential to the conservation of the species. MCBCP's vernal pool complexes and their associated species have been identified as necessary to stabilize spreading navarretia and other listed vernal pool species. The vernal pool complexes identified are Cocklebur, San Mateo, Las Pulgas, Stuart Mesa, and Wire Mountain. Once the species is stabilized, delisting will be considered by USFWS when the following criteria are met: (1) existing vernal pools and their associated watersheds are secured; (2) where necessary reestablish vernal pool habitat to the historical structure; and (3) manage and monitor habitat and listed species.

N.17.5. Management and Monitoring

The Base is in consultation with USFWS regarding monitoring intervals and management for uplands habitats basewide including occupied spreading navarretia habitat. Current basewide management practices that directly or indirectly benefit spreading navarretia include exotic vegetation control, erosion control, resource conservation awareness and education programs, investigative research (e.g., to examine pool and group enhancement, pool creation, and impact of signing and/or fencing), and avoidance and minimization of impacts from projects and Base activities including training. Controls on training activities include the following: (1) keeping bivouac/command post/field support activities at least 300 m from spreading navarretia habitat year-round; (2) keeping vehicle/equipment on existing roads (foot traffic is authorized year-round); and (3) prohibiting digging (including construction of fighting positions) in spreading navarretia habitat.

Environmental regulations and restrictions that apply to the spreading navarretia, its habitat, and other threatened and endangered species on-Base are provided for all users of ranges and training areas to guide training activities and protect these resources. Natural resource, species, and related environmental information for each training area and range is published in Base Order P3500.1 (*Range and Training Regulations*) and depicted on both the MCBCP Military Installation Map and the most current Environmental Operations Map (updated and distributed semiannually).

N.18. THREAD-LEAVED BRODIAEA (*BRODIAEA FILIFOLIA*)

FIGURE N-18. THREAD-LEAVED BRODIAEA

Thread-leaved brodiaea is a perennial herb that produces leaves and flower stalks from dark-brown, fibrous-coated underground corms (bulb-like storage stems that lack succulent leaves). Corms are dormant during the summer (dry season), and begin growing after the first significant fall rains saturate the soil. Leaves grow slowly throughout the winter and reach their full length in February or March. At the time of flowering, generally early summer (late April through early June), the leaves are dead or nearly-so, and next season's corms are mature. The flowering period lasts for 2 to 3 weeks starting in late April to the middle of July, and development of capsules and seeds takes 4 to 8 weeks. Upon maturity, the three segments of the vertically oriented capsules split apart, revealing many small black seeds that are 0.08 to 0.1 inch (2 to 2.5 mm) long. The seeds are then dispersed as wind rattles the capsules, and releases the seeds (USFWS 2009c). The rate of deposit and duration of seeds in the soil until germination is unknown. However, it is likely that a majority of seeds produced in the capsules are dispersed nearby and, as a result, would be expected to be scattered among the standing plants at any given occurrence. All groupings of the species found on MCBCP to date reside in areas with shrink-swell soils where surface cracks are common. Seeds deposited into cracks are incorporated into the soil matrix once the soils are rehydrated and the cracks swell shut in the fall. Specific conditions conducive to triggering natural germination are unknown (AMEC 2009).

Leaves are likely produced by the species every year; young plants may produce only leaves for a few seasons before having enough food stores to be capable of producing flower stalks. Even mature specimens may not flower every year, depending upon environmental conditions. The flower stalks (scapes) are 7.8 to 16.1 inches (20 to 41 cm) tall with several narrow leaves that are shorter than the scape. The tubular flowers, arranged in loose umbels, typically bloom from 1 April through 30 June, and are 0.35 to 0.5 inches (9 to 12 mm) long. The six perianth segments are violet, with their tips spreading. The staminodia (characteristic sterile stamens) are narrow and pointed. All species of the genus *Brodiaea* are self-incompatible, requiring cross-pollination with another genetically distinct plant to set seed, which is typically facilitated by pollinator species. The corm is the principal means by which plants of the genus *Brodiaea* perpetuate themselves (USFWS 2004c). Seedlings produce contractile roots (specialized root form designed to shrink vertically under conditions of seasonal drying) for the first few years. These roots swell with moisture in the wet season creating a space in the malleable clay substrate and, as the season progresses, the succulent root dries and shrinks vertically, drawing the young corm down into the ground. This vertical migration is repeated for a few years until the corm reaches deep enough, that the soil moisture level is sufficient enough,

to keep the succulent root continuously hydrated. The corms of mature plants lose their contractile roots once their vertical migration is complete, and often produce 2 to 15 new adjacent cormlets annually, which are drawn laterally away from their parent corm by contractile roots (USFWS 2004c 2009c).

N.18.1. Status

Thread-leaved brodiaea was listed by USFWS as a threatened species on 13 October 1998 (USFWS 1998d). USFWS found that designation of "critical habitat" for this species was not prudent at that time because such designation would provide no additional benefit over that provided by listing it on privately owned lands (USFWS 1998d). USFWS also found that the MCBCP INRMP provides a sufficient benefit to the species, and exempted all lands on MCBCP from critical habitat pursuant to Section 4(a)(3) of the ESA (USFWS 2005d). A recovery plan for thread-leaved brodiaea has not yet been completed to date by USFWS (USFWS 2005d). A full species profile is available at the USFWS ECOS website (https://ecos.fws.gov/ecp0/profile/speciesProfile?spcode=Q09H), which includes all Federal Register publications related to the listing history, recovery documents, critical habitat designations, and applicable HCPs.

N.18.2. Distribution and Occurrence

The historical range of thread-leaved brodiaea extends from the foothills of the San Gabriel Mountains in Los Angeles County (Glendora and San Dimas), east to Arrowhead Hot Springs in the western foothills of the San Bernardino Mountains (San Bernardino County), and south through eastern Orange and western Riverside Counties to northern San Diego County (Highland Valley). A small, isolated population of thread-leaved brodiaea is also situated just west of Rancho Bernardo in central San Diego County (USFWS 2004c). This species is usually found at elevations of 98.4 to 2,509.8 feet (30 to 765 m) in herbaceous plant communities that occur in open areas on clay soils; soils with a clay subsurface; or clay lenses within loamy, silty loam, or alkaline soils, depending on soil characteristics.

On MCBCP, thread-leaved brodiaea has been found in 375 populations with 191,399 individuals at 52 general localities, which total 67.81 acres (167.6 ha). Thread-leaved brodiaea groupings are based on a GIS 7-m polygon metric. Each individual occurrence is mapped to include all plants within 23 feet (7 m) of it. The polygon is expanded to all individuals within 23 feet (7 m) of their neighbor until all brodiaea within an area are included; individuals outside of the overlapping 7-m polygon clusters are counted as a separate grouping (MCBCP 2009). Populations of thread-leaved brodiaea on MCBCP are of considerable importance not only because of the numbers of plants reported basewide, but also because they are found in more than one vegetation community and soil type, including grasslands and vernal pools. The groupings are distributed in a manner throughout the Base that likely facilitates pollen transfer among them, and also with occurrences to the north and south of MCBCP (USFWS 2005d).

Thread-leaved brodiaea was first located on-Base in 1993 during surveys in what are now Bravo One and Bravo Two Training Areas (Dudek & Associates, Inc. 1994). During those surveys, several large populations (up to 2,000 individuals each) were discovered. In 1997; most of the known thread-leaved brodiaea sites were visited during a basewide rare plant

survey (RECON 1999). This survey examined much of the potential thread-leaved brodiaea habitat, and an additional 14 sites were discovered. These new locations were all identified on clay pan soils within the Las Flores mesa area of the Oscar Two training area and in the Talega Canyon area of the Charlie Training Area. Seven new sites were recorded in the spring of 2000, which brought the total number of sites to 22 (Tierra Data Systems 2000). These sites were located in the following training and cantonment areas: Bravo One, Bravo Two, 52 Area, Alfa One, Oscar Two, India, Golf, and Lima (the Rodeo Grounds). The Bravo Two Training Area was surveyed a second time, and 30 thread-leaved brodiaea plants were discovered that had not been found there previously (during an earlier survey).

From 2001 through 2009 a combined total of 11,154 acres (4,514 ha) of the approximately 55,001 acres (22,258 ha) of potential thread-leaved brodiaea habitat basewide has been surveyed. Currently, the 293 individual groupings of the species identified have been found to occupy 87.7 acres (35.5 ha) total Base-wide. Since the number of cormlets that flower annually is dependent upon precipitation levels, starting in 2007, ES decided to begin counting brodiaea groupings instead of individual plants (MCBCP 2009).

The areas on-Base with the highest potential to have thread-leaved brodiaea present exhibit the following features:

- soil series mapped as a clay soil or with a clay subsoil;
- grassland and coastal sage scrub plant communities;
- less than 60 percent slopes;
- all slope aspects (north, south, east, and west); and
- less than 2,600.1 feet (792.5 m) elevation (North State Resources 2007).

On 8 February 2011, USFWS issued a revised critical habitat designation; however, all areas deemed as potential critical habitat on-Base were excluded under 4(a)(3)(B) of the ESA (USFWS 2011c).

N.18.3. Threats

At the time of ESA listing, USFWS identified several threats to thread-leaved brodiaea across its range, including habitat destruction, degradation, and fragmentation resulting from agriculture; urbanization; pipeline construction; alteration of wetland hydrology; clay mining; OHV activity; weed abatement; and invasive, nonnative plant species. By 1998, at least 25 percent of thread-leaved brodiaea populations or occurrences had been eliminated by urbanization and agricultural conversion (USFWS 2005d).

According to the USFWS 5-year review of the species published in 2005, the current threats to this species are essentially the same as they were at listing and include urbanization, alteration of hydrological conditions and channelization, discing, unauthorized OHV activity, grazing, and nonnative plants. Additional threats since listing include manure dumping and mowing. Development remains the most prominent rangewide threat to thread-leaved brodiaea, though the protective provisions of the ESA have had a significant impact relative to addressing this threat through the development of regional HCPs and Section 7 consultations. As habitat continues to be placed into permanent conservation with adaptive management, the threats to thread-leaved brodiaea

will be further reduced rangewide; current conservation efforts address approximately 75 percent of occurrences. The second most significant rangewide threat to thread-leaved brodiaea is competition from invasive, nonnative plants, which impact at least 15 of the known occurrences. Other threats from unauthorized OHV use, grazing, and manure dumping threaten specific occurrences of thread-leaved brodiaea, and while they are not rangewide threats to the species, these threats hinder recovery of the species (USFWS 2005d).

Since thread-leaved brodiaea is dependent upon pollinator species to create seeds, another potential threat indicated in studies is that if pollinator habitat within 3,280.8 feet (1,000 m) of some host plants is eliminated (e.g., developed), the number of seeds set by some plant species may be decreased by as much as 50 percent. Additional studies suggest that the degradation of pollinator habitat is likely to adversely affect the abundance of pollinator species (USFWS 2004c).

According to USFWS, due to the threats mentioned above, both rangewide and localized, thread-leaved brodiaea remains likely to become an endangered species within the foreseeable future throughout all, or a significant portion, of its range. The USFWS 5-year review of the species recommended that the current listing status for thread-leaved brodiaea remain unchanged, as threatened; however, a new listing priority number of 8C was assigned. The new recovery priority number indicates that the species faces a moderate degree of threat and has a high recovery potential (USFWS 2005d).

N.18.4. Recovery Strategy Goals

Although a final recovery plan for thread-leaved brodiaea has not been published by USFWS to date, MCBCP continuously supports protecting and improving habitat for the species basewide. As of 2010, MCBCP supports approximately 293 groupings of thread-leaved brodiaea, which occupy about 87.7 acres (35.5 ha) total (MCBCP 2009). Their management is included in the Upland Species Management Plan that is currently undergoing consultation with USFWS.

The unpublished draft recovery plan recommends that thread-leaved brodiaea should be evaluated for delisting when, among other criteria, the following occurrences have been fully protected: (1) all known occurrences in Los Angeles and San Bernardino Counties; (2) at least 10 core occurrences in Orange County; (3) at least 10 core occurrences in western Riverside County; (4) at least 12 core occurrences on MCBCP; and (5) at least 20 core occurrences in northwestern San Diego County, especially in the San Marcos area. Where possible, the draft plan proposes delineating a vegetative area of 820.1 feet (250 m) around each eligible occurrence to provide for pollinator habitat (USFWS 2004c).

N.18.5. Management and Monitoring

The Base is in consultation with USFWS regarding monitoring intervals and management of uplands habitats basewide, including occupied thread-leaved brodiaea habitat. Current basewide management practices that directly or indirectly benefit listed thread-leaved brodiaea include the following: (1) exotic vegetation control; (2) erosion control; (3) investigative research (e.g., to examine the feasibility of translocation thread-leaved brodiaea into more protected areas [such as between protected vernal pools in the Wire

Mountain, Stuart Mesa, and Cocklebur areas] as a means of establishing additional core populations); (4) resource conservation awareness; (5) education programs; and (6) avoidance and minimization of impacts from projects and Base activities, including training. Controls on training activities include the following: keeping bivouac/command post/field support activities at least 984.3 feet (300 m) from thread-leaved brodiaea habitat year-round, keeping vehicle/equipment on existing roads (foot traffic is authorized year-round), and prohibiting digging (including construction of fighting positions) in thread-leaved brodiaea habitat.

Environmental regulations and restrictions that apply to the thread-leaved brodiaea, its habitat and threatened and endangered species basewide are provided for all users of ranges and training areas to guide training activities and protect these resources. Natural resource, species, and related environmental information for each training area and range is published in Base Order P3500.1 (*Range and Training Regulations*) and depicted on the most current Environmental Operations Map (updated and distributed semiannually).

Although not required by law, ES LMB is currently considering implementation of a 820.1-foot (250-m) buffer around each brodiaea grouping identified on-Base, based upon USFWS review of data collected on pollinators of thread-leaved brodiaea in the 2005 critical habitat rule, which determined that a 820.1-foot 250-m buffer area around each population identified in the critical habitat determination would provide adequate space to support thread-leaved brodiaea's pollinators (MCBCP 2009).

N.19. ENCINITAS BACCHARIS (*BACCHARIS VANESSAE*)

Encinitas baccharis is a low-growing perennial shrub in the sunflower family (Asteraceae). Encinitas baccharis is a slender-stemmed, dioecious (separate male and female plants) shrub, that grows approximately 1.6 to 4.3 feet (0.5 to 1.3 m) tall. This species can be distinguished from other members of the genus by its numerous, erect, glabrous stems; linear, entire leaves with only one principal vein; and its delicate, narrowly tapered phyllaries (bracts that form the inflorescence), which are reflexed at maturity. The dark green leaves are 0.04 to 1.77 inches (0.1 to 4.5 cm) long, thread-like, and narrower in width than the portion of the twig adjacent to the leaf. The flower heads (capitulae) are cylindrical receptacles each containing clusters of tiny, whitish, flowers; each flower head contains 15 to 22 flowers. The blooming period is between August and November. Encinitas baccharis is unusual among the California species of the genus *Baccharis* because it occurs mainly in

FIGURE N-19. ENCINITAS BACCHARIS

chaparral rather than in riparian environments, washes, or otherwise disturbed lands (USFWS 2011d). It occurs on coastal sandstones and rocky hillsides, often on unusual soil substrates on locations scattered across San Diego County.

N.19.1. Status

Encinitas baccharis was state listed as endangered in 1987 and federally listed as threatened in 1996. A full species profile is available at the USFWS ECOS website (https://ecos.fws.gov/ecp0/profile/speciesProfile?spcode=Q264), which includes all Federal Register publications related to the listing history, recovery documents, and applicable HCPs.

N.19.2. Distribution and Occurrence

The first specimens found on-Base were discovered when conducting the San Diego Plant Atlas Inventories in the Delta Training Area during the summer of 2015. Prior to conducting the inventories, this species was not known to occur on-Base. As a result of the findings, the Base completed the first survey for Encinitas baccharis in August 2015. The survey resulted in the finding of 177 specimens located in the Delta Training Area in generally undisturbed chaparral habitat, and adjacent to the Cleveland National Forest Wilderness Area.

N.19.3. Threats

Habitat for this plant is threatened by altered fire regimes that consist of indirect impacts associated with development such as fuel reduction activities (e.g., brush removal and thinning), and activities associated with fire control. This species has a narrow geographical range in fire-adapted habitats, and the threat from lack of an appropriate fire regime is essentially rangewide, but more in evidence at occurrences and sites in proximity to urban developments. This may result in limited suitable habitat for recruitment of new plants. Impacts from nonnative plants are anticipated to increase with increasing development and have been reported to outcompete Encinitas baccharis individuals. The relatively small population size of most Encinitas baccharis occurrences increases their risk of becoming extirpated by random environmental fluctuations or habitat modification such as brush clearing (USFWS 2011d).

N.19.4. Management and Monitoring

Currently, the Base is conducting inventory surveys for Encinitas baccharis in all potential habitat for this species to determine its distribution and abundance on-Base, and will complete surveys by the end of 2020. All information gained from inventorying and phenology data collection will be provided to USFWS to be incorporated into their formal 5-year review for this species.

Species of Special Concern

Wildlife

N.20. WESTERN POND TURTLE (*ACTINEMYS MARMORATA*)

FIGURE N-20. WESTERN POND TURTLE

The western pond turtle is a small to medium-sized, drab-colored turtle with a shell length of 3.5 to 8.5 inches (8.9 to 21.6 cm). The western pond turtle has an olive-brown or blackish-brown carapace that is relatively flat with a pattern of spots, lines, or dashes radiating from the center of each scute. Other distinguishing characteristics include a network of black markings on the pond turtle's head and neck, and prominent scales on limbs that are flecked or lined in black.

This turtle inhabits a wide variety of water bodies ranging from permanent to intermittent, and freshwater to brackish environments. Western pond turtles prefer habitat with slow-flowing water, underwater cover, and emergent basking sites. They are found in creeks, slow moving rivers, marshes, ponds, lakes, reservoirs, vernal pools, canals, and even irrigation ditches and sewage treatment plants. Pond turtles require terrestrial habitat for reproduction, aestivation, and overwintering. Mating typically occurs in April and May and females climb onto land sometime between April and August to dig a nest, usually in adjacent uplands along stream or pond margins. Pond turtles hibernate underwater and aestivate during summer droughts by burying themselves in soft bottom mud or within moist mats of algae in shallow pools.

N.20.1. Status

The western pond turtle is not included in the Federal List of Threatened and Endangered Species, but is under review by USFWS. The species is listed as sensitive by BLM and the U.S. Forest Service. A full species profile is available at the USFWS ECOS website (https://ecos.fws.gov/ecp0/profile/speciesProfile?spcode=C06B), which includes all Federal Register publications related to the listing status review and applicable HCPs.

The species is state listed as a Species of Special Concern.

N.20.2. Distribution and Occurrence

The western pond turtle ranges from Washington (historically British Columbia), south along the Pacific slopes and interior valleys into northern Baja California, with a few isolated populations elsewhere (Jennings and Hayes 1994). It is discontinuously distributed and uncommon in parts of is range. Isolated populations occur in the Mojave River in California, the lower Columbia River, the Puget Sound Trough, and in areas south of the Transverse Ranges in southern California and northern Baja California. The western pond turtle is San Diego's only native freshwater turtle and historically occupied eight of the 10

watersheds in the county. Today the pond turtle is known to occupy 13 sites within seven of the 10 watersheds (Madden-Smith et al. 2005).

In the 1990s, the pond turtle occupied most of the major drainages on-Base. Population estimates completed in 1996 and again in 1999 revealed a 16 percent Basewide decline in pond turtle populations. Surveys conducted in 2008 and 2010 detected breeding populations of pond turtles at six sites: Cristianitos Creek, Upper San Mateo Creek, Cocklebur Lagoon, Las Flores Lagoon, and the Upper and Lower Santa Margarita River. Successful recruitment was observed at four of these sites: Upper San Mateo Creek, Cocklebur Lagoon, and the Upper and Lower Santa Margarita River (Schuster and Fisher 2010).

N.20.3. Threats

The main threat to the western pond turtle is loss or degradation of habitat primarily due to urbanization and agriculture. Over 90 percent of the wetland habitats within the historic range of the species in California have been eliminated by development, and flood and water diversion projects (USFWS 1992). Associated with these threats has been an increase in habitat fragmentation and decrease in genetic variability. The species has also declined due to commercial exploitation, invasion of nonnative species competition and predation, and disease. Localized threats include contaminant spills, grazing, and off-road vehicle use (USFWS 1992).

N.20.4. Recovery Strategy Goals

No recovery plan or goals have been established for the western pond turtle.

N.20.5. Management and Monitoring

Because the western pond turtle is only considered a Species of Special Concern, it receives no formal legal protection. However, the programmatic instructions and habitat management measures outlined in the Estuarine and Beach Ecosystem Conservation Plan, Riparian Ecosystem Plan, and the Riparian BO directly and/or indirectly benefit the western pond turtle through the management of suitable wetlands and adjacent habitat including estuaries, rivers, creeks and vernal pools.

In addition, the Base has instituted measures for avoidance and minimization to wetland habitats. These measures are specified in MCBCP Base Order 3500.1 (*Range and Training Regulations*), which prescribes regulations and general precautions for range and training area users that limit impacts to natural resources. Restrictions specific to wetland habitats (including vernal pools, coastal marshes and lagoons) are as follows:

- Vehicles operating in the vicinity of wetlands are authorized year-round and shall remain on existing roads, trails and crossings.
- Foot traffic is authorized year-round on existing roads, trails and crossings.
- Foot traffic is prohibited in all coastal marshes from 1 March to 15 September, and prohibited all year in the Santa Margarita Estuary and the mouth of Cocklebur Canyon.

- Off-road vehicular or foot traffic, excavations, and/or fill occurring in wetlands must be reviewed by ES, and receive appropriate permits and approvals prior to conducting the action.
- Vehicle/equipment operations near known vernal pool areas shall be kept on existing roads, year-round. Contact ES prior to conducting activities involving soil excavation, filling, or grading.
- Digging, including construction of fighting positions, is prohibited in vernal pools.
- Bivouac/command and post/field support activities shall be kept at least 50 m from identified vernal pools.

The Base also conducted surveys of western pond turtles in 2008 and 2010 to assess their distribution, abundance, and general health of the pond turtle populations on MCBCP. The information gathered during these surveys is intended to be used for development of protection and management measures if the species is proposed for listing as a threatened or endangered species in the future.

N.21. WESTERN SPADEFOOT TOAD (*SPEA HAMMONDII*)

The western spadefoot toad is a burrowing, stout-bodied toad ranging in size from 1.5 to 2.5 inches (3.7 to 6.2 cm). Spadefoot toads are distinguished by their cat-like vertical pupils, glossy black wedge-shaped "spade" on each hind foot used for digging, and lack of parotid glands (large swellings on the side of the head and behind the eye). The western spadefoot is whitish below and dusky green or gray above with skin tubercles (small, rounded protuberances) that are sometimes orange or reddish in color. This species typically has irregular light-colored dorsal stripes with central stripes occasionally bordering a dark, hour-glass shaped area.

FIGURE N-21. WESTERN SPADEFOOT TOAD

Western spadefoot toads are rarely seen because they spend the majority of their life buried underground in earth-filled burrows up to 3 feet (90 cm) deep, and enter water only to breed. They usually use the hardened spades on their hind feet to dig their way underground, but will occasionally utilize mammal burrows. Emergence from underground retreats is triggered by sound and vibrational cues of raindrops striking the ground surface during rain events in the wet season, typically between January and May, at which time breeding and foraging take place. Breeding takes place in vernal pools and other temporary water sources, such as intermittent streams. Females lay 300 to 500 eggs underwater. The eggs hatch quickly (3 to 4 days) and tadpoles transform in 4 to 11 weeks. Juveniles leave the breeding pool a few days after metamorphosis. Western spadefoot toads forage on a

variety of insects, worms, and other invertebrates before returning to their long dormancy (8 to 9 months) underground.

N.21.1. Status

The western spadefoot toad is not included in the Federal List of Threatened and Endangered Species, but is under review by USFWS. The species is also listed as sensitive by BLM. Despite not being federally listed, western spadefoot toad is included in the approved recovery plan for the listed species of southern California vernal pools. A full species profile is available at the USFWS ECOS website (https://ecos.fws.gov/ecp0/profile/speciesProfile?sId=5425), which includes all Federal Register publications related to the listing review and applicable HCPs.

The species is state listed as a Species of Special Concern.

N.21.2. Distribution and Occurrence

The western spadefoot is endemic to California and northern Baja California. It ranges throughout the Central Valley and adjacent foothills and in the Coast Ranges from Point Conception, Santa Barbara County, south into northwestern Baja California. Elevations of occurrence extend from near sea level up to 4,500 feet (1,365 m), but they are generally found below 3,000 feet (900 m) (Jennings and Hayes 1994). Western spadefoot toads prefer open areas with sandy or gravelly soil in a variety of habitats including, but not limited to, grasslands, coastal sage scrub, chaparral, river floodplains, foothills, and mountains. The species has been extirpated throughout most of the lowlands of southern California (Stebbins 1985).

Surveys conducted in 2013 detected western spadefoot toad on 70 locations across the Base in the following geographic areas: Bravo bluffs (Bravo 2 Training Area), coastal bluffs (Romeo Two Training Area to the Agricultural Lease Area and Oscar One Training Area in the south), Echo Training Area, Papa Training Area, Range 409, Santa Margarita River Watershed, and along the southern boundary of the Base. The species was found utilizing breeding locations in grassland, sage scrub, disturbed, and woodland habitats, but the most common breeding locations were roadside pools. The roadside pools generally occurred on the edges of roads or trails created by military and/or urban activity and were unvegetated or had minimal vegetation. The primary location on-Base for western spadefoot toad appears to be the coastal bluffs, where high numbers of breeding pools as well as high densities of tadpoles were found.

N.21.3. Threats

The primary threat to the western spadefoot toad is loss of habitat, particularly of vernal pool breeding sites, as a consequence of urban and agricultural development. Jennings and Hayes (1994) estimated that over 80 percent of habitat once known to be occupied by the western spadefoot toad in southern California (from the Santa Clara River Valley in Los Angeles and Ventura Counties southward) has been developed or converted to land use that is incompatible with successful reproduction and recruitment of the species. Roads represent another threat to the western spadefoot toad. Road construction can result in direct mortality, loss and fragmentation of habitat, and motor vehicle strikes. Additionally,

western spadefoot toads face the threat of predation by nonnative species such as bullfrogs, crayfish, aquatic insects, and tadpole shrimp.

N.21.4. Recovery Strategy Goals

One of the overall goals of the vernal pool recovery plan is to ensure the long-term conservation of vernal pool species of concern, including western spadefoot toad, by stabilizing and protecting populations so further decline in species status and range are prevented. To meet this goal, the recovery plan uses an "ecosystem-level" strategy that focuses on protection of vernal pool regions representing the suite of vernal pool communities in California that are necessary to conserve the species addressed in the plan. Within each vernal pool region, the plan identifies core areas where recovery actions will be focused. Portions of MCBCP fall within the Western Riverside and San Diego Vernal Pool Regions; however, no core areas are identified on-Base.

N.21.5. Management and Monitoring

Because the western spadefoot toad is considered a Species of Special Concern, it receives no formal legal protection. However, the U.S. Marine Corps is currently in consultation with USFWS regarding programmatic basewide management of upland habitats including vernal pool habitat used by western spadefoot toad. The western spadefoot toad benefits from current management practices such as invasive, nonnative species control (e.g., bullfrog and crayfish); erosion control; resource conservation awareness and education programs; investigative research (e.g., to examine vernal pool and group enhancement, pool creation, and impact of signing and/or fencing); and avoidance and minimization of vernal pool impacts from projects and Base activities including training.

The Base has instituted measures for avoidance and minimization of impacts to vernal pool habitat and species. These measures are specified in MCBCP Base Order P3500.1 (*Range and Training Regulations*), which prescribes regulations and general precautions for range and training area users that limit impacts to vernal pool species (including western spadefoot toad) by restricting activities in and adjacent to vernal pool habitat. Restrictions specific to vernal pools are as follows:

- Foot traffic is authorized year-round. Digging, including construction of fighting positions, is prohibited in vernal pools.
- Vehicle/equipment operations near known vernal pool areas shall be kept on existing roads year-round. Contact ES prior to conducting activities involving soil excavation, filling, or grading.
- Bivouac/command and post/field support activities shall be kept at least 50 m from identified vernal pools.

Additionally, MCBCP conducted a survey of western spadefoot toad in 2013 to assess their distribution, habitat use, and breeding phenology on-Base. A second survey was planned for 2014, but was postponed due to unsuitable conditions (i.e., lack of rain). The second survey is anticipated to be completed in 2015, depending on weather. The information gathered during these surveys is intended to be used for development of protection and

management measures if the species is proposed for listing as a threatened or endangered species in the future.

N.22. TRICOLORED BLACKBIRD (*AGELAIUS TRICOLOR*)

The tricolored blackbird is a medium-sized passerine, ranging in size from 7 to 9.5 inches (18 to 24 cm) in length. This species closely resembles its near-relative, the red-winged blackbird (*Agelaius phoeniceus*), except adult males of the tricolored blackbird are black with red with white edges rather than yellow on the wing shoulder. Adult females are sooty brown-black with distinct grayish streaks, a relatively white chin and throat, and a smaller reddish shoulder-patch.

FIGURE N-22. TRICOLORED BLACKBIRD

N.22.1. Status

The tricolored blackbird is not included in the Federal List of Threatened and Endangered Species but listing status is under review by USFWS. A full species profile is available at the USFWS ECOS website (https://ecos.fws.gov/ecp0/profile/speciesProfile?spcode=B06P), which includes all Federal Register publications related to the listing review and applicable HCPs. This species is also protected under the MBTA.

The tricolored blackbird is a state Species of Special Concern and was given emergency endangered status under the California Endangered Species Act in December 2014, which provided temporary protection, but was allowed to expire in June 2015. In August 2015, the Center for Biological Diversity submitted a petition to the California Fish and Game Commission to formally list the tricolored blackbird as a threatened or endangered species. CDFW requested input from the public between March and June 2016. The petition is still under review (CDFW 2016).

N.22.2. Distribution and Occurrence

The tricolored blackbird occurs in California, Oregon, Nevada, Washington, and Baja California. The species mainly occurs in the lowlands of California west of the Sierra Nevada. Most tricolored blackbirds breed in California's Central Valley. The most favored sites for colonies are heavy growths of cattails and bulrushes, though other vegetation including sedges, nettles, willows, thistles, mustard, blackberry, wild rose, and tall grass may be resorted to for nesting (CDFW 2015). In recent years, some of the largest colonies have occurred in grain fields in the San Joaquin Valley, particularly in agricultural areas (American Bird Conservancy 2016).

Tricolored blackbirds form the largest colonies of any North American land bird, with a single breeding colony often numbering tens of thousands of birds. Breeding typically occurs between April and July. The female builds an open cup nest woven out of vegetation. Four eggs are typically laid during a first nesting and second nest attempts, with clutches of three or more eggs, are fairly common (American Bird Conservancy 2016).

Tricolored blackbirds have been detected on-Base and have historically nested near the Base. There are no breeding records on-Base, however.

N.22.3. Threats

Loss of breeding habitat to urban expansion and changes in agricultural land uses and loss of foraging habitat are considered the primary threats to tricolored blackbirds. Use by the tricolored blackbird of agricultural fields, where reproduction often fails due to human activities and to increased predation, another factor contributing to the population decline (CDFW 2015).

Because of the severe, ongoing drought in California, tricolored blackbirds have increasingly turned to nesting in agricultural silage fields, which now hold a significant proportion of the breeding population. Harvesting often occurs when the chicks are just beginning to fledge, which severely limits nesting success. Lack of insect prey and water nearby can also severely limit colony productivity (American Bird Conservancy 2016).

N.22.4. Recovery Strategy Goals

No recovery plan or goals have been established for the tricolored blackbird.

N.22.5. Management and Monitoring

Although this species is not covered by the Estuarine and Beach Ecosystem Conservation Plan, Riparian Ecosystem Conservation Plan, or the Riparian BO, the programmatic instructions and habitat enhancement measures outlined in these plans and the BO directly and/or indirectly benefit the tricolored blackbird through the management of suitable foraging habitat.

N.23. BELDING'S SAVANNAH SPARROW (PASSERCULUS SANDWICHENSIS BELDINGI)

The Belding's savannah sparrow is a small brown sparrow approximately 6 inches (14 cm) in length. It has fine streaking on the head and face, and a pale-beige to white belly, and often displays a dark central breast spot. It is similar to other subspecies of savannah sparrows, but is darker and heavily streaked on the back, breast, and sides.

FIGURE N-23. BELDING'S SAVANNAH SPARROW

As with most ground-dwelling species, this bird is inconspicuous and blends well with its environment. The most distinguishing characteristic is the yellowish color of the lores (area between the bill and eyes). The Belding's savannah sparrow is one of four subspecies of savannah sparrows that are otherwise widely distributed and occur in a variety of habitat types, including grasslands, high-elevation meadows, and marshes. The Belding's savannah sparrow is unique in that it represents one of only two wetland-

dependent avian species endemic to coastal salt marshes in southern California. This subspecies is a year-round resident of these salt marshes and is therefore reliant upon these habitats to meet all of its life history requirements (USFWS 1998e).

N.23.1. Status

The Belding's savannah sparrow is not included in the Federal List of Threatened and Endangered Species, but is covered by the MBTA. The species is state listed as endangered. The Belding's savannah sparrow is also a covered species in the North American Landbird Conservation Plan (Rich et al. 2004), and the California Partners in Flight (CPIF) Draft Grassland Bird Conservation Plan (CPIF 2000).

N.23.2. Distribution and Occurrence

Belding's savannah sparrow is a nonmigratory subspecies of the savannah sparrow that is endemic to the coast of southern California and northern Baja California. It resides year-round in coastal salt marshes from Goleta Slough in Santa Barbara County to northern Baja California. Nesting occurs primarily in pickleweed habitat at the higher elevations of the salt marshes, above the reach of the highest spring tide. Total population size may fluctuate annually. A partial statewide survey was conducted in 1973, and the first statewide survey was done in 1977. Since 1986, statewide surveys have been undertaken at 5-year intervals. The latest statewide count was coordinated by CDFW in 2015. The 2015 census indicated 3,740 breeding pairs in 27 coastal salt marshes, the highest California state total reported since periodic counts began in 1973 (Zembal et al. 2015).

The Belding's savannah sparrow breeds from January through August, and has been found at two locations on MCBCP: Aliso Creek and the Santa Margarita River Estuary. No breeding pairs have been observed at Aliso Creek since 2001, and the recent absence of sparrows at Aliso Creek has been attributed to disturbance and loss of habitat from military activities. The Santa Margarita Estuary, however, supported an estimated 100 breeding pairs in 2010 (Zembel and Hoffman 2010) and continues to provide suitable habitat for the species on-Base.

N.23.3. Threats

The only known threat to the continued existence of Belding's savannah sparrow in California continues to be the destruction or degradation of its salt-marsh habitat. Adverse impacts rangewide have included filling, dredging, and development of wetlands; loss of regular tidal connection with the ocean; and inconsistent tidal influence on upper marsh habitat. At least 75 percent of southern California's former coastal wetlands have been lost, and the remainder suffers ongoing degradation (Zembal and Hoffman 2002). Ongoing concerns are flooding or other disruptions in the natural drainage of coastal wetlands because of upstream development or flood control; human disturbance, including trampling of marsh vegetation; and impact of exotic predators in marshes, especially from domestic cats and nonnative red foxes.

N.23.4. Recovery Strategy Goals

No recovery plan or goals have been established for the Belding's savannah sparrow.

N.23.5. Management and Monitoring

Although this species is not covered by the Estuarine and Beach Ecosystem Conservation Plan, Riparian Ecosystem Conservation Plan, or the Riparian BO, the programmatic instructions and habitat enhancement measures outlined in these plans and the BO directly and/or indirectly benefit the Belding's savannah sparrow through the management of occupied habitat, including Aliso Creek and the Santa Margarita River Estuary.

The Base has also instituted measures for avoidance and minimization to Endangered Species Management Zones that include both Aliso Creek and the Santa Margarita Estuary. These measures are specified in MCBCP Base Order P3500.1 (*Range and Training Regulations*), which prescribes regulations and general precautions for range and training area users that limit impacts to natural resources. In addition, the Base continues to grant access for Belding's savannah sparrow surveys by statewide survey efforts conducted every 5 years.

N.24. BURROWING OWL (ATHENE CUNICULARIA)

The burrowing owl is a small owl 7.6 to 9.8 inches (19.5 to 25 cm) and weighs approximately 0.33 pounds (150 grams), with long slender tarsi covered with short hair-like feathers that terminate in sparse bristles on the feet. The head is rounded, lacks ear tufts, and is chocolate in color with white streaking or spotting. There are buffy-white margins around the eyes and a white throat patch. Juveniles are similar to adults but are unstreaked to lightly streaked, light to brownish buff below, and have more pale secondary coverts. The burrowing owl is the only North American strigiform not exhibiting reversed size dimorphism.

FIGURE N-24. BURROWING OWL

Burrowing owls breed in grassland and open scrub using the burrows of small mammals or human-made substitutes such as pipes or culverts. Within southern California, the most commonly used burrows are those created by California ground squirrels (*Otospermophilus beecheyi*). During the breeding season, eggs are produced from late March to mid-June, and fledglings are active through August. Within southern California, during winter months or the nonbreeding season generally 1 September through 31 January, there is an influx of migratory birds. Pairs are typically monogamous and lay seven to nine eggs per clutch. The female incubates the eggs and the male is responsible for providing her with food during this period. The incubation period is from 21 to 28 days. Nestlings are altricial at hatching. The owlets open their eyes and begin to show evasive behavior at 5 days. At approximately 2 weeks of age, chicks will huddle around the entrance of the burrow to await food. Chicks are able to take short flights at 4 weeks of age, and can fly well by 6 weeks of age.

Fledging occurs at 44 days. The male does all the hunting while young require brooding. Females begin hunting as young become less dependent. Chicks are often relocated to "satellite" burrows to presumably reduce the risk of predation and possibly to avoid nest parasites. Dispersing young use satellite burrows in the vicinity of their natal burrows for about 2 months after hatching before departing the natal area. Burrowing owls typically raise one brood per year, but replacement clutches are often laid if the first attempt is lost.

Primary food sources are invertebrates but they also forage on rodents, reptiles, amphibians and small birds.

N.24.1. Status

The burrowing owl is listed by USFWS as a Bird of Conservation Concern and is considered a Species of Special Concern by CDFW. A full species profile is available at the USFWS ECOS website (https://ecos.fws.gov/ecp0/profile/speciesProfile?spcode =B0NC), which includes all Federal Register publications related to the listing history as well as applicable HCPs.

N.24.2. Distribution and Occurrence

Burrowing owls were once a common, locally abundant species throughout much of California and Arizona. By the 1940s, burrowing owls had become scarce in many portions of the southwest desert as a result of shooting and collapse of ground squirrel burrows. During the last 10 to 15 years, burrowing owls have been extirpated from approximately 8 percent of their former range including Sonoma, Marin, Santa Cruz, and Napa Counties.

Burrowing owls are widely distributed in proper habitat throughout the lowlands of the state, but rare along the coast north of Marin County and extremely rare east of the Sierra Nevada crest. Burrowing owls are fairly common residents along the Lower Colorado River Valley and around the agricultural areas of the Imperial Valley. They are rare in the undisturbed desert areas of the eastern and southeastern portion of California. Breeding in central California has been reduced to only three isolated populations: the Central Valley, southern San Francisco Bay between Alameda and Redwood City, and near the Livermore area. Within San Diego County in 2003, there were approximately 25 to 30 resident pairs. In 2007, approximately 41 to 46 pairs were breeding within the county and there were approximately 148 to 168 resident birds (including breeding pairs and their offspring). These resident owls were joined by 50 to 100 migrants. The San Diego County owl breeding population has decreased approximately 90 percent from what it was 25 to 30 years ago. It then numbered in the hundreds of pairs and, at the time of this symposium, it was reduced to perhaps 25 to 30 resident pairs. Even with the recently observed additional East Otay Mesa and Ramona Grasslands owls, there are not likely more than 46 pairs in the county.

The status of burrowing owl on MCBCP has gone from breeding resident to occasional winter resident. In the 1970s, approximately 15 pairs were documented as breeding on-Base. This number dropped to two pair in the 1980s and the last pair was documented in 1994. Currently, the burrowing owl is considered a winter resident only; however, the last survey conducted December 2014 through January 2015 documented no burrowing owls.

It's important to note that this survey was limited in scope and did not survey all suitable or potentially suitable habitat on-Base.

N.24.3. Threats

Throughout their range, burrowing owls are threatened by habitat loss, predation, vehicle impacts, and control programs for ground squirrels. Predators at burrows include snakes, raccoons, striped skunks, coyote, and red foxes; as well as domestic cats and dogs. Various hawks, other owls, and American crows have also been seen as predators of adult and young owls.

The extirpation of burrowing owl as a breeding resident on-Base may have been caused by a variety of factors. These include land use changes from agriculture and cattle grazing to heavy tank training and off-road maneuvers that crush ground squirrel burrows and compact the soil. Cattle were historically grazed on MCBCP; once the military eliminated cattle, the vegetation changed to permit tall nonnative grasses and sweet fennel to flourish. Increased military training activities coupled with vegetation changes led to increased fire activity. Occasional fires are useful in burrowing owl habitat and potentially positive as they open up the habitat, but increased fire frequency can lead to a decrease in essential prey items. Consequently, the habitat on-Base has become less conducive to breeding.

N.24.4. Recovery Strategy Goals

No recovery plan or goals are available for the burrowing owl.

N.24.5. Management and Monitoring

The Base currently conducts basewide 2-year-long inventories and habitat assessments in order to comply with military order to participate in and contribute to regional conservation efforts. The next survey will occur from 2016 through 2017, as funding allows.

N.25. PEREGRINE FALCON (FALCO PEREGRINUS ANATUM)

FIGURE N-25. PEREGRINE FALCON

The peregrine falcon has long pointed wings with a wing span of approximately 3 feet (1 m), which form a sickle-shaped silhouette when extended in flight. The species typically weighs just over 2 pounds (907.2 grams). Adults have a dark grey back, cheeks, and crown, and dark bars or streaks on their pale chest and abdomen. Females and males are identical in appearance; however, the female can be a third larger. Immature peregrines are buff-colored in front and have dark-brown backs. The peregrine falcon feeds primarily on other birds, such as songbirds, shorebirds, and ducks, and in urban areas,

starlings and pigeons. Unique to this species is the notched beak used to efficiently kill prey; they capture prey by flying high above and then stoop-diving, striking in mid-air, and killing with a swift sharp-blow typically by severing the spinal column at the neck.

N.25.1. Status

The peregrine falcon was officially delisted from the Federal Threatened and Endangered Species List on 25 August 1999. However, it remains listed as a Bird of Conservation Concern by USFWS and is protected by the MBTA. A full species profile is available at the USFWS ECOS website (https://ecos.fws.gov/ecp0/profile/speciesProfile?spcode=B01H), which includes all Federal Register publications related to the listing/delisting history and recovery, as well as applicable HCPs.

- The peregrine falcon was delisted from the California Threatened and Endangered Species List on 4 November 2009; however, it remains a fully protected species under the California Fish and Game Code.

N.25.2. Distribution and Occurrence

In North America, peregrine falcons can be found in mountains, valleys, and along the coastline, from the Arctic tundra down to Mexico. By the mid-1960s there were no peregrine falcons in the eastern United States. The decline spread westward and, by the 1970s, western populations had declined by 90 percent. The peregrine falcon disappeared as a breeding species from southern California and in many other parts of the western United States, southern Canada, and the Northwest Territories. Beginning in 1974, various states, provinces, and national agencies in both Canada and the United States put forth great efforts for the recovery of the peregrine falcon. Since 1977, over 2,700 peregrine falcons were released in the western United States (Tarski 2001). In 1998, the total known breeding population of peregrine falcons was 1,650 pairs in the United States and Canada (USFWS 1999b). Since their federal delisting in 1999, the U.S. population has grown from 1,750 pairs to 3,005 pairs in 2003 (USFWS 2006c).

Peregrine falcons can be seen on MCBCP at any time of the year. In 2001, one peregrine falcon pair occupied a nesting site in the Ysidora Basin cliffs that overlooked the Santa Margarita River. Occasionally, the peregrine falcon can be seen using the mouths of the Santa Margarita River, and the San Mateo and San Onofre Creeks to forage. Breeding season begins early March to late August. Individuals that breed in the north migrate into California for the winter.

N.25.3. Threats

The decline in the peregrine falcon population is attributed to environmental contaminants primarily dichlorodiphenyltrichloroethane (DDT) polybrominated diphenyl ethers (PBDEs), polychlorinated biphenyls (PCBs), and various metal contaminants. Pesticide biomagnification caused organochlorine to build up in the species' fat tissues, reducing the amount of calcium in their eggshells; with thinner shells, significantly fewer falcon eggs survived to hatching. Electrocution, human disturbance, and degradation of suitable nesting and foraging habitats also contributed to their rangewide population decline. Currently,

their recovered population is considered secure and vital throughout the United States (USFWS 2006c).

N.25.4. Management and Monitoring

Although this species is not covered by the Estuarine and Beach Ecosystem Conservation Plan, Riparian Ecosystem Conservation Plan, or the Riparian BO, the programmatic instructions and habitat enhancement measures outlined in these plans and the BO directly and/or indirectly benefit the peregrine falcon through the management of suitable foraging and nesting areas.

Plants

N.26. PENDLETON BUTTON-CELERY (*ERYNGIUM PENDLETONENSE*)

Pendleton button-celery, a member of the carrot family (Apiaceae), is a perennial herb with sprawling stems up to 7.8 inches (20 cm) long. The main stem is branched and has leaves that are 3.1 to 9.8 inches (8 to 25 cm) long. The inflorescences are heads in cymes with nine to 19 flowers per inflorescence. The flowers bloom from April through July. Pendleton button-celery is unique among the rare and sensitive plant species on-Base, as it is only known to occur on MCBCP. Habitat for Pendleton button-celery includes clay and vernally mesic soils in areas containing coastal bluff scrub, valley and foothill grasslands, and vernal pools at less than 164 feet (50 m) above sea level (Dudek & Associates, Inc. 2006).

FIGURE N-26. PENDLETON BUTTON-CELERY

N.26.1. Status

Pendleton button-celery is not federally or state listed.

N.26.2. Distribution and Occurrence

Pendleton button-celery is unique among the rare and sensitive plant species on-Base, as it is only known to occur on MCBCP (Marsden and Simpson 1999). Pendleton button-celery was first identified on 13 June 1992 and was described as a new species in 1999. Pendleton button-celery was distinguished from the more widespread San Diego button-celery, a federally endangered listed species that also occurs on MCBCP. The Base has conducted inventories in all potential habitat and as of October 2015 has identified 1,135 populations in 10 occurrences with 67,322 individual plants, totaling approximately 90 acres (36.4 ha).

N.26.3. Threats

Pendleton button-celery is vulnerable to many threats, including introduction of invasive plant species, changes in habitat hydrology, and military training activities such as foot traffic and off-road vehicle use (Tetra Tech 2014).

N.26.4. Recovery Strategy Goals

No recovery plans or goals are available for Pendleton button-celery.

N.26.5. Management and Monitoring

Currently, the Base has inventoried all potential habitat and determined distribution and abundance. The Base has also collected in-depth phenology and density information. In 2016, the Base will conduct the last phenology and habitat data collection for inclusion in the *Acmispon prostratus, Baccharis vanessae, Eryngium aristulatum* var. *parishii, Eryngium pendletonense, Navarretia fossalis, and Phacelia stellaris* Management Plan. All information gained from monitoring and management activities will be provided to USFWS to avoid federal listing under the ESA.

N.27. BRAND'S STAR PHACELIA (*PHACELIA STELLARIS*)

Brand's star phacelia is an herbaceous annual in the Hydrophyllaceae (waterleaf) subfamily of the Boraginaceae family of flowering plants. The species is spreading to erect ranging from 2.5 to 10 inches (6.4 to 25.4 cm) tall. Leaves are basal, deeply lobed, and 0.2 to 3 inches (0.5 to 7.6 cm) long. The lower pedicels are recurved, and usually longer than the upper ones. The calyx lobes are 0.11 to 0.16 inch (3 to 4 mm) long when in flower, and 0.2 to 0.31 inch (5 to 8 mm) long when in fruit. This species of the genus *Phacelia* is distinguished from other similar taxa by its annual habit, pinnately deeply lobed leaves, calyx lobes that are 0.11 to 0.16 inch 3 to 4 mm long, small less than 0.2 inch (5 mm) usually deciduous corollas, corolla scales 0.02 inch (0.5 mm) or less in length, and its coarsely pitted seeds (USFWS 2004d).

FIGURE N-27. BRAND'S STAR PHACELIA

N.27.1. Status

Brand's phacelia was removed as a candidate for federal listing by USFWS on 22 November 2013 (78 Federal Register 70104). A full species profile is available at the USFWS ECOS website (https://ecos.fws.gov/ecp0/profile/speciesProfile?spcode=Q3IO),

which includes all Federal Register publications related to the listing history, applicable HCPs, and the Candidate Conservation Agreement.

Brand's star is not listed by the state as endangered or threatened.

N.27.2. Distribution and Occurrence

Brand's star phacelia is an annual whose population varies yearly depending upon environmental conditions at each known location. It primarily occurs within coastal dunes and sandy washes in Diegan sage scrub habitat, and is a sensitive plant associated with the southern foredune community. This species was historically found in Los Angeles, Riverside, and San Diego Counties, and in coastal northern Baja California, Mexico. A significant portion of the linear extent of the coastal occurrences of this species has been lost to urbanization and habitat degradation. All five of the occurrences of Brand's star phacelia in Los Angeles County are only historical, with the last documented in 1943. This species was also documented from Riverside County in Fairmont Park based on a specimen collected in 1925. Brand's star phacelia was first collected in San Diego County in 1881. Six historical occurrences are known from San Diego County: San Diego in 1882, the San Diego River last documented in 1882, Crown Point last collected in 1935, Old San Diego last collected in 1881, North Coronado last collected in 1891, and Silver Strand last collected in 1935 (USFWS 2004d). Only three of the 15 sites in the United States ever known to support populations of this species still remain; two of these three known extant populations are in coastal San Diego County. The other is in western Riverside County. Two populations may remain in Mexico, although one has not been verified since 1975.

Brand's star phacelia was discovered on MCBCP in 1993 during a rare plant survey of the Santa Margarita Dunes. Prior to this study, there was no record of Brand's star phacelia north of the Silver Strand State Beach (10 miles (16.1 km) north of the U.S./Mexican border). This small new population was found just along the eastern fence line of the North Spit of the mouth of the Santa Margarita River (Blue Beach), and it represented a northern range extension of 45 miles (72.4 km) for this species. Since the distribution of Brand's star phacelia is very limited, the new population was noted as being of extremely high biological significance (Garcia and Associates 1996). The site supported 88 plants in three subpopulations over an area of 376.7 square feet (35 square meters [m^2]). This population was subsequently reported to consist of 88 plants in an area of 484.4 square feet (45 m^2) (BioSystems Analysis 1994). In 1994, 50 plants were found in the same area, and 48 plants were found in 1995. In 1996, 45 plants were counted, with only 25 occurring within one of the three previously known subpopulations; however, a new subpopulation was identified in an area measuring 6.56 feet by 16.4 feet (2 m by 5 m) (Garcia and Associates 1996). The Final Biological Survey Report for Rare Plants at MCBCP indicated that Brand's star phacelia was not found during 1997 surveys (RECON 1999).

The 2000 rare plant survey of the Base (Tierra Data Systems 2000) surveyed approximately 3.5 miles (5.63 km) of beach habitat and found 14 live plants and 101 small dead plants, presumably from the prior year, in its previously identified area just east of the least tern colony at the mouth of the Santa Margarita River. The plants found closely resembled the description of Brand's star phacelia in *The Jepson Manual: Vascular Plants of California* (Baldwin et. al. 2012), but there were some important features that did not

match the description, including style and stamen length and number of seeds (Tierra Data Systems 2000). The data from this report may be inaccurate because the photographs included in the report apparently depict a different and more common species of the genus *Phacelia* (USFWS 2004d). In 2002, the presence of Brand's star phacelia at this site was reconfirmed by Base and USFWS staff (USFWS 2004d). In May 2007, three flowering Brand's star phacelia individuals were encountered at the documented North Blue Beach location; no dried plants were observed in the area. The small number of plants observed is attributed to below average rainfall of 3.18 inches (8.08 cm) in 2007 (AMEC 2007).

Brand's star phacelia has also been found on state lands at Border Field State Park within a few hundred yards of the U.S./Mexican border fenceline. This occurrence, consisting of a few plants in sandy soil, was recorded by the California Natural Diversity Data Base (CNDDB 2000) and reportedly supported about 80 plants when visited during a March 2002 survey. The occurrence consisted of two areas, one 43.1 square feet (4 m^2) and another 64.6 square feet (6 m^2) (USFWS 2004d).

A specimen of Brand's star phacelia collected in 2000 by Oscar Clark in western Riverside County, on land designated as Regional Park Open Space near an area where a collection was made in the 1930s, was verified by Andy Sanders (USFWS 2004d).

The total number of individuals rangewide was estimated at around 500 in 2004 by USFWS, and 1,550 in 2006 by CNDDB (NatureServe 2006, 2009).

N.27.3. Threats

Threats to this species are primarily from existing and potential destruction, modification, and/or curtailment of its habitat or range. A significant portion of the linear extent of this species coastal habitat, sandy washes and dune in the Diegan sage scrub, has been lost to urbanization and habitat degradation. In addition to urbanization, threats to this species include trampling or habitat degradation by foot, equestrian and vehicular traffic, and the invasive spread of nonnative plants (e.g., highway ice plant [*Carpobrotus edulis*] and sea fig [*Carpobrotus chilensis*]) (USFWS 2004j; NatureServe 2009).

Brand's star phacelia is closely related to *Phacelia douglasii* and *Phacelia insularis*, and it is suggested that, in at least part of its range, Brand's star phacelia has hybridized with one or both of these species to produce "intermediates" (NatureServe 2006). Although hybridization with other species within the genus will ultimately cause genetic degradation of the listed species over time (NatureServe 2006), hybridization can play an important role in evolutionary biology. While most hybrids are disadvantaged as a result of genetic incompatibility, the fittest survive, regardless of species boundaries. Although rare, hybrids may have a beneficial combination of traits allowing them to exploit new habitats or to succeed in a marginal habitat where the two parent species are disadvantaged. Through the process of hybrid speciation, successful hybrids could evolve into similar new species within 50 to 60 generations. Some scientists speculate that life is a genetic continuum rather than a series of autonomous species (Wikipedia 2009a, b; Schwenk et al. 2008).

N.27.4. Recovery Strategy Goals

No recovery plans or goals are available for Brand's star phacelia.

N.27.5. Management and Monitoring

A Candidate Conservation Agreement (CCA) was developed for Brand's phacelia in 2013 with USFWS, Naval Base Coronado, California State Parks, and U.S. Customs and Border Protection. The purpose of the agreement is to ensure the long-term conservation of Brand's phacelia through implementation of conservation actions and the minimization of threats to its persistence to avoid federally listing the plant. The participants in the CCA anticipate that successful and continued implementation of conservation actions will be sufficient to improve the status of this species thereby precluding the need to list it within the foreseeable future as threatened or endangered under the ESA.

To meet this objective, the Base is inventorying the lower Santa Margarita River for new populations, monitoring all known populations, and collecting data on the species phenology for the duration of the CCA (2018). Habitat enhancement has and will also be conducted in occupied habitat. The Base will coordinate twice a year with other CCA members to write a combined yearly report documenting progress made implementing the plan. The CCA will be updated every 5 years.

N.28. NUTTALL'S ACMISPON (*ACMISPON PROSTRATUS*)

Nuttall's acmispon is a low-growing taprooted annual herb in the pea family (Fabaceae). It was first described in 1838 as prostrate lotus (*Hosackia prostrata*) by Thomas Nuttall in the *Flora of North America* and later re-described in the publication *Pittonia* as Nuttall's lotus (*L. nuttallianus*) by Edward L. Greene in 1890. Nuttall's acmispon has a slender branching stem that is typically prostrate and grows 23 to 31 inches (60 to 80 cm) long. Leaves of Nuttall's acmispon are dissected with three to six leaflets that are 0.1 to 0.4 inch (3 to 10 mm) in length. The umbel-shaped flower clusters of Nuttall's acmispon are composed of three to eight yellow-red flowers that bloom from March through June. Fruits are in the form of slender two-seeded pods that are 0.4 to 0.6 inch (1 to 1.5 cm) long. The presence of Nuttall's acmispon is strongly correlated with sandy soils that are located near the coast. This narrow endemic plant persists in small isolated occurrences that are associated with coastal dunes and coastal scrub habitats at elevations less than 30.3 feet (<10 m) (AMEC 2007).

FIGURE N-28. NUTTALL'S ACMISPON

N.28.1. Status

Nuttall's acmispon is a federally listed Species of Concern and former Category 2 candidate for federal listing. According to USFWS, a "*Species of Concern is an informal term, not defined in the federal Endangered Species Act. The term commonly refers to species that are declining or appear to be in need of concentrated conservation actions"* (AMEC 2007). Nuttall's acmispon is not state listed.

N.28.2. Distribution and Occurrence

Nuttall's acmispon is known to occur on the coastal area at the southern end of the Base, adjacent to the Del Mar South Jetty and within the Blue Beach Training Area. Potential threats to this species on-Base include trampling, least tern nesting habitat enhancement activities, the encroachment of sea-fig and sea-fig removal activities (chemical and mechanical treatment), other nonnative weed and weed maintenance activities, and military training activities (AMEC 2007).

N.28.3. Threats

Threats to this species are primarily from existing and potential destruction, modification, and/or curtailment of its habitat or range. In addition to urbanization, threats to this species include trampling or habitat degradation by foot, equestrian and vehicular traffic, and the invasive spread of nonnative plants (AMEC 2007).

N.28.4. Recovery Strategy Goals

No recovery plans or goals are available for Nuttall's acmispon.

N.28.5. Management and Monitoring

The Base will inventory all potential habitat to determine distribution, abundance, and phenology of Nuttall's acmispon. All information gained from monitoring and management activities will be provided to USFWS to avoid federal listing under the ESA.

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Appendix O

State Listed and Other Species of Special Concern on Camp Pendleton

Table O-1
Listed and Other Wildlife Species of Special Concern at Camp Pendleton

Common Name	Scientific Name	Status[1]			Ecosystem	
		Federal	State	Other	Terrestrial Upland	Wetland, Aquatic, and Marine
Invertebrates						
Riverside Fairy Shrimp	*Streptocephalus woottoni*	FE				X
San Diego Fairy Shrimp	*Branchinecta sandiegonensis*	FE				X
Fish						
Southern California Steelhead	*Oncorhynchus mykiss*	FE				X
Tidewater Goby	*Eucyclogobius newberryi*	FE				X
Birds						
American Peregrine Falcon	*Falco peregrinus anatum*		CFP	MBTA	X	X
Bald Eagle	*Haliaeetus leucocephalus*		SE, CFP	BGEPA		X
Bank Swallow	*Riparia riparia*		ST	MBTA		X
Belding Savannah Sparrow	*Passerculus sandwichensis beldingi*		SE	MBTA	X	X
California Brown Pelican	*Pelecanus occidentalis californicus*		SD	MBTA		X
Swainson's Hawk	*Buteo swainsoni*		ST	MBTA	X	
Burrowing Owl	*Athene cunicularia*		CSSC	MBTA	X	
Tricolored Blackbird	*Agelaius tricolor*	Under review	Under review	MBTA	X	X
Loggerhead Shrike	*Lanius ludovicianus*		CSSC	MBTA	X	
Cooper's Hawk	*Accipiter cooperii*		CSSC	MBTA	X	
Sharp-shinned Hawk	*Accipiter striatus*		CSSC	MBTA	X	
Golden Eagle	*Aquila chrysaetos*		CFP, CSSC	BGEPA	X	
Ferruginous Hawk	*Buteo regalis*		CSSC	MBTA	X	X
Northern Harrier	*Circus cyaneus*		CSSC	MBTA	X	X
White-tailed Kite	*Elanus leucurus*		CFP	MBTA	X	X
Osprey	*Pandion haliaetus*		CSSC	MBTA		X
California Horned Lark	*Eremophila alpestris actia*		CSSC	MBTA	X	
Vaux's Swift	*Chaetura vauxi*		CSSC	MBTA	X	
Least Bittern	*Ixobrychus exilis*		CSSC	MBTA		X
Wood Stork	*Mycteria americana*		CSSC	MBTA		X
Southern California Rufous Crowned Sparrow	*Aimophila ruficeps canescens*		CSSC	MBTA	X	
Bell's Sage Sparrow	*Amphispiza belli belli*		CSSC	MBTA	X	

Common Name	Scientific Name	Status[1]			Ecosystem	
		Federal	State	Other	Terrestrial Upland	Wetland, Aquatic, and Marine
Merlin	*Falco columbarius*		CSSC	MBTA		X
Prairie Falcon	*Falco mexicanus*		CSSC	MBTA	X	
Common Loon	*Gavia immer*		CSSC	MBTA		X
Purple Martin	*Progne subis*		CSSC	MBTA		X
Hooded Oriole	*Icterus cucullatus*		CSSC	MBTA	X	
Black Tern	*Chlidonias niger*		CSSC	MBTA		X
California Gull	*Larus californicus*		CSSC	MBTA		X
Black Skimmer	*Rynchops nigra*		CSSC	MBTA		X
Elegant Tern	*Sterna elegans*		CSSC	MBTA		X
California Least Tern	*Sterna antillarum browni*	FE	SE	MBTA		X
Western Snowy Plover	*Charadrius alexandrinus nivosus*	FT	CSSC	MBTA		X
Light-footed Ridgway's Rail[1]	*Rallus obsoletus levipes*	FE	SE	MBTA		X
Yellow Warbler	*Dendroica petechia*		CSSC	MBTA		X
Least Bell's Vireo	*Vireo bellii pusillus*	FE	SE	MBTA		X
Southwestern Willow Flycatcher	*Empidonax traillii extimus*	FE		USFS, MBTA		X
Yellow-billed Cuckoo, western DPS	*Coccyzus americanus*[2]	FT	SE	USFS, MBTA		X
Coastal California Gnatcatcher	*Polioptila californica californica*	FT	CSSC	MBTA	X	
American White Pelican	*Pelecanus erythrorhynchos*		CSSC	MBTA		X
Double-crested Cormorant	*Phalacrocorax auritus*		CSSC	MBTA		X
Baird's Sandpiper	*Calidris bairdii*		CSSC	MBTA		X
Long-billed Curlew	*Numenius americanus*		CSSC	MBTA	X	X
Short-eared Owl	*Asio flammeus*		CSSC	MBTA	X	X
Long-eared Owl	*Asio otus*		CSSC	MBTA	X	
Spotted Owl	*Strix occidentalis occidentalis*		CSSC	USFS, MBTA	X	
White-faced Ibis	*Plegadis chihi*		CSSC			X
Cactus Wren	*Campylorhynchus brunneicapillus sandiegoense*		CSSC	USFS, MBTA	X	
Mammals						
American Badger	*Taxidea taxus*		CSSC		X	
Dulzura (California) Pocket Mouse	*Perognathus californicus femoralis*		CSSC		X	
San Diego Pocket Mouse	*Chaetodipus fallax*		CSSC		X	
San Diego Black-tailed Jackrabbit	*Lepus californicus bennettii*		CSSC		X	
Western Mastiff Bat	*Eumops perotis californicus*		CSSC		X	

Common Name	Scientific Name	Status[1]			Ecosystem	
		Federal	State	Other	Terrestrial Upland	Wetland, Aquatic, and Marine
Pocketed Free-tailed Bat	*Nyctinomops femorrosaccus*		CSSC		X	
San Diego Woodrat	*Neotoma lepida intermedia*		CSSC		X	
Southern Grasshopper Mouse	*Onychomys torridus ramona*		CSSC		X	
California Sea Lion	*Zalophus californianus*		CP			X
Northern Elephant Seal	*Mirounga angustirostris*		CP, CFP			X
Ringtail	*Bassariscus astutus*		CFP		X	
Pallid Bat	*Antrozous pallidus*		CSSC		X	
Yuma Myotis	*Myotis yumanensis*		CSSC		X	
Reptiles						
Southwestern Pond Turtle	*Actinemys marmorata pallida*		CSSC			X
Coastal Rosy Boa	*Lichanura trivirgata*			USFS	X	
San Diego Ringneck Snake	*Diadophis punctatus similis*			USFS	X	
Coast Patch-nosed Snake	*Salvadora hexalepis virgultea*		CSSC		X	
Two-striped Garter Snake	*Thamnophis hammondii*		CP, CSSC	USFS	X	X
South Coast Garter Snake	*Thamnophis sirtalis* ssp.		CSSC		X	X
Coast Horned Lizard	*Phrynosoma coronatum (blainvillii)*		CP, CSSC	USFS	X	
Western Skink	*Plestiodon skiltonianus*		CSSC		X	
Orange-throated Whiptail	*Aspidoscelis hyperythra beldingi*		CP, CSSC		X	
Red Diamond Rattlesnake	*Crotalus ruber*		CSSC		X	
Amphibians						
Arroyo Toad	*Anaxyrus californicus*	FE			X	X
Pacific Slender Salamander	*Batrachoseps pacificus major*		CSSC			X
Western Spadefoot Toad	*Spea hammondii*		CP, CSSC			X
Coast Range Newt	*Taricha torosa torosa*		CSSC			X

[1] FE = Federally Endangered
FT = Federally Threatened
SD = State Delisted
SE = State Endangered
ST = State Threatened
CSSC = California Department of Fish and Wildlife Species of Special Concern
CP = California Protected
CFP = California Fully Protected
MBTA = Migratory Bird Treaty Act
USFS = U.S. Forest Service sensitive species

Table O-2

Listed and Other Rare Plants at Camp Pendleton
29 June 2017

Scientific Name	Common Name	Fed[1]	State[2]	CNPS[3]	State Rank[4]	Global Rank[4]	Populations Per Mapping Rule[5]	Occurrences Per 0.25-Mile Rule	Individuals	Acres Occupied[6]
Abronia maritima	red sand-verbena		SP	4.2	S3S4	G4	429	14	4,396	8.919657
Abronia villosa var. aurita	chaparral sand-verbena		SP	1B.1	S2	G5T2T3	178	13	3,991	10.46695
Acmispon prostratus	Nuttall's acmispon		SP	1B.1	S1	G1G2	86	3	15,886	12.27059
Aphanisma blitoides	Aphanisma		SP	1B.2	S3	G3G4	5	4	183	0.020837
Arctostaphylos rainbowensis	Rainbow manzanita		SP	1B.1	S2	G2	32	12	73	12.152735
Artemisia palmeri	San Diego sagewort		SP	4.2	S3?	G3G4	2	2	3	0.000144
Asplenium vespertinum	western spleenwort		SP	4.2	S4	G4	2	1	5	0.000144
Atriplex coulteri	Coulter's saltbush		SP	1B.2	S1S2	G3	124	24	9,613	1.151358
Atriplex pacifica	South Coast saltscale		SP	1B.2	S2	G4	1	1	1	0.000072
Baccharis vanessae	Encinitas baccharis	FT	SE	1B.1	S1	G1	39	4	223	4.292283
Bahiopsis laciniata (=Viguiera laciniata)	San Diego County viguiera		SP	4.2	S4	G4	51	7	21,949	138.456496
Brodiaea filifolia	thread-leaved brodiaea	FT	SE	1B.1	S2	G2	397	52	316,130	81.931282
Brodiaea orcuttii	Orcutt's brodiaea		SP	1B.1	S2	G2	4	2	235	0.059205
Calandrinia breweri	Brewer's calandrinia		SP	4.2	S4	G4	4	4	14	0.000287
Calochortus catalinae	Catalina mariposa lily		SP	4.2	S4	G4	2	1	55	0.000144
Calystegia soldanella	beach morning-glory			CBR			26	12	1,454	0.320507
Camissoniopsis lewisii	Lewis' evening-primrose		SP	3	S4	G4	74	13	24,148	4.974117
Caulanthus simulans	Payson's jewel-flower		SP	4.2	S4	G4	3	3	890	48.63913
Centromadia parryi ssp. australis	southern tarplant		SP	1B.1	S2	G3T2	1	1	1	0.000072
Centromadia pungens ssp. laevis	smooth tarplant		SP	1B.1	S2	G3G4T2	1	1	1	0.000072
Chamaebatia australis	southern mountain misery		SP	4.2	S4	G4	4	2	324	2.181155

Scientific Name	Common Name	Fed[1]	State[2]	CNPS[3]	State Rank[4]	Global Rank[4]	Populations Per Mapping Rule[5]	Occurrences Per 0.25-Mile Rule	Individuals	Acres Occupied[6]
Chorizanthe leptotheca? (Probably Wrong per Jon Rebman; does not occur in this region)	Peninsular spineflower		SP	4.2	S3	G3	1	1	1	1.515857
Chorizanthe polygonoides var. longispina	knotweed spineflower; long-spined spineflower		SP	1B.2	S3	G5T3	Checklist Only	Checklist Only	Checklist Only	Checklist Only
Cistanthe maritima	seaside cistanthe		SP	4.2	S3	G3G4	2	2	120	1.99756
Comarostaphylis diversifolia ssp. diversifolia	summer-holly		SP	1B.2	S2	G3T2	5	4	33	0.00036
Convolvulus simulans	small-flowered morning-glory		SP	4.2	S4	G4	6	2	2,721	0.162196
Deinandra paniculata	paniculate tarplant		SP	4.2	S4	G4	176	29	44,073	21.77742
Dichondra occidentalis	western dichondra		SP	4.2	S3S4	G3G4	287	41	66,941	191.7379
Dudleya blochmaniae ssp. blochmaniae	Blochman's dudleya		SP	1B.1	S2	G2T2	237	17	278,784	35.20479
Dudleya multicaulis	many-stemmed dudleya		SP	1B.2	S2	G2	175	29	54,204	81.76269
Dudleya variegata	variegated dudleya		SP	1B.2	S2	G2	1	1	1	0.000072
Dudleya viscida	sticky dudleya		SP	1B.2	S2	G2	29	7	214,106	152.5145
Eriogonum giganteum var. giganteum*	Santa Catalina Island buckwheat		SP*	4.3*	S3*	G3T3*	Checklist Only	Checklist Only	Checklist Only	Checklist Only
Eryngium aristulatum var. parishii	San Diego button-celery	FE	SE	1B.1	S1	G5T1	80 VPs	4	34,793	0.911788
Eryngium pendletonense	Pendleton button-celery		SP	1B.1	S1	G1	1243	10	69,237	60.88904
Erysimum aff. ammophilum	sand-loving wallflower		SP	1B.2	S2	G2	35	8	41,082	65.09291
Ferocactus viridescens (Most likely wrong; Unable to refind)	San Diego barrel cactus		SP	2B.1	S2S3	G3?	1	1	4	0.856579
Harpagonella palmeri	Palmer's grapplinghook		SP	4.2	S3	G4	38	16	9910	6.561765
Holocarpha virgata ssp. elongata	graceful tarplant		SP	4.2	S3	G5T3	1680	5	79,652	34.75062
Hordeum intercedens	vernal barley		SP	3.2	S3S4	G3G4	35	16	392	14.16367

Scientific Name	Common Name	Fed[1]	State[2]	CNPS[3]	State Rank[4]	Global Rank[4]	Populations Per Mapping Rule[5]	Occurrences Per 0.25-Mile Rule	Individuals	Acres Occupied[6]
Horkelia cuneata ssp. puberula [ssp. per Jon Rebman; var. per CNPS]	mesa horkelia		SP	1B.1	S1	G4T1	3	2	20	0.000215
Horkelia truncata	Ramona horkelia		SP	1B.3	S3	G3	35	1	5,449	40.09454
Isocoma menziesii var. decumbens	decumbent goldenbush		SP	1B.2	S2	G3G5T2T3	73	13	110	0.380674
Iva hayesiana	San Diego marsh-elder		SP	2B.2	S2	G3?	4	3	5	0.000287
Juncus acutus ssp. leopoldii	southwestern spiny rush		SP	4.2	S4	G5T5	48	8	845	2.238724
Lasthenia glabrata ssp. coulteri	Coulter's goldfields		SP	1B.1	S2	G4T2	1	1	1	0.000072
Lepidium virginicum var. robinsonii	Robinson's pepper-grass		SP	4.3	S3	G5T3	8	8	175	0.000574
Leptosyne maritima	sea dahlia		SP	2B.2	S1	G2	14	4	1,399	0.806029
Lilium humboldtii ssp. ocellatum	ocellated Humboldt lily		SP	4.2	S3	G4T3	20	8	77	11.11152
Lycium californicum	California box-thorn		SP	4.2	S4	G4	224	22	6,370	12.88866
Microseris douglasii ssp. platycarpha	small-flowered microseris		SP	4.2	S4	G4T4	70	11	1,766	4.421232
Monardella hypoleuca ssp. intermedia	intermediate monardella		SP	1B.3	S2S3	G4T2T3	8	6	1,542	0.140928
Myosurus minimus ssp. apus	little mousetail		SP	3.1	S2	G5T2Q	43 VPs	10	527	0.012245
Navarretia fossalis	spreading navarretia	FT	SP	1B.1	S2	G2	27 VPs	7	7,074	0.133592
Navarretia prostrata	prostrate vernal pool navarretia		SP	1B.1	S2	G2	1	1	1	0.086571
Nemacaulis denudata var. denudata	coast woolly-heads		SP	1B.2	S2	G3G4T2	83	3	1,463,926	30.22436
Nolina cismontana	chaparral nolina		SP	1B.2	S3	G3	7	2	176	0.574354
Ophioglossum californicum	California adder's-tongue		SP	4.2	S4	G4	2	1	130	0.000144
Orobanche parishii ssp. brachyloba	short-lobed broomrape		SP	4.2	S3	G4?T4	1	1	1	0.000072
Pentachaeta aurea ssp. aurea	golden-rayed pentachaeta		SP	4.2	S3	G4T3	2	2	1,500	0.226333

Scientific Name	Common Name	Fed[1]	State[2]	CNPS[3]	State Rank[4]	Global Rank[4]	Populations Per Mapping Rule[5]	Occurrences Per 0.25-Mile Rule	Individuals	Acres Occupied[6]
Phacelia stellaris	Brand's phacelia	CCA	SP	1B.1; ESA CCA	S1	G1	10	1	14,857	0.2981
Pickeringia montana var. tomentosa	woolly chaparral-pea		SP	4.3	S3S4	G5T3T4	3	2	3	0.000216
Pinus torreyana*	Torrey pine		SP*	1B.2*	S1*	G1T1*	1	1	1	0.000072
Piperia cooperi	chaparral rein orchid		SP	4.2	S3	G3	6	6	8	0.001951
Pseudognaphalium leucocephalum	white rabbit-tobacco		SP	2B.2	S2	G4	110	23	114,663	52.26476
Quercus dumosa	Nuttall's scrub oak		SP	1B.1	S3	G3	7	5	69	0.046607
Quercus engelmannii	Engelmann oak		SP	4.2	S3	G3	526	25	3,645	106.3243
Rhinotropis cornuta var. fishiae (=Polygala cornuta var. fishiae)	Fish's milkwort		SP	4.3	S4	G5T4	55	13	1,129	101.3118
Romneya coulteri	Coulter's matilija poppy		SP	4.2	S4	G4	2	2	151	2.164452
Saltugilia caruifolia	caraway-leaved woodland-gilia		SP	4.3	S4	G4	1	1	1	0.000072
Salvia munzii	Munz's Sage		SP	2B.2	S2	G2	1	1	1	0.000071
Selaginella cinerascens	ashy spike-moss		SP	4.1	S3S4	G3G4	22	3	25	4.687635
Senecio aphanactis	california groundsel; chaparral ragwort		SP	2B.2	S2	G3?	Checklist Only	Checklist Only	Checklist Only	Checklist Only
Suaeda esteroa	estuary seablite		SP	1B.2	S2	G3	1	1	800	0.000072
Suaeda taxifolia	woolly seablite		SP	4.2	S4	G	66	17	311	1.636663
Viguiera purisimae	La Purisima viguiera		SP	2B.3	S1	G4?	10	1	1,005	2.877005

Legend:

[1] **Federal: CCA =** Candidate Conservation Agreement

[2] **State: SP** = Special Vascular Plants

[3] **CNPS: CBR** = Considered But Rejected

[4] **State & Global Ranks:** Source is CDFW Special Vascular Plants, Bryophytes, and Lichens List

[5] **Populations Per Mapping Rule:**

- **Vernal pool plants:** number of pools occupied
- **Phacelia stellaris:** 4-meter mapping rule
- **All other rare plants:** 7-meter mapping rule

[6] **Acres Occupied:** a dissolve was performed in GIS to eliminate overlapping polygons

*** Planted:** This species was planted on the Base

Appendix P

Goals, Objectives, and Actions Matrix

Appendix P – Proposed Goals, Objectives, and Actions[1]

Programs/ Elements/ Goals	Proposed Objectives	Proposed Actions	Responsible Entity (AirStn, GWS, LMS, or WMS)[2]	STEP Catalog Reference #	*Wetland, Aquatic, and Marine Ecosystem*	*Terrestrial Upland Ecosystem*
Threatened, Endangered, and Rare Species Program (Section 4.1) **Program Goal: Manage threatened, endangered, and rare species (e.g., regional species of concern) and their habitats to support sustainable populations while providing maximum training flexibility.**						
ESA Wildlife Management Element (Section 4.1.1) ***Element Goal: Adaptively manage sustainable populations of federally listed threatened and endangered wildlife species to achieve conservation goals, while providing maximum training flexibility.***						
	Objective 1 Maintain a comprehensive record of data for all listed wildlife species on Camp Pendleton to support effective adaptive management decisions and program funding requirements.	4.1.1.1 – Develop and maintain an integrated database from all annual and periodic listed species surveys and incidental observations.	LMS, WMS	In-house	X	X
		4.1.1.2 – Continue to inventory and monitor Riverside fairy shrimp and San Diego fairy shrimp, and update GIS records.	LMS	CN-3004	X	
		4.1.1.3 – Conduct Quino checkerspot butterfly surveys when funding is available to monitor potential occurrence on Camp Pendleton.	WMS	CN-3004		X
		4.1.1.4 – Conduct annual monitoring of tidewater goby to detect presence/absence and suitability of habitat.	WMS	CN-3004	X	
		4.1.1.5 – Conduct annual arroyo toad population monitoring on-Base per the USGS (2003) protocol to determine Proportion Area Occupied. Conduct periodic surveys (GSRC 2017) to monitor abundance and distribution of arroyo toads on Air Station.	AirStn, WMS	CN-3004	X	
		4.1.1.6 – Conduct annual least Bell's vireo monitoring to document all territories on Camp Pendleton and record fecundity.	AirStn, WMS	CN-3004	X	
		4.1.1.7 – Conduct annual southwestern willow flycatcher monitoring to document territories, transients, and nest success, and band all chicks.	AirStn, WMS	CN-3004	X	
		4.1.1.8 – Conduct annual least tern monitoring to document all nest location and determine nesting success rate.	WMS	CN-3004	X	
		4.1.1.9 – Conduct annual snowy plover nest monitoring to document all nesting sites, determine nest success, and estimate number of fledglings.	WMS	CN-3004	X	
		4.1.1.10 – Conduct light-footed Ridgway's rail surveys every two years to determine breeding locations.	WMS	CN-3004	X	
		4.1.1.11 – Conduct coastal California gnatcatcher monitoring surveys once every three years.	WMS	CN-3004		X
		4.1.1.12 – Record incidental observation data for light-footed Ridgway's rail and yellow-billed cuckoo during other surveys (nesting data are not recorded).	WMS	CN-3004	X	
		4.1.1.13 – Conduct annual Stephens' kangaroo rat population monitoring using Stephens' kangaroo rat Proportion Area Occupied protocol surveys.	WMS	CN-3004		X
		4.1.1.14 – Conduct annual Pacific pocket mouse monitoring using the Pacific pocket mouse Proportion Area Occupied protocol surveys.	WMS	CN-3004		X
	Objective 2 Develop and implement management plans for key listed wildlife species and implement adaptive management studies to meet Camp Pendleton's ESA responsibilities to sustain and enhance the conservation potential of listed species while providing maximum training flexibility.	4.1.1.15 – Collaboratively work with USFWS to develop a Fairy Shrimp Management Plan from 2015–2018.	LMS	CN-3005	X	
		4.1.1.16 – Develop and refine the fairy shrimp Management Areas that have differing conservation levels, including: maximum, status quo, and limited conservation by 2018.	LMS	CN-3004	X	
		4.1.1.17 – Implement actions identified in Fairy Shrimp Management Plan 2019–2021.	LMS	CN-3003	X	
		4.1.1.18 – Identify feasibility of translocating tidewater goby individuals to suitable habitat off Camp Pendleton by 2019.	WMS	In-house	X	
		4.1.1.19 – Conduct a pilot study for southern California steelhead surveys methodology by 2018 and implement annually thereafter.	WMS	In-house	X	
		4.1.1.20 - Develop and conduct a habitat suitability assessment for southern California steelhead in the Santa Margarita River and estuary to determine connectivity of spawning and over-summering habitat, food availability and predator/competitor issues by 2018.	WMS	CN-3004	X	
		4.1.1.21 - Monitor developing life stages of arroyo toad in the Santa Margarita River annually to determine impacts of water management activities on Camp Pendleton, and report status as required by the Santa Margarita River-Conjunctive Use Project Adaptive Management Plan.	WMS	CN-3004	X	

Programs/ Elements/ Goals	Proposed Objectives	Proposed Actions	Responsible Entity (AirStn, GWS, LMS, or WMS)[2]	STEP Catalog Reference #	*Wetland, Aquatic, and Marine Ecosystem*	*Terrestrial Upland Ecosystem*
		4.1.1.22 – Analyze 5-year trend data and adapt management as necessary to maintain a stable population of arroyo toad on Camp Pendleton.	WMS	In-house	X	
		4.1.1.23 – Complete arroyo toad mitigation and management study by 2018 in support of reducing training restrictions.	WMS	CN-3005	X	
		4.1.1.24 – Monitor Sierra Training Area Roads after rain events of at least 1-inch (2.54 centimeters) precipitation to determine adverse impacts to arroyo toads; report results to USFWS.	WMS	In-house	X	
		4.1.1.25 – Conduct annual maintenance and improvement of least tern nesting habitat by March 15 of each year using results of micro-habitat study, including vegetation management and sand mobilization.	WMS	CN-3003	X	
		4.1.1.26 – Reduce and effectively manage the populations of potential predators in the vicinity of nesting snowy plover and nesting colonies of the endangered least tern on Camp Pendleton beaches to minimize depredation of eggs, chicks, and adult birds.	WMS	CN-3003	X	
		4.1.1.27 – Conduct annual least tern/plover fence installment by March 15 and perform breeding season maintenance.	WMS	CN-3003	X	
		4.1.1.28 – Determine the efficacy of methods for estimating snowy plover fledglings by 2018–2022.	WMS	CN-3004	X	
		4.1.1.29 – Assess predation and competition threats to the survival and recovery of listed shorebirds annually and incorporate recommendations into future management techniques.	WMS	In-house	X	
		4.1.1.30 – Update the Base MBTA permit annually to allow continued removal of problem raptors from the California least tern and western snowy plover management areas.	WMS	In-house	X	
		4.1.1.31 – Complete raptor relocation study initiated in 2013 and determine if raptor relocation is a viable option for reducing predation on least terns.	WMS	In-house	X	
		4.1.1.32 – To limit impacts to breeding listed shorebirds, minimize unauthorized recreational usage of training beaches by posting signage, taking enforcement actions, and reporting trespass issues on an as-needed basis.	GWS, **WMS**	In-house	X	
		4.1.1.33 – Investigate limiting habitat factors for southwestern willow flycatcher on Camp Pendleton and propose management actions necessary to sustain a viable population.	WMS	In-house	X	
		4.1.1.34 – Conduct post-fire recovery studies in coastal sage scrub to determine length of time and plant biodiversity required for California gnatcatcher to resume breeding; conduct studies annually for at least 5 years until results are sufficient to inform future management strategies.	WMS	CN-3004		X
		4.1.1.35 – Assess need for California Gnatcatcher Management Plan by 2018.	WMS	In-house		X
		4.1.1.36 – Identify need and perform annual habitat enhancement at the 53.1-acre (21.5-hectare) Juliet Stephens' kangaroo rat Management Area sufficient to sustain a population of Stephens' kangaroo rat, including implementation of prescribed burn plans and conducting prescribed burns at least every 4 years depending on annual rainfall and invasive grass cover.	LMS, WMS	CN-3004		X
		4.1.1.37 – Support consultation NEPA review for Stephens' Kangaroo Rat and Pacific Pocket Mouse Management Plans by 2018.	WMS	In-house		X
		4.1.1.38 – Implement Stephens' Kangaroo Rat and Pacific Pocket Mouse Management Plans starting in 2019.	WMS	CN-3004		X
		4.1.1.39 – Assess Pacific pocket mouse micro-habitat requirements and use to better inform future restoration and habitat improvement projects.	WMS	CN-3004		X
		4.1.1.40 – Track dispersal and survivorship rates of Stephens' kangaroo rat translocated to the Juliet Stephens' kangaroo rat mitigation area annually; determine genetic viability of population by 2019.	WMS	CN-3004		X
		4.1.1.41 – Monitor Stephens' kangaroo rat vegetation in Range 409 at least once every 5 years to determine whether training is impacting burrow density.	WMS	CN-3004		X
		4.1.1.42 – Maintain Stephens' kangaroo rat occupancy on Camp Pendleton on at least 1,551.8 acres (628 hectares) of habitat.	WMS	CN-3004		X
		4.1.1.43 – Purchase informational Carsonite markers and install in sensitive habitat as needed to facilitate compliance with the Base Order, Range Regulations, Chapter 2.	WMS	CN-3003	X	X
		4.1.1.44 – Monitor creek crossings to avoid or minimize degradation of listed species habitat.	WMS	In-house	X	

Programs/ Elements/ Goals	Proposed Objectives	Proposed Actions	Responsible Entity (AirStn, GWS, LMS, or WMS)[2]	STEP Catalog Reference #	*Wetland, Aquatic, and Marine Ecosystem*	*Terrestrial Upland Ecosystem*
		4.1.1.45 – Monitor stream water quality, flood regimes, and storm event frequency seasonally to assess immediate and long-term impacts to listed species.	WMS	In-house	X	
		4.1.1.46 – Amend Riparian and Estuarine/Beach conservation plans to incorporate newly listed species and/or new occurrences of listed species into the plans.	Air Stn, LMS, WMS	In-house	X	
	Objective 3 Maintain awareness of current and emerging issues related to federally listed wildlife species and other species of concern with potential implications to Camp Pendleton.	4.1.1.47 – Review electronic Federal Register updates periodically to maintain awareness of federally listed species that have the potential to be found on or adjacent to Camp Pendleton and obtain status of new listings, critical habitat proposals, recovery plans, and policy decisions that may affect projects on Camp Pendleton.	LMS, WMS	In-house	X	X
		4.1.1.48 – Participate in regional working groups to increase knowledge of federally listed species status and management issues.	LMS, WMS	In-house	X	X
Regional Wildlife Species of Concern Element (Section 4.1.2) ***Element Goal: Monitor non-federally listed wildlife species of concern to better understand the distribution and abundance of regionally sensitive species.***						
	Objective 1 Monitor wildlife species of concern by conducting inventory surveys and studies on a regular basis to comply with military order to participate in and contribute to regional conservation efforts.	4.1.2.1 – As funding allows, perform surveys to inventory species of regional concern (e.g., state-listed species, CDFW species of special concern, San Diego County MSCP conservation species, etc.). Obtain 2 years of inventory data for each species.	AirStn, WMS	CN-3006	X	X
		4.1.2.2 – Determine need for conducting monarch butterfly wintering habitat studies by 2018.	WMS, LMS	In-house		X
		4.1.2.3 - Monitor grunion activity on installation beaches as feasible for inclusion in Statewide assessment of fishery management.	WMS	In-house	X	
		4.1.2.4 – Evaluate management techniques to promote conservation of pollinating species of birds and insects and their habitats per the 2015 MOU between DoD and the Pollinator Partnership.	AirStn, WMS	In-house	X	X
		4.1.2.5 – As funding allows, perform inventory surveys to comply with the Strategic Plan for Amphibian and Reptile Conservation and Management on DoD Lands.	AirStn, WMS	CN-3006	X	X
		4.1.2.6 – Engage in the formation of local or regional partnerships that benefit the goals and objectives of the INRMP per the Marine Corps Order P5090.2 (e.g., California gnatcatcher regional census surveys).	LMS, WMS	In-house	X	X
		4.1.2.7 – Monitor bat species on an as-needed basis and evaluate bat species of concern for potential management actions.	AirStn, WMS	In-house	X	X
		4.1.2.8 – Provide access, when compatible with military training, safety, and natural resources management goals, for qualified research projects that are regional in nature.	AirStn, LMS, WMS	In-house	X	X
		4.1.2.9 – Evaluate the ability to financially support or contribute manpower to the survey of species at locations off Camp Pendleton to help determine regional abundance and distribution.	LMS, WMS	In-house	X	X
Threatened and Endangered and Rare Plant Management Element (Section 4.1.3) ***Element Goal: Manage for the continued sustainability of federally listed and select rare plants while reducing encumbrances to training lands.***						
	Objective 1 Implement management to maintain and enhance the three largest occurrences of thread-leaved brodiaea (82 percent) and remove the remaining occurrences (49) from training restrictions by 2018.	4.1.3.1 – Write Thread-leaved Brodiaea Management Plan in coordination with agencies 2015–2018.	LMS	CN-3005		X
		4.1.3.2 – Incorporate all information into USFWS 5-year Review.	LMS	CN-3005		X
		4.1.3.3 – Implement Final Thread-leaved Brodiaea Management Plan in 2018–2023.	LMS	CN-3003		X
		4.1.3.4 – Release 49 occurrences and all new populations of Thread-leaved Brodiaea from Range and Training Regulations in 2018.	LMS	CN-3003		X
		4.1.3.5 – Update Thread-leaved Brodiaea Management Plan every 10 years.	LMS	CN-3005		X
	Objective 2 Manage populations of San Diego button-celery to be self-sustaining.	4.1.3.6 – Conduct San Diego button-celery population monitoring during years with average or above average rainfall.	LMS	CN-3004		X
		4.1.3.7 – Write San Diego button-celery section of Management Plan in coordination with USFWS 2015–2018.	LMS	CN-3005		X
		4.1.3.8 –Enhance San Diego button-celery-occupied pools in Management Plan.	LMS	CN-3005		X
		4.1.3.9 – Implement Final San Diego button-celery Management Plan 2018–2023.	LMS	CN-3003		X
		4.1.3.10 – Incorporate all information into USFWS 5-year Review.	LMS	In-house		X
		4.1.3.11 – Update plan every 10 years, if needed.	LMS	CN-3005		X

Programs/ Elements/ Goals	Proposed Objectives	Proposed Actions	Responsible Entity (AirStn, GWS, LMS, or WMS)[2]	STEP Catalog Reference #	*Wetland, Aquatic, and Marine Ecosystem*	*Terrestrial Upland Ecosystem*
	Objective 3 Manage populations of spreading navarretia to be self-sustaining.	4.1.3.12 – Conduct spreading navarretia population monitoring during years with average or above average rainfall.	LMS	CN-3004	X	
		4.1.3.13 – Write spreading navarretia section of Management Plan in coordination with USFWS 2015–2018.	LMS	CN-3005	X	
		4.1.3.14 –Enhance spreading navarretia occupied pools in Management Plan.	LMS	CN-3005	X	
		4.1.3.15 – Implement final Spreading Navarretia Management Plan 2018–2023.	LMS	CN-3003	X	
		4.1.3.16 – Incorporate all information into USFWS 5-year Review.	LMS	In-house	X	
		4.1.3.17 – Update plan every 10 years, if needed.	LMS	CN-3005	X	
	Objective 4 Inventory all potential habitat and collect ecological and natural history data for Encinitas baccharis.	4.1.3.18 – Inventory all potential Encinitas baccharis habitat to determine distribution and abundance 2015–2021.	LMS	CN-3006		X
		4.1.3.19 – Incorporate all information into USFWS 5-year Review.	LMS	In-house		X
		4.1.3.20 – Develop management strategy in 2022.	LMS	CN-3009		X
	Objective 5 Continue to conserve populations of Brand's phacelia by implementing the Candidate Conservation Agreement.	4.1.3.21 – Inventory lower Santa Margarita River in 2015–2018.	LMS	CN-3006	X	X
		4.1.3.22 – Monitor existing known population in 2013–2018.	LMS	CN-3008	X	X
		4.1.3.23 – Enhance occupied habitat 2013–2018.	LMS	CN-3008	X	X
		4.1.3.24 – Collect phenology data each year 2013–2018.	LMS	CN-3008	X	X
		4.1.3.25 – Coordinate twice a year with Candidate Conservation Agreement members.	LMS	In-house	X	X
		4.1.3.26 – Write yearly Brand's phacelia Candidate Conservation Report from 2014–2018.	LMS	In-house	X	X
		4.1.3.27 – Update Candidate Conservation Agreement if needed 2019–2024.	LMS	In-house	X	X
	Objective 6 Manage populations of Pendleton button-celery to be self-sustaining so the species does not require federal listing.	4.1.3.28 – Inventory all potential habitat on Camp Pendleton to determine distribution, abundance, and phenology by 2018.	LMS	CN-3006	X	X
		4.1.3.29 – Write Pendleton Button-celery section of Management Plan in collaboration with USFWS 2015–2018.	LMS	CN-3009	X	X
		4.1.3.30 – Implement Pendleton Button-celery Management Plan in 2018.	LMS	CN-3007	X	X
		4.1.3.31 – Update plan every 10 years if needed.	LMS	CN-3009	X	X
	Objective 7 Manage populations of Nuttall's acmispon to be self-sustaining so the species does not require federal listing.	4.1.3.32 – Inventory all potential habitat on Camp Pendleton to determine abundance, distribution, and phenology 2013–2018.	LMS	CN-3006	X	X
		4.1.3.33 – Write Nuttall's Acmispon section of Management Plan in collaboration with USFWS 2015–2018.	LMS	CN-3009	X	X
		4.1.3.34 – Implement Nuttall's Acmispon Management Plan 2018–2021.	LMS	CN-3007	X	X
		4.1.3.35 – Update plan every 10 years if needed.	LMS	CN-3009	X	X
	Objective 8 Continue baseline floral inventory to determine plant species diversity on Camp Pendleton.	4.1.3.36 – Conduct floral inventories (annually for the Base, periodically for the Air Station) using the San Diego Plant Atlas methods through 2021.	AirStn, LMS	CN-3032	X	X
	Objective 9 Revisit historic rare plant observations.	4.1.3.37 – Confirm historic rare plant observations are still present 2011–2022.	LMS	CN-3008		X
	Objective 10 Maintain awareness of current and emerging issues related to federally listed plant species and other species of concern with potential implications to Camp Pendleton.	4.1.3.38 – Review electronic federal register updates periodically to maintain awareness of federally listed species that have the potential to be found on or adjacent to Camp Pendleton and obtain status of new listings, critical habitat proposals, recovery plans, and policy decisions that may affect projects on Camp Pendleton.	LMS	In-house	X	X
		4.1.3.39 – Participate in regional working groups to increase knowledge of federally listed species status and management issues.	LMS	In-house	X	X

Programs/ Elements/ Goals	Proposed Objectives	Proposed Actions	Responsible Entity (AirStn, GWS, LMS, or WMS)[2]	STEP Catalog Reference #	*Wetland, Aquatic, and Marine Ecosystem*	*Terrestrial Upland Ecosystem*
Sustainable Ecosystem Management Program (Section 4.2) **Program Goal: Manage Camp Pendleton lands to support present and future training requirements while conserving and enhancing ecosystem integrity.**						
Wildlife Observation Database Element (Section 4.2.1) ***Element Goal: Maintain a database of incidental wildlife observations reported on Camp Pendleton***						
	Objective 1 Document incidental wildlife observations made on Camp Pendleton as they are reported.	4.2.1.1 – Add incidental wildlife observations into the Wildlife Observation Database as records become available as a reference source for data calls.	WMS	In-house	X	X
Exotic Wildlife Control Element (Section 4.2.2) ***Element Goal: Conduct removal of target exotic wildlife species***						
	Objective 1 Obtain reasonable control (distribution and abundance) of exotic wildlife species to benefit listed and nonlisted species through annual removal efforts.	4.2.2.1 – Conduct brown-headed cowbird trapping annually to reduce or eliminate parasitism of listed riparian bird species.	WMS	CN-3003	X	
		4.2.2.2 – Conduct exotic aquatic species removal efforts (annually for the Base, periodically for the Air Station). Focus on nonnative fish, bullfrogs, and crawfish.	AirStn, WMS	CN-3003	X	
Ecosystem Mapping Element (Section 4.2.3) ***Element Goal: Map Camp Pendleton vegetation every 5 years using the National Vegetation Classification Standard (NVCS).***						
	Objective 1 Map Camp Pendleton vegetation using the NVCS every 5 years.	4.2.3.1 – Conduct NVCS mapping in 2014–2019.	LMS	CN-3032	X	X
		4.2.3.2 – Map vegetation communities to the alliance level.	LMS	CN-3032	X	X
		4.2.3.3 – Provide GIS mapping at the Group level to customers by 2019.	LMS	In-house	X	X
Ecosystem Monitoring Element (Section 4.2.4) ***Element Goal: Monitor ecosystem health per vegetation community to maintain landscape sustainability using adaptive management.***						
	Objective 1 Develop new and implement existing monitoring protocols for each vegetation community by 2018.	4.2.4.1 – Implement modified CRAM for riparian areas every 3 yearsuntil success criteria are met.	AirStn, LMS	CN-3020	X	
		4.2.4.2 – Implement CRAM for all wetland types including estuaries every 3 years from 2016–2021.	LMS	CN-3020	X	
		4.2.4.3 – Implement dune vegetation monitoring per the Riparian, Beach, and Estuary BO every 5 years.	LMS	CN-3034	X	
		4.2.4.4 – Develop coastal sage scrub and chaparral health monitoring protocol by 2019.	LMS	CN-3035		X
		4.2.4.5 – Implement coastal sage scrub and chaparral monitoring in accordance with protocol 2019–2020.	LMS	CN-3034		X
		4.2.4.6 – Implement perennial grassland monitoring every 10 years.	LMS	CN-3034		X
		4.2.4.7 – Implement oak woodland monitoring every 10 years.	LMS	CN-3034		X
		4.2.4.8 – Implement annual Santa Margarita River-Conjunctive Use Project BO riparian monitoring by 2018.	LMS	CN-3034	X	
Forest Pest and Disease Management Element (Section 4.2.5) ***Element Goal: Prevent pests and disease from damaging the function and biodiversity of forested ecosystems on Camp Pendleton.***						
	Objective 1 Develop, implement, and collaborate on monitoring programs for forest pests and disease.	4.2.5.1 – Monitor at risk vegetation for GSOB, PSHB, palm weevil, and KSHB annually to 2021. Initiate treatment if found.	AirStn, LMS	CN-3027 CN-3026		X
	Objective 2 Time the treatment of infected trees to limit the spread of pests and disease, e.g., prior to beetle flight seasons.	4.2.5.2 –Conduct emergency removal and treatment of infected trees and wood.	AirStn, LMS	CN-3027 CN-3026		X
		4.2.5.3 – Resolve conflicts with MBTA in a way that maximizes the conservation of oak and riparian forests.	AirStn, LMS	CN-3027 CN-3026		X
		4.2.5.4 – Update the existing GSOB EDRR plan that integrates a number of strategies, including education and outreach, monitoring, and developing and implementing new Camp Pendleton policies.	LMS	CN-3027 CN-3026		X

Programs/ Elements/ Goals	Proposed Objectives	Proposed Actions	Responsible Entity (AirStn, GWS, LMS, or WMS)[2]	STEP Catalog Reference #	*Wetland, Aquatic, and Marine Ecosystem*	*Terrestrial Upland Ecosystem*
Wetland, Aquatic, and Marine Ecosystem Management Element (Section 4.2.6) ***Element Goal: Conserve and enhance the natural and beneficial uses of regulated wetlands and ledger/manage no net loss of size, function, and value of wetlands.***						
	Objective 1 Assess the distribution and extent of wetlands using the NVCS by 2018 and update every 5 years.	4.2.6.1 – Conduct wetland mapping using NVCS method 2014–2018.	LMS	CN-3018	X	
		4.2.6.2 – Populate acreages of each wetland type on no net-loss ledger 2019–2021.	LMS	In-house	X	
	Objective 2 Assess the baseline ecological function of wetlands and estuaries using the CRAM and monitor every 3 years.	4.2.6.3 – Conduct CRAM on each wetland type to determine functions and values by 2018 and monitor on a 3-year cycle.	LMS	CN-3018 CN-3020	X	
		4.2.6.4 – Populate functions and values (health scores) of each wetland type on no net-loss ledger by 2018.	LMS	In-house	X	
		4.2.6.5 – Prepare and implement projects to enhance wetland functions and values by 2020 and ledger the no net loss of functions and values.	LMS	CN-3019	X	
	Objective 3 Assess the ecological function of estuaries annually using the EPA's *Rapid Bioassessment Protocols for Use in Streams and Wadeable Rivers: Preiphyton, Benthic Macroinvertebrates and Fish*.	4.2.6.6 – Conduct quarterly water quality testing in estuaries to assess trends in water chemistry composition for individual coastal lagoon and estuarine habitats.	WMS	CN-3004	X	
		4.2.6.7 – Conduct quarterly benthic habitat monitoring to detect ecological integrity and fluctuations in biotic composition in coastal lagoons.	WMS	CN-3004	X	
Vernal Pool Management Element (Section 4.2.7) ***Element Goal: Conserve and enhance the natural and beneficial uses of regulated vernal pools and ledger/manager no net loss of size, function, and value of regulated pools***						
	Objective 1 Develop a Vernal Pool Management Plan to guide goals.	4.2.7.1 – Collaboratively develop plan with USFWS 2015–2018.	LMS	CN-3021	X	
		4.2.7.2 – Develop methods to improve health of vernal pools 2015–2018.	LMS	CN-3021	X	
		4.2.7.3 – Determine USACE regulated vernal pools by 2018.	LMS	CN-3021	X	
		4.2.7.4 – Assess the function and value of regulated vernal pools using the chosen health monitoring system by 2018.	LMS	CN-3018 CN-3020 CN-3021	X	
		4.2.7.5 – Conduct comparative analysis of using the CRAM vs. the Base Class System.	LMS	CN-3021	X	
		4.2.7.6 – Conduct the chosen health monitoring system to determine function and values of regulated vernal pools in 2018.	LMS	CN-3018 CN-3020	X	
	Objective 2 Implement the final Vernal Pool Management Plan actions starting in 2019.	4.2.7.7 – Start to improve function and values of regulated vernal pools by 2019.	LMS	CN-3019	X	
		4.2.7.8 – Populate the number and function and values (health score) of each regulated vernal pool on the no net-loss ledger from 2019–2021.	LMS	CN-3020	X	
Nonnative and Invasive Species Management Element (Section 4.2.8) ***Element Goal: Minimize the introduction of exotic plant species; detect and rapidly respond to control in a cost-effective and environmentally sound manner; monitor invasive plant species populations, restore invaded ecosystems, and promote public education.***						
	Objective 1 Write the NIS Management Plan.	4.2.8.1 – Collect baseline information for the NIS Management Plan; complete by 2018.	LMS	In-house	X	X
	Objective 2 Continue to implement invasive plant EDRR Program to prevent the spread of new populations of highly invasive exotic plants on Camp Pendleton to prevent long-term costs associated with controlling larger infestations.	4.2.8.2 – Perform annual monitoring and treatment of major roads and firebreaks and other major vectors on Camp Pendleton for new infestations.	LMS	CN-3025	X	X
		4.2.8.3 – Treat new infestations promptly when discovered.	LMS	CN-3026	X	X

Programs/ Elements/ Goals	Proposed Objectives	Proposed Actions	Responsible Entity (AirStn, GWS, LMS, or WMS)[2]	STEP Catalog Reference #	*Wetland, Aquatic, and Marine Ecosystem*	*Terrestrial Upland Ecosystem*
	Objective 3 Reduce cover of artichoke thistle, yellow star thistle, giant reed, chrysanthemum, fountain grass, and pampas grass to <1 percent cover; manage the spread of fennel into sensitive habitats by 2020.	4.2.8.4 – Implement annual maintenance treatment program for select species including artichoke thistle, yellow star thistle, chrysanthemum, fountain grass, and pampas grass.	LMS	CN-3026		X
		4.2.8.5 – Determine treatment strategy for fennel control on Camp Pendleton.	LMS	CN-3026		X
	Objective 4 Reduce cover of riparian type-converting invasive plants including salt cedar and perennial pepperweed to <1 percent cover and eliminate giant reed by 2020.	4.2.8.6 – Implement annual maintenance treatment program for all riparian areas.	AirStn, LMS	CN-3026	X	
		4.2.8.7 – Monitor for new riparian exotics and treat accordingly.	AirStn, LMS	CN-3025	X	
		4.2.8.8 – Evaluate areas slow to recover naturally for habitat restoration.	LMS	CN-3026	X	
	Objective 5 Manage invasive exotic plants in coastal dune, strand habitats, and bluffs, and restore with native dune and bluff plants.	4.2.8.9 – Implement the coastal dune restoration plan developed by The Nature Conservancy as funds become available per Riparian BO. (This also enhances snowy plover habitat.)	LMS	CN-3026		X
		4.2.8.10 – Reduce dune invasive exotic plant infestations (ice plant, New Zealand spinach, radish, perennial pepperweed) to <1 percent by 2020.	LMS	CN-3026		X
		4.2.8.11 – Remove thatch, upland plants, and invasive plants; create dunes; and replace with appropriate native species from plantings and locally collected seed.	LMS	CN-3003		X
	Objective 6 Support regional invasive plant information sharing.	4.2.8.12 – Participate in San Diego Weed Management Area steering committee.	LMS	CN-3028	X	X
Erosion Control Element (Section 4.2.9) ***Element Goal: Conserve soil resources that support the training landscapes and their ecosystems***						
	Objective 1 Maximize the capability of the landscape to support military training and sensitive habitats.	4.2.9.1 – Conduct erosion control projects as prioritized with range and training area users.	LMS	CN-3041	X	X
Wildland Fire Management Element (Section 4.2.10) ***Element Goal: Manage fire potential to minimize coastal sage scrub type conversion and minimize adverse impacts to highly valued natural and cultural resources and assets.***						
	Objective 1 Develop National Wildland Fire Management Complaint Fire Danger Rating System.	4.2.10.1 – Collect weekly live and dead fuel moisture readings on the coast, inland valley, and mountains.	LMS	CN-3030	X	X
		4.2.10.2 – Maintain RAWS quarterly.	LMS	CN-3030	X	X
		4.2.10.3 – Use the Weather Information Monitoring System internet platform to develop the daily AFDR and send to the Camp Pendleton Fire Department to inform decision makers and facilitate appropriate fire defense positions.	LMS	CN-3030	X	X
	Objective 2 Support fuels management to enhance grassland ecosystem health and prevent coastal sage scrub habitat type conversion to a disturbed state.	4.2.10.4 – Conduct and write a wildfire risk assessment annually that looks at fuel loads adjacent to coastal sage scrub as well as military training facilities, infrastructure, and planned projects.	LMS	CN-3030	X	X
		4.2.10.5 – Adjust firebreaks and fuelbreaks to reduce wildfire and wildfire frequency in in coastal sage scrub.	LMS	CN-3029	X	X
		4.2.10.6 – Monitor effects of prescribed burns to grasslands and restore to native perennial grassland if obtainable.	LMS	CN-3029	X	X
		4.2.10.7 – Annually map all prescribed burns and wildfires to track the frequency in coastal sage scrub and perennial grasslands and determine if management actions are necessary to improve the health of sites after fires.	LMS	CN-3029	X	X
	Objective 3 Conduct conservation prescribed burns to improve wildlife and other habitat in accordance with species and ecosystem management goals.	4.2.10.8 – Conduct prescribed burns at a minimum every 4 years for Stephens' kangaroo rat depending on annual rainfall and invasive grass cover.	LMS	CN-3029		X
		4.2.10.9 – Conduct prescribed burns at a minimum every 4 years for Pacific pocket mouse depending on annual rainfall and invasive grass cover.	LMS	CN-3029		X
		4.2.10.10 – Conduct conservation burns to reduce annual grass, fennel, and Russian thistle, while improving the recovering coastal sage scrub.	LMS	CN-3029		X
		4.2.10.11 – Conduct prescribed burns at Cocklebur Mesa and View Point Vernal Pool to improve vernal pool mesas , as needed.	LMS	CN-3029	X	X

Programs/ Elements/ Goals	Proposed Objectives	Proposed Actions	Responsible Entity (AirStn, GWS, LMS, or WMS)[2]	STEP Catalog Reference #	*Wetland, Aquatic, and Marine Ecosystem*	*Terrestrial Upland Ecosystem*
Climate Change Element (Section 4.2.11) ***Element Goal: Provide Marine Corps decision makers with tools to understand future climate change-induced impact to natural resources.***						
	Objective 1 Prepare Vulnerability Assessments for species and habitats.	4.2.11.1 – Prepare habitat Vulnerability Assessments for each habitat type (e.g., vernal pools) on Camp Pendleton by 2020.	LMS	CN-3023	X	X
		4.2.11.2 – Prepare one ecosystem Vulnerability Assessment by 2020.	LMS	CN-3023	X	X
	Objective 2 Collect climate informed data.	4.2.11.3 – Continue yearly RAWS weather monitoring.	LMS	CN-3030	X	X
		4.2.11.4 – Continue yearly wildfire mapping.	LMS	CN-3030	X	X
		4.2.11.5 – Continue yearly fuel moisture monitoring.	LMS	CN-3030	X	X
		4.2.11.6 – Continue yearly insect monitoring by functional guild (e.g., decomposers, pollinators, herbivores, predators) and per five vegetation communities as an indicator of climate change.	LMS	CN-3038	X	X
		4.2.11.7 – Collect appropriate climate data during wildlife monitoring to support future analysis of climate change impacts to species.	WMS	In-house	X	X
Habitat Restoration Element* (*Section 4.2.12*)** ***Element Goal: Implement habitat restoration to support sustainable landscapes						
	Objective 1 Support completion of restoration projects required by BOs, sustainable habitat goals, and disturbed areas, as needed.	4.2.12.1 – Continue to restore Sierra IV buffer.	LMS	CN-3003		X
		4.2.12.2 – Complete implementation of P-1117 Vernal Pool Restoration in 2020.	LMS	CN-3019	X	
		4.2.12.3 – Start the restoration of San Onofre vernal pools and mesa starting in 2018.	LMS	CN-3003	X	
		4.2.12.4 – Restore Cocklebur Vernal Pool Mesa after the Conservation Burn is conducted in 2019.	LMS	CN-3003	X	
		4.2.12.5 – Complete restoration of P-529, Paintball-Exchange, Pio Pico, De Luz, and P-002.	LMS	CN-3003		X
Migratory Bird and Raptor Management Program (Section 4.3) **Program Goal: Provide that populations of migratory birds and raptors are conserved in compliance with legal drivers while ensuring maximum flexibility to the Marine Corps military training mission.**						
Migratory Bird and Raptor Conservation Element (Section 4.3.1) ***Element Goal: Promote the conservation of migratory birds and raptors through MBTA compliance, population monitoring, and habitat management***						
	Objective 1 Monitor the compliance of Camp Pendleton policies, programs, and procedures with the MBTA, and develop measures to avoid and minimize impacts to bird populations, as well as conservation measures.	4.3.1.1 – Monitor and interpret new local/regional/state/federal policies related to migratory birds as they are issued. Develop new guidance in response to new policies as needed.	AirStn, WMS	In-house	X	X
		4.3.1.2 – Review projects for potential impacts to migratory bird populations through the NEPA process.	WMS	In-house	X	X
		4.3.1.3 – Engage in early planning and scoping with USFWS to address migratory bird conservation, and to initiate appropriate actions to avoid or minimize the exposure of birds and their habitats to avian stressors that may result in take of migratory birds.	AirStn, WMS	In-house	X	X
		4.3.1.4 – Provide as-needed support to the Planning Branch for including applicable measures in environmental review documents.	WMS	In-house	X	X
	Objective 2 Identify activities on Camp Pendleton having population-level effects on migratory bird populations through annual and as-needed monitoring.	4.3.1.5 – Conduct annual neotropical migratory bird studies to monitor populations and survivorship (MAPS Program).	AirStn, WMS	CN-3012	X	X
		4.3.1.6 – Evaluate landscape attributes as needed to determine patch sizes and connectivity of habitat support sustainable populations of migratory birds.	WMS	In-house	X	X
		4.3.1.7 – Participate in annual Christmas bird counts by providing access to Audubon Society.	WMS	In-house	X	X
		4.3.1.8 – Perform in-house annual surveys to map blue heron nesting colonies (locations and number of nests).	WMS	In-house	X	
	Objective 3 Monitor and manage raptor populations on Camp Pendleton to support healthy populations, comply with federal laws (BGEPA and MBTA), and support the military mission.	4.3.1.9 – Track population changes of raptors by conducting surveys every 5 years.	WMS	CN-3010	X	X
		4.3.1.10 – Update existing avian protection program (2010) by 2018.	WMS	CN-3037	X	X
		4.3.1.11 – Partner with Facilities Maintenance Department to identify and prioritize power lines, wind turbines, and communication towers for modifications that are hazardous to large birds concurrent with updating the avian protection plan.	WMS	In-House		X
		4.3.1.12 – Coordinate with USFWS to interpret policies related to golden eagles and design measures to minimize and mitigate impacts to the species by 2019.	WMS	In-house		X

Programs/ Elements/ Goals	Proposed Objectives	Proposed Actions	Responsible Entity (AirStn, GWS, LMS, or WMS)[2]	STEP Catalog Reference #	*Wetland, Aquatic, and Marine Ecosystem*	*Terrestrial Upland Ecosystem*
		4.3.1.13 – Evaluate and recommend management actions for bald and golden eagles consistent with current and forthcoming policy by 2019.	WMS	In-house		X
	Objective 4 Manage and maintain permits for authorized removal of birds and bird nests.	4.3.1.14 – Maintain and renew (as needed) a Migratory Bird Depredation Permit.	AirStn, GWS, WMS	In-house	X	X
	Objective 5 Restore annual nonnative grasslands to perennial grass and forb lands in prescribed burn areas to promote nesting and foraging areas for grassland migratory bird populations where possible.	4.3.1.15 – Start a monitoring program to determine which historic prescribed burn areas managed for fuels reduction are annual grasslands, perennial grasslands, or perennial grasslands invaded by nonnative grasses.	LMS	CN-3034		X
		4.3.1.16 – Restore annual grasslands to native perennial grasslands only if it does not conflict with fuel management objectives.	LMS	CN-3039		X
		4.3.1.17 – Establish native bunchgrasses for the benefit of grassland migratory birds.	LMS	CN-3039		X
Bird/Wildlife Air Strike Hazard Element (Section 4.3.2) ***Element Goal: Support reduction of BASH risk though avian-specific reporting, monitoring, and habitat management***						
	Objective 1 Conduct monitoring, inspection, reporting, and wildlife conflict management to support the BASH program.	4.3.2.1 – Report incidents of bird strikes in Air Station air space when they occur.	AirStn	CN-3045		X
		4.3.2.2 – Implement measures as needed to exclude nesting/roosting/perching within the Air Station's area of operation (e.g., installation of anti-perch devices, ensuring hangars are secured, etc.).	AirStn	CN-3044		X
		4.3.2.3 – Conduct daily inspections (drives) to monitor potential avian use of hangars.	AirStn	CN-3045		X
		4.3.2.4 – Maintain vegetation at or below approximately 3 inches (7.62 centimeters) around the air strip.	AirStn	CN-3044		X
		4.3.2.5 – Develop procedures for the removal and control of bird and other wildlife attractants, when required.	AirStn	CN-3044		X
		4.3.2.6 – Conduct BASH surveys and prepare appropriate NEPA documentation, when required.	AirStn	CN-3045		X
		4.3.2.7 – Remove nests when required and in accordance with permits. Salvage bird remains for diagnostic purposes.	AirStn	CN-3044		X
Marine and Fish Management Program (Section 4.4) **Program Goal: Manage sustainable populations of native marine and freshwater species to meet the conservation objectives of applicable regulations and provide maximum flexibility for military training mission.**						
Magnuson-Stevens Act and MMPA Compliance Element (Section 4.4.1) ***Element Goal: Support compliance with the Magnuson-Stevens Act and MMPA***						
	Objective 1 Facilitate compliance with the Magnuson-Stevens Act and MMPA through review of policies and development of response protocols.	4.4.1.1 – Review existing and new policies on an as-needed basis to inform Planning Branch.	WMS	In-house	X	
		4.4.1.2 – Finalize protocols for responding to stranded marine mammals by 2018.	WMS	In-house	X	
		4.4.1.3 – Coordinate with the game warden to obtain reports and manage records of dead or stranded marine mammals; implement NOAA Fisheries stranding mammal guidance and coordinate with NOAA Fisheries, Sea World, and/or USFWS as necessary regarding stranded mammals and enforcement actions.	WMS	In-house	X	
Marine and Freshwater Monitoring Element (Section 4.4.2) ***Element Goal: Conduct monitoring of marine and freshwater habitats***						
	Objective 1 Monitor marine and freshwater environments and species to document diversity of native aquatic species through periodic inventory and habitat assessments.	4.4.2.1 – Periodically (minimally every 10 years) monitor biodiversity of native estuarine and freshwater fishes in recreational lakes, estuaries, and streams using seining, minnow traps, electrofishing, and other applicable monitoring techniques.	WMS	CN-3038	X	
		4.4.2.2 – Periodically (minimally every 10 years) assess the condition of nearshore habitat and diversity of marine species.	WMS	CN-3034	X	
		4.4.2.3 – Investigate need to conduct focused freshwater fish surveys by 2018 and implement outcome of analyses.	WMS	In-house	X	

Programs/ Elements/ Goals	Proposed Objectives	Proposed Actions	Responsible Entity (AirStn, GWS, LMS, or WMS)[2]	STEP Catalog Reference #	*Wetland, Aquatic, and Marine Ecosystem*	*Terrestrial Upland Ecosystem*
Game Management Program (Section 4.5) **Program Goal: Manage Sustainable game populations to support a recreational hunting program that is consistent with the military mission and other species management programs.**						
Game Species Element (Section 4.5.1) ***Element Goal: Monitor and manage game species to support recreational hunting***						
	Objective 1 Implement management strategies to sustain mule deer populations as determined by current deer harvest and survey data.	4.5.1.1 – Collect deer data from hunting and deer-vehicle strikes on the same day deer were taken.	GWS	In-house		X
		4.5.1.2 – Provide aerial deer surveys as needed to obtain current data.	**GWS**, WMS	CN-3038		X
		4.5.1.3 – Evaluate deer data annually.	GWS	In-house		X
		4.5.1.4 – Create mule deer management strategy based on past (hunting) year and submit to CDFW annually.	GWS	In-house		X
		4.5.1.5 – Manage hunter effort through lottery check-in times, and times allowed for field changes or pot-luck and walk-in hunters.	GWS	In-house		X
	Objective 2 Collect game species data that are useful in evaluating appropriate hunting bag limits, monitor for over-harvest, and identify health/disease conditions.	4.5.1.6 – Tally the number of doves, rabbits, pigeons, squirrels, and ducks harvested seasonally and annually.	GWS	In-house	X	X
		4.5.1.7 – Measure hunter effort for small game and waterfowl hunters seasonally and annually and record sex data for quail and waterfowl.	GWS	In-house	X	X
		4.5.1.8 – Measure hunter effort on huntable species seasonally and annually.	GWS	In-house	X	X
	Objective 3 Implement game management strategies that support a recreational hunting program, and are consistent with the military mission.	4.5.1.9 – Revise and document harvest bag limits and dates of seasons annually.	GWS	In-house	X	X
		4.5.1.10 – Authorize specific training/hunting area use each hunting day dependent upon training use, hunter numbers, effort, and safety with sufficient manpower to run programs.	GWS	In-house	X	X
Bison Management Element (Section 4.5.2) ***Element Goal: Manage bison population***						
	Objective 1 Manage the bison population to minimize mission conflicts and impacts to habitat and safety.	4.5.2.1 – Employees respond to reported bison emergencies to minimize conflicts.	GWS	In-house		X
		4.5.2.2 – Implement Bison Management Plan recommendations in a timely manner once the specific course of action is approved by management.	GWS	In-house		X
Outdoor Recreation Program (Section 4.6) **Program Goal: Provide natural resources-related recreational opportunities to installation personnel, their dependents, and the general public to the maximum extent practicable when compatible with the military mission, security, and natural resources sustainability.**						
Fishing Element (Section 4.6.1) ***Element Goal: Manage mission-compatible and ecologically sustainable fishing opportunities that enhance quality of life for active and retired military personnel, DoD civilian personnel, their dependents, and the sponsored public.***						
	Objective 1 Manage fisheries to provide a high-quality recreational fishing program and experience consistent with the military mission and other species management programs.	4.6.1.1 – Stock Lake O'Neill with exotic game fish annually, or as conditions allow. Stock nonnative fish salvaged during aquatic exotic species removal effort to the extent practicable; augment with hatchery fish when funding is available.	WMS	CN-3003	X	
		4.6.1.2 – Install and maintain floating Solar Bee™ pond circulators in Lake O'Neill annually to oxygenate water.	WMS	CN-3037	X	
		4.6.1.3 – Collect accurate fish counts and data from anglers when information is needed by biologists.	GWS	In-house	X	
		4.6.1.4 – GWS and WMS will collaborate on annual fish stocking at Lake O'Neill.	GWS	In-house	X	
	Objective 2 Provide an accessible, sustainable outdoor fishing experience for military and civilian patrons within the constraints of the military mission and capability of the resources.	4.6.1.5 – Track fishing permit sales annually.	GWS	In-house	X	
		4.6.1.6 – Track anglers each time they access fishing areas within training areas.	GWS	In-house	X	
		4.6.1.7 – Upgrade the Environmental Fish and Wildlife Control Tracking System once funded to collect information from anglers.	GWS	CN-3038	X	
		4.6.1.8 – Evaluate fishing program annually.	GWS	In-house	X	
		4.6.1.9 – Keep annual prices reasonable and consistent with other installations with similar programs.	GWS	In-house	X	

Programs/ Elements/ Goals	Proposed Objectives	Proposed Actions	Responsible Entity (AirStn, GWS, LMS, or WMS)[2]	STEP Catalog Reference #	*Wetland, Aquatic, and Marine Ecosystem*	*Terrestrial Upland Ecosystem*
Hunting Element (Section 4.6.2) ***Element Goal: Manage quality, mission-compatible and ecologically sustainable hunting opportunities that enhance quality of life for active and retired military personnel, DoD civilian personnel, and their dependents***						
	Objective 1 Provide a quality, sustainable outdoor hunting experience for those permitted to hunt on-Base within the constraints of the military mission, and capability of the resources.	4.6.2.1 – Revise and document harvest bag limits and dates seasonally and annually.	GWS	In-house	X	X
		4.6.2.2 – Authorize specific training/hunting area use each hunting day dependent upon training use, hunter numbers, effort, and safety with sufficient manpower to run programs.	GWS	In-house	X	X
		4.6.2.3 – Evaluate hunting program annually.	GWS	In-house	X	X
		4.6.2.4 – Keep annual prices reasonable and consistent with other installations with similar programs.	GWS	In-house	X	X
Recreation and Camping Element (Section 4.6.3) ***Element Goal: Manage a quality, mission-compatible, and sustainable recreation camping opportunity that enhances quality of life for active and retired military, DoD civilians, their dependents, and the sponsored public***						
	Objective 1 Provide a quality, sustainable outdoor camping experience within the constraints of the military mission and capability of the resources.	4.6.3.1 – Maintain the number of camping customers and permits sold sufficient to provide a consistent funding source annually.	GWS	In-House		X
		4.6.3.2 – Evaluate camping program annually.	GWS	In-House		X
		4.6.3.3 – Keep annual prices reasonable and consistent with other installations with similar programs.	GWS	In-House		X
		4.6.3.4 – Provide camping customers with multiple campsite options on weekends and holidays when possible.	GWS	In-House		X
		4.6.3.5 – Provide DoD dispersed-use campers with a safe, quiet, enjoyable scenic experience.	GWS	In-House		X
Human-Wildlife Conflict Management Program (Section 4.7) **Program Goal: Manage Camp Pendleton wildlife conflict response and resolution.**						
Human-Wildlife Conflict Management Element (Section 4.7.1) ***Element Goal: Manage Camp Pendleton wildlife conflict response and resolution to emergency or human-health wildlife problems***						
	Objective 1 Manage wildlife conflict responses as related to human health and safety, military operations, quality of life, cantonment areas, and other species management programs.	4.7.1.1 – Respond within 30 minutes to human-wildlife conflict hazards and provide follow-up support.	**GWS**, WMS	In-house	X	X
		4.7.1.2 – Remove problem wildlife to minimize emergencies.	GWS	In-house	X	X
		4.7.1.3 – Prioritize wildlife emergency responses.	GWS	In-house	X	X
		4.7.1.4 – Assist in response to service calls regarding retrieval, capture, and safe delivery of wildlife.	AirStn	In-house	X	X
		4.7.1.5 – Maintain animal handling and transportation equipment in good working order.	AirStn, GWS	In-house	X	X
Incident Management Program (Section 4.8) **Program Goal: Support conservation compliance and oversight for the installation mission and activities.**						
Incident Management Element (Section 4.8.1) ***Element Goal: Manage the timely redress of unauthorized impacts to regulated resources.***						
	Objective 1 In a timely manner investigate, report, and address solutions for environmental incidents pertaining to regulated resources as needed using the EIRS.	4.8.1.1 – Conduct timely investigations and make recommendations/redress to provide reports on incidents in EIRS that inform managers and other Environmental Security staff of potential and identified impacts to regulated resources that may require corrective actions.	GWS, LMS, WMS	In-House	X	X
	Objective 2 Mitigate unauthorized impacts to regulated resources on an as-needed basis.	4.8.1.2 – Start habitat restoration at Vernal Pool Group 68 in 2018.	LMS	CN-3002		X
		4.8.1.3 – Implement range 501 Pacific pocket mouse restoration 2014–2019.	LMS	CN-3003		X
		4.8.1.4 – Conduct new restorations as required through 2023.	LMS	CN-3003 CN-3041	X	X

Programs/ Elements/ Goals	Proposed Objectives	Proposed Actions	Responsible Entity (AirStn, GWS, LMS, or WMS)[2]	STEP Catalog Reference #	*Wetland, Aquatic, and Marine Ecosystem*	*Terrestrial Upland Ecosystem*
Wildlife Permits Element (Section 4.8.2) ***Element Goal: Manage permits that allow for minimizing conflicts with human health and Camp Pendleton's mission.***						
	Objective 1 Manage wildlife permits to minimize human-health and training conflicts.	4.8.2.1 – Evaluate specific types of permits needed on a regular/annual basis to support the Marine Corps mission to minimize conflicts and maximize training.	GWS	In-House	X	X
		4.8.2.2 – Obtain or renew wildlife permits from state and federal agencies annually, when needed, or as required by law.	GWS	In-House	X	X
		4.8.2.3 – Submit permit data back to issuing agency as required within each permit (annually, every 2 years, or every 3 years).	GWS	In-House	X	X
		4.8.2.4 – Continually collect and maintain accurate data/records on each specific wildlife response and use specific data to populate each permit category.	GWS	In-House	X	X
Natural Resources Awareness and Education Program (Section 4.9) **Program Goal:** ***Raise awareness of Camp Pendleton's natural resources management program successes and contribution to conservation of the resources entrusted to USMC stewardship.***						
Data Sharing Element (Section 4.9.1) ***Element Goal: Share ecological data with stakeholders and interested parties to promote regional conservation of sensitive natural resources***						
	Objective 1 Facilitate the public availability of ecological data collected on Camp Pendleton to support regional conservation and research efforts.	4.9.1.1 – Make available survey data and copies of completed reports, when requested.	LMS, WMS	In-house	X	X
		4.9.1.2 – Partner with groups to improve regional sharing of ecological data.	LMS, WMS	In-house	X	X
Internal Education Element (Section 4.9.2) ***Element Goal: Inform military staff about natural resources and the programs to manage these resources, maintain natural resources staff technical expertise related to ecosystem management, and provide CLEOs with training opportunities to meet their mandated training requirements.***						
	Objective 1 Provide training opportunities and information to other units and staff on a periodic basis to enhance their understanding of wildlife and land management programs being conducted on Camp Pendleton and promote compliance with GWS, LMS, WMS, and Air Station programs.	4.9.2.1 – Coordinate with and support each section in ES and within the Air Station's Environmental Department through as-needed informal meetings, staff support, and project coordination.	AirStn, GWS, LMS, WMS	In-house	X	X
		4.9.2.2 – Participate in annual Reserve Support Unit conference to inform reservists of wildlife conservation issues.	WMS	In-house	X	X
		4.9.2.3 – Provide annual briefs to the primary units training on installation beaches to promote compliance with the Estuarine/Beach Conservation plan by March 30 annually, and continue briefs, as needed, throughout the nesting season.	WMS	In-house	X	
	Objective 2 Provide mandated and focused training for all CLEOs.	4.9.2.4 – CLEOs shall complete the FLETC LMPT course (or equivalent) upon being hired into the position.	GWS	CN-3051	X	X
		4.9.2.5 – CLEOs shall qualify with all issued firearms twice annually.	GWS	CN-3051	X	X
		4.9.2.6 – CLEOs will attend the annual CLEO In-Service training (dependent upon manpower or other factors).	GWS	CN-3051	X	X
		4.9.2.7 – CLEOs will meet and hold any special certifications as required to perform their duties (e.g., hunter education instructor, defensive tactics instructor, firearms instructor).	GWS	CN-3051	X	X
	Objective 3 Support current trainings for WMS and LMS staff on technical issues related to wildlife and plant species, ecosystem habitat management, and biodiversity.	4.9.2.8 – Attend regional and range-wide workshops, symposiums, meetings, etc. to maintain and share knowledge of listed species management techniques and issues (e.g., annual Western Snowy Plover Regional Unit 6 Working Group Meeting).	LMS, WMS	CN-3051	X	X
		4.9.2.9 – Attend formal trainings to further expertise in wildlife species management.	WMS	CN-3051	X	X
External Education Element (Section 4.9.3) ***Element Goal: Promote public awareness of Camp Pendleton's natural resources management program and USMC stewardship.***						
	Objective 1 Maintain public awareness of Camp Pendleton's effort to manage natural resources and INRMP programs through public outreach.	4.9.3.1 – Develop and maintain resource briefs to provide overviews on MCB and MCAS Camp Pendleton INRMP programs.	AirStn, GWS, LMS, WMS	In-house	X	X
		4.9.3.2 – Present papers, posters, articles, and briefings to appropriate venues, newspapers, and professional periodicals.	AirStn, GWS, LMS, WMS	In-house	X	X
		4.9.3.3 – Participate in annual events such as science fairs, Earth Day, and other appropriate venues to help educate Camp Pendleton residents about wildlife management topics.	AirStn, GWS, LMS, WMS	In-house	X	X

Programs/ Elements/ Goals	Proposed Objectives	Proposed Actions	Responsible Entity (AirStn, GWS, LMS, or WMS)[2]	STEP Catalog Reference #	*Wetland, Aquatic, and Marine Ecosystem*	*Terrestrial Upland Ecosystem*
		4.9.3.4 – Participate annually with local high schools in the School-to-Career program to orient students to the environmental compliance and natural resources management professions, education requirements, and expertise being exercised at Camp Pendleton.	AirStn, GWS, LMS, WMS	In-house	X	X
		4.9.3.5 – Complete installation of blue whale bone display at Del Mar Recreation Beach in 2018.	WMS	CN-3037	X	
		4.9.3.6 – Create and edit cinema-style short documentaries highlighting the successful integration of the military mission with endangered species management to be presented to Camp Pendleton residents in 2018–2019.	WMS	CN-3037	X	X
		4.9.3.7 – Conduct presentations on natural resources and installations wildlife management programs to groups off Camp Pendleton such as conservation organizations and college classes.	GWS, LMS, WMS	In-house	X	X
	Objective 2 Elevate public awareness and elicit understanding of and support for listed species conservation objectives.	4.9.3.8 – Develop and install signs and kiosks to inform Camp Pendleton users of sensitive habitat and endangered species in site-specific locations annually, or as opportunities are identified.	AirStn, LMS, WMS	CN-3037	X	X
		4.9.3.9 – Annually distribute informational brochures to MCCS recreational beach program managers to help educate beach users about listed species and regulations associated with Endangered Species Management Zone.	WMS	CN-3003	X	X
		4.9.3.10 – Conduct natural resource brief on fairy shrimp to groups using Oscar II, Fire Base Gloria, Cal Site 23, and DZ Tank Park.	LMS	CN-3003	X	
	Objective 3 Provide and support public awareness of natural resources sustainability as appropriate.	4.9.3.11 – Maintain social media (Facebook site) and update regularly.	GWS	CN-3024	X	X
		4.9.3.12 – Make recreation regulations available to customers through social media and other means.	GWS	CN-3024	X	X

[1] List of Acronyms and Abbreviations:

AirStn	Air Station	ESA	Endangered Species Act	MMPA	Marine Mammal Protection Act
BASH	Bird Air Strike Hazard	FLETC	Federal Law Enforcement Training Center	NEPA	National Environmental Policy Act
BGEPA	Bald and Golden Eagle Protection Act	GIS	geographic information system	NIS	Nonnative, Invasive Species
BO	Biological Opinion	GSOB	goldspotted oak borer	NOAA	National Oceanic and Atmospheric Administration
CDFW	California Department of Fish and Game	GWS	Resource Enforcement/Compliance Section (referred to as GWS)	NVCS	National Vegetation Classification System
CLEO	Conservation Law Enforcement Officer	INRMP	Integrated Natural Resources Management Plan	PSHB	polyphagous shot hole borer
CRAM	California Rapid Assessment Methodology	KSHB	Kuroshio shot hole borer	RAWS	Remote Automatic Weather Stations
DoD	Department of Defense	LMPT	Land Management Police Training	STEP	Status Tool for the Environmental Program
EA	Environmental Assessment	LMS	Land Management Section	USACE	U.S. Army Corps of Engineers
EDRR	Early Detection Rapid Response	MBTA	Migratory Bird Treaty Act	USFWS	U.S. Fish and Wildlife Service
EIRS	Environmental Incident Reporting System	MCAS	Marine Corps Air Station	USGS	U.S. Geological Survey
EPA	U.S. Environmental Protection Agency	MCB	Marine Corps Base	USMC	U.S. Marine Corps
ES	Environmental Security	MCCS	Marine Corps Community Services	WMS	Wildlife Management Section

[2] Where multiple entities are noted, boldface indicates the entity that has lead responsibility for the action. Where none are in boldface, then the entities listed are co-leaders of the action.

Appendix Q

Established Species Survey Protocols

Appendix Q: Established Species Survey Protocols

Title of Protocol	Preferred Citation or Authors	Year Established	Published? Y/N
Wildlife			
MCBCP Arroyo Toad Monitoring Program: 3-Year Trend Analyses for 2003-2005	Brehme, C. S., S. L. Schuster, C. J. Rochester, S. A. Hathaway, and R. N. Fisher. 2006. MCBCP Arroyo Toad Monitoring Program: 3-Year Trend Analyses for 2003-2005. U.S. Geological Survey Data Summary prepared for Marine Corps Base Camp Pendleton. 102 pp.	2006	N
Coastal California Gnatcatcher (*Polioptila californica californica*) Presence/Absence Survey Guidelines	U.S. Fish and Wildlife Service	1997	Y
Light-footed Clapper Rail (*Rallus longirostris levipes*) 5-Year Review: Summary and Evaluation	U.S. Fish and Wildlife Service	2009	Y
U.S. Fish and Wildlife Service Least Bell's Vireo Survey Guidelines	U.S. Fish and Wildlife Service	2001	Y
Status of the California Least Tern and Western Snowy Plover Populations Breeding at Marine Corps Base, Camp Pendleton California, 2014	Boylan J. T., K. Murbock, E. Rice, T. Wooten, A. DiNuovo, L. Nordstrom, and R. Swaisgood. 2015. Status of the California Least Tern Population Breeding at Marine Corps Base, Camp Pendleton, California, 2014. Unpubl. Report prepared for Department of the Navy, Environmental Core, Naval Facilities Engineering Command Southwest, San Diego, CA under Agreement Number N62473-13-2-4901. 73 pp + Appendices	2015	N
Pacific Pocket Mouse Monitoring Protocol for MCB Camp Pendleton	Brehme, C.S., J. A. Tracey, T. A. Matsuda, and R. N. Fisher in collaboration with K. Burnham, P. Meserve, W. Spencer, D. Deutschman, W. Miller, and M. Pavelka. 2011. Pacific Pocket Mouse Monitoring Protocol for Marine Corps Base Camp Pendleton. Prepared for Wildlife Management Branch, AC/S Environmental Security, Marine Corps Base Camp Pendleton. 55pp.	2011	N
Quino Checkerspot Butterfly (*Euphydryas editha quino)* Survey Protocol Information	US Fish and Wildlife Service	2002	Y
Stephens' Kangaroo Rat (*Dipodomys stephensi)* Monitoring Protocol for MCB Camp Pendleton	Brehme, C., K. Burnham, D. Kelt, A. Olsen, S. Montgomery, S. Hathaway, and R. Fisher. 2006. Stephens' Kangaroo Rat (D*ipodomys stephensi)* Monitoring Protocol for MCB Camp Pendleton. Prepared for AC/S Environmental Security, Marine Corps Base, Camp Pendleton	2006	N

Title of Protocol	Preferred Citation or Authors	Year Established	Published? Y/N
July 2000 U.S. Fish and Wildlife Service Flycatcher Survey Protocol (Revised)	U.S. Fish and Wildlife Service	2000	Y
U.S. Fish and Wildlife Service 2006. Tidewater Goby Survey Protocol	U.S. Fish and Wildlife Service	2006	Y
A Natural History Summary and Survey Protocol for the Western Yellow-billed Cuckoo Population	Halterman, M., M. J. Johnson, and J. A. Holmes. A Natural History Summary and Survey Protocol for the Western Yellow-Billed Cuckoo Population. 17 pp.	2011	N
Plants			
Inventory protocol with data dictionary	Kenney, Bieber		N
Inventory protocol with data dictionary	Kenney, Bieber		N
Inventory protocol with data dictionary	Kenney, Bieber		N
Inventory protocol with data dictionary	Kenney, Bieber		N
Inventory protocol with data dictionary	Kenney, Bieber		N
Dune Management Plan	Part of Riparian BO		N
Dune Monitoring Plan	RECON	2005	N
Yearly Fire Mapping	TetraTech	2014	N
Yearly fuel moisture monitoring protocol	SPAWAR	2013	N
Gold Spotted Oak Borer Monitoring Plan	SPAWAR	2015	N
Oak-woodland monitoring report	SPAWAR	2014	N
Grassland monitoring report	SERG	2009	N
Riparian health monitoring report	EDAW	2009	N
Vernal Pool Habitat Impact Monitoring Plan for Tracked Vehicle Impacts at MCBCP	AECOM	2010	
California Rapid Assessment Method for Wetlands - Riparian Wetlands Field Book - Version 5.0.2	Collins, J. N., E. D. Stein, M. Sutula, R. Clark, A. E. Fetscher, L. Grenier, C. Grosso, and A. Wiskind	2008	
California Rapid Assessment Method for Wetlands - User's Manual - Version 5.0.2	Collins, J. N., E. D. Stein, M. Sutula, R. Clark, A. E. Fetscher, L. Grenier, C. Grosso, and A. Wiskind	2008	
Pendleton Riparian Monitoring Plan	AECOM	2009	
Vernal Pool Habitat Impact Monitoring Plan for Tracked Vehicle Impacts at MCBCP	AECOM	2010	
Perennial Grassland Monitoring MCBCP (cover states March 2009, inside page states submitted January 2010)	Soil Ecology & Restoration Group - SERG	2010	
BRFI inventory protocol	LMS	2014	
Pendleton button-celery inventory protocol	LMS	2014	

Title of Protocol	Preferred Citation or Authors	Year Established	Published? Y/N
Spreading navarretia inventory protocol	LMS	2014	
San Diego button-celery inventory protocol	LMS	2014	
Brand's phacelia and Nuttall's Acmispon inventory protocol	LMS	2014	
Dune habitat monitoring	RECON	2005	
GSOB inventory/monitoring plan	SPAWAR	2015	
Oak woodland monitoring report	SPAWAR	2014	

Appendix R

Watchlist of Nonnative Plant Species for Camp Pendleton

Appendix R
Nonnative Plant Species for Camp Pendleton

Species Name	Common Name	Cal IPC #	Tier I*
Watch List (Surveillance)			
Aegilops cylindrica	Jointed Goat Grass	None	X
Aegilops truncalis	Barbed Goat Grass	High	X
Alhagi maurorum	Camelthorn	Moderate	X
Alternanthera philoxeroides	Alligator Weed	High	X
Ammophila arenaria	European Beachgrass	High	X
Anthoxanthum odoratum	Sweet Vernalgrass	Moderate	X
Bellardia trixago	Bellardia	Limited	X
Brachypodium sylvaticum	Perennial False-Brome	Moderate	X
Briza maxima	Big Quackin Grass	Limited	X
Bromus japonicus	Japanese Brome	Limited	X
Carduus acanthoides	Plumeless Thistle	Limited	X
Carduus nutans	Musk Thistle	Moderate	X
Carthamus lanatus	Woolly Distaff Thistle	Moderate	X
Centaurea calcitrapa	Purple Star Thistle	Moderate	X
Centaurea debeauxii	Meadow Knapweed	Moderate	X
Centaurea diffusa	Diffuse Knapweed	Moderate	X
Centaurea stoebe, C. maculosa	Spotted Knapweed	None	X
Centaurea virgata ssp.*squarrosa*	Squarrose Knapweed	Moderate	X
Chondrilla juncea	Rush Skeletonweed	Moderate	X
Cirsium arvense	Canada Thistle	Moderate	X
Conicosa pugioniformis	Narrowleaf Iceplant	Limited	X
Cordyline australis	Giant Dracaena	Limited	X
Cotoneaster lacteus	Parney's Cotoneaster	Moderate	X
Cotoneaster pannosus	Silverleaf Cotoneaster	Moderate	X
Cytisus multiflorus	Portugese Broom	Moderate	X
Cytisus scoparius	Scotch Broom	High	X
Dipsacus fullonum	Common Teasel	Moderate	X
Dipsacus sativus	Fuller's Teasel	Moderate	X
Egeria densa	Brazillian Egeria	High	X
Ehrharta calycina	Purple Veldtgrass	High	X
Eichhornia crassipes	Water Hyacinth	High	X
Elaeagnus angustifolia	Russian-Olive	Moderate	X
Enchylaena tomentosa	Ruby Salt Bush	None	X
Erodium malacoides	Mediterranean Filaree	None	X
Euphorbia esula	Leafy Spurge	Moderate	X
Euphorbia terracina	Carnation Spurge	Moderate	X
Euphorbia virgata	Slender Leafy Spurge	None	X
Glyceria declinata	Waxy Mannagrass	Moderate	X
Halogeton glomeratus	Halogeton	Moderate	X
Hedera helix, H. Canariensis	English Ivy, Algerian Ivy	High	X
Helichrysum petiolare	Licorice Plant	Limited	X
Heliotropium supinum	Dwarf Heliotrope	None	X
Holcus lanatus	Common Velvetgrass	Moderate	X
Hydrilla verticillata	Hydrilla	High	X
Hypericum canariense	Canary Island Hypericum	Moderate	X
Hypericum perforatum	Common St. John's Wort	Moderate	X
Kochia scoparia	Kochia (Scarlet Wisteria)	Limited	X
Lepidium appelianum	Hairy Whitetop	None	X
Leucanthemum vulgare	Ox-Eye Daisy	Moderate	X
Limonium duriusculum	European Sea Lavender	None	X

Species Name	Common Name	Cal IPC #	Tier I*
Linaria genistifolia ssp. *dalmatica*	Toadflax	Moderate	X
Lonicera japonica	Japanese Honeysuckle	None	X
Lythrum salicaria	Purple Loosestrife	Limited	X
Myriophyllum aquaticum	Parrotfeather	High	X
Myriophyllum spicatum	Eurasian Watermilfoil	High	X
Onopordum acanthium	Scotch Thistle	High	X
Polypodium calirhiza	Licorice Plant	None	X
Potamogeton crispus	Curlyleaf Pondweed	Moderate	X
Prunus cerasifera	Cherry Plum	Limited	X
Rubus armeniacus	Himalaya Blackberry	High	X
Saccharum ravennae	Ravennagrass	Moderate	X
Salsola paulsenii	Barbwire Russian-Thistle	Limited	X
Salsola soda	Opposite Leaf Russian Thistle	Moderate	X
Salvinia molesta	Giant Salvinia	High	X
Sapium sebiferum	Chinese Tallow Tree	Moderate	X
Saponaria officinalis	Bouncing Bet	Limited	X
Senecio linearifolius	Linear-Leaved Australian Fireweed	None	X
Senecio glomeratus, S. minimus	Cutleaf, Australian Burnweed	Moderate	X
Sesbania punicea	Red Sesbania, Scarlet Wisteria	High	X
Spartina alterniflora, and *S. alterniflora x folisa*	Smooth Cordgrass and Hybrids	High	X
Spartina anglica	Common Cordgrass	Moderate	X
Spartina densiflora	Dense-Flowered Cordgrass	High	X
Spartina patens	Saltmeadow Cordgrass	Limited	X
Stipa capensis	Mediterranean steppegrass	Moderate	X
Stipa tenuissima	Mexican Feather Grass	None	X
Taeniatherum caput-medusae	Medusahead	High	X
Tragopogon porrifolius	Purple Salsify	None	X
Ulex europaeus	Gorse	High	X
Volutaria canariensis	Canary Island Knapweed	None	X
Zantedeschia aethiopica	Calla Lily	Limited	X
Eradication			
Acacia dealbata	Silver wattle	Moderate	X
Acacia melanoxylon	Black Acacia, Blackwood Acacia	Limited	X
Acacia saligna	Golden Wreath Wattle	None	X
Acroptilon repens	Russian Knapweed	Moderate	X
Ageratina adenophora	Croftonweed, Eupatorium	Moderate	X
Ailanthus altissima	Tree of Heaven	Moderate	X
Araujia sericifera	Bladder Flower	None	X
*Arctotheca calendula (*Sterile and Fertile)	Fertile Capeweed	Moderate	X
Arundo donax	Arundo, Giant Reed	High	X
Asparagus asparagoides	Florist's Smilax, Bridal Creeper	Moderate	X
Asphodelus fistulosus	Onion Weed, Hollow-Stem Asphodel	Moderate	X
Carrichtera annua	Ward's Weed	None	X
Carya illinoinensis	Pecan	None	X
Cenchrus clandestinus	Kikuyu Grass	Limited	X
Cenchrus setaceus	Fountain Grass	None	X
Centaurea benedicta	Blessed Thistle	None	x
Centaurea solstitialis	Yellow Star Thistle	High	X
Centaurium pulchellum	Lesser Centaury	None	X
Cortaderia jubata	Purple Jubata Grass	High	X
Cortaderia selloana	Selloa Pampas Grass	High	X
Delairea odorata	German-Ivy, Cape-Ivy	High	X
Dittrichia graveolens	Stinkwort	Moderate	X
Ehrharta longiflora	Long-Flowered Veldtgrass	Moderate	X

Species Name	Common Name	Cal IPC #	Tier I*
Emex spinosa	Devil's Thorn, Spiny Emex	Moderate	X
Eriogonum giganteum	Santa Catalina Island Buckwheat	None	X
Festuca arundinacea	Tall Fescue	Moderate	X
Ficus carica	Edible Fig	Moderate	X
Fraxinus uhdei	Shamel Ash	None	X
Genista monosperma	Bridal Veil Broom	None	X
Genista monspessulana	French Broom	High	X
Glebionis coronaria	Crown Daisy, Garland, Chrysanthemum	None	X
Gleditsia triacanthos	Honeylocust	None	X
Hypharrhenia hirta	Thatchgrass	None	X
Ipomoea cairica	Ivy-Leaf Morning Glory, Mile-A-Minute Vine	None	X
Juglans nigra	Black Walnut	None	X
Lagunaria patersonia	Cow Itch Tree	None	X
Lepidium chalepense	Lens-Podded White-Top	Moderate	X
Limonium ramosissimum	Algerian Sea Lavender	Limited	X
Melinis repens	Natal Grass	None	X
Olea europaea	Olive	Limited	X
Oncosiphon piluliferum	Stinknet	None	X
Paspalum vaginatum	Seashore Paspalum	None	X
Pelargronium xhortorum	Zonal Geranium	None	X
Pentameris airoides	False Hair Grass	None	X
Prunus ilicifolia ssp. *Lyonii*	Catalina Cherry	None	X
Quercus ilex	Holly Oak	None	X
Rapistrum rugosum	Annual Bastard Cabbage	None	
Schinus terebinthifolius	Brazillian Pepper Tree	Limited	X
Senecio quadridentatus	Cotton Fireweed	None	X
Solanum eleagnifolium	Silver-Leaf Horse-Nettle	None	X
Spartium junceum	Spanish Broom	High	X
Stenotaphrum secundatum	Saint Augustine Grass	None	X
Vinca major	Greater Periwinkle, Big Periwinke	Moderate	X
Management			
Agave americana	American Agave	None	
Agrostis stolonifera	Creeping Bentgrass	Limited	
Amaranthus albus	White Tumbleweed	None	
Apium graveolens	Common Celery	None	
Brassica napus	Swede Rape, Rapesweed	None	
Brassica rapa	Turnip, Field Mustard, Birdsrape Mustard	Limited	
Brassica tournefortii	Sahara Mustard	High	X
Cakile edentula	American Sea-Rocket	None	
Cakile maritima	European Sea-Rocket	Limited	X
Cardaria chalepensis	Lens-Podded White-Top	Moderate	
Cardaria draba	Heart-Pod Hoary-Cress	Moderate	X
Cardaria pubescens	Hairy Whitetop	Limited	
Carduus tenuiflorus	Slenderflower Thistle	Limited	
Carpobrotus chilensis	Sea-Fig, Iceplant	Moderate	X
Carpobrotus edulis	Hottentot-Fig, Iceplant	High	X
Conicosia pugioniformis	Narrowleaf Iceplant	Limited	
Cotoneaster franchetii	Orange Cotoneaster	Moderate	
Crataegus monogyna	Hawthorn	Limited	
Crocosmia x crocosmiiflora	Montbretia	Limited	
Crupina vulgaris	Common Crupina, Bearded Creeper	Limited	
Crypsis schoenoides	Prickle Grass	None	
Crypsis vaginiflora	Swamp Grass	None	
Cynara cardunculus	Artichoke Thistle, Cardoon	High	X

Species Name	Common Name	Cal IPC #	Tier I*
Cynoglossum officinale	Houndstongue	Moderate	
Daucus carota	Carrot, Queen Anne's Lace	None	
Descurainia sophia	Flixweed, Tansy Mustard	Limited	
Dichondra micrantha	Asian Ponyfoot	None	
Digitalis purpurea	Foxglove	Limited	
Digitaria sanguinalis	Large Crabgrass	None	
Dimorphotheca fruticosa	Trailing African Daisy	None	X
Ehrharta erecta	Panic Veldt Grass, Erect Veldt Grass	Moderate	
Eragrostis lehmanniana	Lehmann's Lovegrass	None	X
Erechtites glomerata, E. minima	Australian Fireweed, Australian Burnweed	Moderate	
Eucalyptus camaldulensis	River Red Gum	Limited	
Eucalyptus citriodora	Lemon-Scent Gum	None	
Eucalyptus cladocalyx	Sugar Gum	None	
Eucalyptus cornuta	Bushy Yate	None	
Eucalyptus globulus	Blue Gum, Tasmanian Blue Gum	Moderate	
Eucalyptus rudis	Australian Flooded Gum	None	
Euphorbia lathyris	Caper Spurge, Gopher Plant	None	
Euphorbia maculata	Spotted Spurge	None	
Euphorbia oblongata	Oblong Spurge	Limited	
Euphorbia peplus	Petty Spurge	None	
Foeniculum vulgare	Fennel	High	X
Gypsophilia paniculata	Baby's Breath	None	
Ilex aquifolium	English Holly	Moderate	
Isatis tinctoria	Dyer's Woad	Moderate	
Lepidium didymum	Lesser Water-Cress	None	
Lepidium latifolium	Perrenial Pepperweed, Broad-Leaf Peppergrass	None	X
Limonium perezii	Perez's Sea Lavender	None	
Limonium sinuatum	Notch-Leaf Marsh-Rosemary	None	X
Linaria vulgaris	Yellow Toadflax, Butter and Eggs	Moderate	
Lobularia maritima	Sweet Alyssum	Limited	
Lolium multiflorum	Italian Ryegrass	Moderate	
Ludwigia grandiflora	Large-Flower Primrose-Willow	None	
Ludiwigia hexapetela	Uruguayan Primrose-Willow, Uruguayan Marsh-Purlane	High	
Ludwigia peploides ssp. *montevidensis*	Creeping Water-Primrose	High	
Medicago sativa	Alfalfa, Lucerne	None	
Mentha pulegium	Pennyroyal	Moderate	
Mentha spicata	Spearmint	None	
Myoporum laetum	Ngaio Tree, Mousehole Tree	Moderate	X
Myosotis latifolia	Common Forget-Me-Not	Limited	
Ononis alopecuroides	Foxtail Restharrow	Limited	
Opuntia ficus-idica	Mission Prickly-Pear, Indian Fig	None	
Panicum miliaceum	Broomcorn Millet	None	
Parentucellia viscosa	Yellow Glandweed, Sticky Parentucellia	Limited	
Parapholis incurva	Sickle Grass	None	
Paspalum dilatatum	Dallis Grass	None	
Pennisetum setaceum	Fountain Grass	None	X
Phalaris aquatic	Harding Grass	Moderate	X
Phoenix canariensis	Canary Island Date palm	None	X
Phytolacca americana	Common Pokeweed	Limited	
Polygonum cuspidatum	Japanese Knotweed	Moderate	
Polygonum sachalinense	Sakhalin Knotweed	Moderate	
Pyracantha angustifolia, P. crenulata,	Pyracantha, Firethorn	Limited	

Species Name	Common Name	Cal IPC #	Tier I*
P. coccinea			
Raphanus sativus	Radish	Limited	
Retama monosperma	Bridal Broom	Moderate	X
Schinus molle	Peruvian Pepper Tree	Limited	X
Schismus barbatus	Mediterranean Schismus	Limited	
Senecio jacobaea	Tansy Ragwort	Limited	
Sinapis arvensis	Wild Mustard, Charlock	Limited	
Stipa miliacea	Smilo Grass	None	
Tamarix aphylla	Athel Tamarisk	Limited	
Tamarix gallica	French Tamarix	None	
Tamarix parviflora	Small-Flower Tamarisk	High	X
Tamarix ramosissima	Salt Cedar	High	X
Tanacetum vulgare	Common Tansy	Moderate	
Tetragonia tetragonioides	New Zealand Spinach	Limited	
Torilis arvensis	Hedge Parsley	Moderate	
Tropaeolum majus	Garden Nasturtium	None	
Washingtonia robusta	Mexican Fan Palm	None	X
Watsonia meriana	Bulbil Watsonia	Limited	
Naturalized (Treated in Restoration projects)			
Abutilon theophrasti	Velvet-Leaf	None	
Acacia baileyana	Cootamundra Wattle	None	
Acacia cyclops	Western Coastal Wattle, Cyclops Acacia	None	
Acacia longifolia	Sydney Golden Wattle	None	
Acacia retinoides	Everblooming Acacia	None	
Agrostis avenacea	Pacific Bentgrass	Limited	
Aira caryophyllea	Silver European Hairgrass	None	
Amaranthus hybridus	Slender Pigweed	None	
Amaranthus restroflexus	Rough Pigweed	None	
Anagallis arvensis	Scarlet Pimpernel, Poor Man's Weatherglass	None	
Anthemis cotula	Mayweed, Stinkweed, Dog-Fennel	None	
Anthrisus caucalis	Bur Chervil	None	
Aptenia cordifolia	Baby Sun Rose	None	
Atriplex prostrata	Spearscale	None	
Atriplex semibiccata	Australian Saltbush	Moderate	
Atriplex suberecta	Peregrine Saltbush	None	
Avena barbata	Slender Wild Oat	Moderate	
Avena fatua	Wild Oat	Moderate	
Avena occidentalis	Western Oat	None	
Avena sterilis	Animated Oat	None	
Bassia hyssopifolia	Five-Hook Bassia	Limited	
Beta vulgaris	Sea Beet	None	
Brachypodium distachyon	Annual False-Brome, False Brome, Purple False Brome, Stiff Brome	Moderate	
Brassica nigra	Black Mustard	Moderate	
Briza minor	Quaking Grass	None	
Bromus catharticus	Recuegrass	None	
Bromus diandrus	Ripgut Brome	Moderate	
Bromus hordeaceus	Soft Chess, Soft Brome	Limited	
Bromus madritensis L. ssp. *madritensis*	Compact Brome	High	
Bromus madritensis L. ssp. *rubens*	Red Brome	None	
Bromus sterilus	Poverty Brome	None	
Bromus tectorum	Cheat Grass, Downy Brome	High	
Caesalpina spinosa	Tara	None	
Capsella bursa-pastoris	Shepherd's Purse	None	

Species Name	Common Name	Cal IPC #	Tier I*
Carduus pycnocephalus	Italian Thistle	Moderate	
Cenchrus incertus	Coast Sandbur	None	
Centaurea melitensis	Tocalote, Malta Star Thistle	Moderate	
Cerastium glomeratum	Mouse-Eared Chickweed	None	
Chenopodium album	Lamb's Quarters	None	
Chenopodium murale	Nettle-Leaf Goosefoot	None	
Chenopodium strictum	White-Leaf Goosefoot	None	
Chloris gayana	Rhodes Grass	None	
Cirsium vulgare	Bull Thistle	Moderate	
Conium maculatum	Common Poison Hemlock	Moderate	
Convolvulus arvensis	Field Bindweed	None	
Cotula australis	Australian Brass-Buttons	None	
Cotula coronopifolia	African Brass-Buttons	Limited	
Crassula tillaea	Mossy Stonecrop	None	
Cynodon dactylon	Bermuda Grass	Moderate	
Cyperus involucratus	African Umbrella Plant	None	
Dactylis glomerata	Orchard Grass	Limited	
Echinochloa crus-galli	Common Barnyard Grass	None	
Echium candicans	Pride of Madeira	Limited	
Eragrostis cilianensis	Stinkgrass	None	
Erigeron bonariensis	Flax-Leaf Fleabone	None	
Erodium botrys	Long-Beak Filaree/Storksbill	None	
Erodium brachycarpum	Short-Beak Filaree/Storksbill	None	
Erodium cicutarium	Red-Stem Filaree/Storksbill	Limited	
Erodium moschatum	White-Stem Filaree/Storksbill	None	
Euphorbia serpens	Creeping Spurge	None	
Festuca bromoides	Brome Fescue	None	
Festuca myuros	Rat-Tail Fescue	None	
Festuca perennis	Perennial Ryegrass, Italian Ryegrass	None	
Festuca temulenta	Darnel	None	
Galium parisiense	Wall Bedstraw	None	
Gastridium phleoides	Nit Grass	None	
Geranium dissectum	Cut-Leaf Geranium	Moderate	
Gazania linearis	Treasure Flower	None	
Glinus lotoides	Lotus Sweetjuice	None	
Hainardia cylindrica	Barbgrass	None	
Hedypnois cretica	Crete Hedypnois	None	
Helminthotheca echioides	Bristly Ox-Tongue	None	
Hirschfeldia incana	Shortpod Mustard, Summer Mustard	Moderate	
Hordeum marinum	Mediterranean Barley	None	
Hordeum murinum L. ssp. *glaucum*	Glaucous Barley	None	
Hordeum murinum L. ssp. *leporinum*	Hare Barely	None	
Hordeum vulgare	Cultivated Barley	None	
Hypochaeris glabra	Smooth Cat's Ear	Limited	
Hypochaeris radicata	Hairy Cat's Ear, Rough Cat's Ear, Hairy Dandelion	Moderate	
Lactuca serriola	Prickly Lettuce	None	
Lamarckia aurea	Golden-Top	None	
Lamium amplexicale	Henbit	None	
Lantana camara	Lantana	None	
Lepidium draba	Heart-Pod Hoary-Cress	None	
Lotus corniculatus	Birdfoot Trefoil	None	
Lycopersicon esculentum	Garden Tomato	None	
Lythrum hyssopifolium	Grass Poly, Hyssop Loosestrife	Limited	
Malephora crocea	Crocea Iceplant	None	

Species Name	Common Name	Cal IPC #	Tier I*
Malva parviflora	Cheeseweed	None	
Marrubium vulgare	Horehound	Limited	
Matricaria discoidea	Common Pineapple-Weed	None	
Medicago lupulina	Black Medick, Yellow Trefoil	None	
Medicago polymorpha	California Burclover	Limited	
Melaleuca nesophila	Showy Honey-Myrtle, Pink Melaleuca	None	
Melia azedarach	China Berry, Persian-Lilac	None	
Melilotus albus	White Sweet Clover	None	
Melilotus indicus	Indian Sweet Clover	None	
Mesembryanthemum crystallinum	Crystalline Iceplant	Moderate	
Mesembryanthemum nodiflorum	Slender-Leaf Iceplant	None	
Nerium oleander	Oleander	None	
Nicotiana glauca	Tree Tobacco	Moderate	
Oenothera speciosa	Beautiful Evening-Primrose	None	
Oxalis corniculata	Creeping Woodsorrel	None	
Oxalis pes-caprae	Bermuda-Buttercup, Buttercup Oxalis, Yellow Oxalis	Moderate	
Phalaris minor	Little-Seed Canary Grass	None	
Phalaris paradoxa	Paradox Canary Grass	None	
Phragmites australis	Common Reed	None	
Picris echioides	Bristly Oxtongue	Limited	
Plantago coronopus	Cut-Leaf Plantain	None	
Plantago lanceolata	English Plantain, Rib-Grass, Buckhorn Plantain	Limited	
Plantago major	Common Plantain	None	
Poa annua	Annual Bluegrass	None	
Poa pratensis	Kentucky Bluegrass	Limited	
Polycarpon tetraphyllum	Four-Leaf Allseed	None	
Polygonum aviculare L. spp. *Depressum*	Common Knotweed, Door Weed	None	
Polygonum aviculare L. spp. *neglectum*	Prostrate Knotweed	None	
Polypogon interruptus	Ditch Beard Grass	None	
Polypogon maritimus	Mediterranean Beard Grass	None	
Polypogon monspeliensis	Annual Beard Grass, Rabbitfoot Polypogon	Limited	
Polypogon viridis	Water Bread Grass	None	
Portulaca oleracea	Common Purslane	None	
Pulicaria paludosa	Spanish False-Fleabane	None	
Pseudognaphalium luteoalbum	Fragrant Everlasting Cudweed	None	
Ranunculus repens	Creeping Buttercup	Limited	
Raphanus raphanistrum	Jointed Charlock	None	
Ricinus communis	Castor Bean	Limited	
Robinia pseudoacacia	Black Locust	Limited	
Rumex acetosella	Red Sorrel, Sheep Sorrel	Moderate	
Rumex conglomeratus	Whorled Dock	None	
Rumex crispus	Curly Dock	Limited	
Rumex dentatus	Toothed Dock	None	
Rumex pulcher	Fiddle Dock	None	
Rumex stenophyllus	Narrow-Leaf Dock	None	
Salsola australis	Australian Tumbleweed	None	
Salsola tragus	Prickly Russian Thistle, Tumbleweed	Limited	
Schismus arabicus	Arabian Schismus	Limited	
Senecio vulgaris	Common Groundsel	None	
Senna didymobotrya	African Senna	None	
Silene gallica	Common Catchfly	None	
Silybum marianum	Milk Thistle	Limited	

Species Name	Common Name	Cal IPC #	Tier I*
Sisymbrium altissimum	Tumble Mustard	None	
Sisymbrium irio	London Rocket	Moderate	
Sisymbrium officinale	Hedge Mustard	None	
Sisymbrium orientale	Hare's-Ear Cabbage	None	
Solanum elaeagnifolium	Silver-Leaf Horse-Nettle		
Solanum nigrum	Black Nightshade	None	
Sonchus asper	Prickly Sow-Thistle	None	
Sonchus oleraceus	Common Sow-Thistle	None	
Sorghum halepense	Johnson Grass	None	
Spergula arvensis	Stickwort, Starwort	None	
Spergularia rubra	Ruby Sand-Spray	None	
Spergularia villosa	Villous Sand-Spray	None	
Stellaria media	Common Chickweed	None	
Stellaria pallida	Pale Starwort	None	
Tagetes erecta	Marigold	None	
Taraxacum officinale	Common Dandelion	None	
Torilis arvensis	Japanese Hedge-Parsley	Moderate	
Torilis nodosa	Knot Hedge-Parsley	None	
Tribulus terrestris	Puncture Vine	None	
Trifolium hirtum	Rose Clover	Moderate	
Triticum aestivum	Cereal Wheat	None	
Ulmus parvifolia	Chinese Elm	None	
Undaria pinnatifida	Wakame	Limited	
Urtica urens	Dwarf Nettle	None	
Verbascum thapsus	Common Mullein, Woolly Mullein	Limited	
Verbascum virgatum	Wand Mullein	None	
Veronica anagallis-aquatica	Water Speedwell	None	
Veronica catenata	Broad-Fruit/Chain Speedwell	None	
Vicia benghalensis	Purple Vetch	None	
Vicia sativa L. ssp. *nigra*	Narrow-Leaf Vetch, Common Vetch	None	
Vicia sativa L. ssp. *sativa*	Spring Vetch	None	
Vicia villosa	Winter Vetch	None	
Vulpia myuros	Rattail Fescue	Moderate	
Westringia fruticosa	Coastal Rosemary	None	

Cal IPC = California Invasive Plant Council - Invasive Plant Inventory
Limited: Minor ecological impacts on a statewide level, or not enough information to justify a higher rating. Low to moderate rates of invasion. Distribution generally limited, but the species may be locally persistent and/or problematic.
Moderate: Substantial and apparent, but not severe, ecological impacts on physical processes, plant and animal communities, and vegetation structure. Their characteristics are conducive to moderate to high rates of dispersal, though establishment is generally dependent upon ecological disturbance. Distribution may range from limited to widespread.
High: Severe ecological impacts on physical processes, plant and animal communities, and vegetation structure. Their characteristics are conducive to moderate to high rates of dispersal and establishment. Most are widely distributed ecologically.
* Tier I = Zero Tolerance (in Restoration sites)

Appendix S

INRMP Annual Reviews and Streamlined Review of INRMP Updates

Appendix S
INRMP Annual Reviews and Streamlined Review of INRMP Updates

Annual Reviews

The Sikes Act directs the Department of Defense (DoD), U.S. Fish and Wildlife Service (USFWS), and state fish and wildlife agencies to review Integrated Natural Resources Management Plans (INRMPs) for operation and effect on a regular basis, but not less than every 5 years. It is DoD policy to review INRMPs with their partners annually to improve project tracking and assessment, facilitate adaptive management, and to inform changes to future INRMP updates and revisions. Annual reviews also provide a determination as to whether the INRMP needs a minor change (update) or revision in order to continue to address adequately the purposes and requirements of the Sikes Act.

The Marine Corps Base Camp Pendleton Environmental Security Department and the Marine Corps Air Station Camp Pendleton Environmental Department are responsible for ensuring that annual reviews of INRMPs are conducted, documented, and reported. The annual review is to be conducted in collaboration with the Land Management Section, Wildlife Management Section, Resource Enforcement/Compliance Section, installation Command representative, and representatives from AC/S G-F (Facilities) and AC/S G-3/5 (Operations, Plans, and Training). Annual reviews should specifically assess conservation goals and objectives and the status of Natural Resources Conservation metrics.

The Natural Resources Conservation Metrics Portal (located on the Marine Corps WEBCASS Enterprise portal) is a web-based application developed to support the gathering and reporting of essential information annually required by Congress, Executive Orders, existing U.S. laws, and the DoD. This Conservation Metrics Portal is the Marine Corps' vehicle for facilitating and documenting the progress of the annual review and determining the overall health of the Marine Corps' Natural Resources program. These metrics are intended to meet the INRMP tracking requirements established by the Sikes Act.

Seven focus areas have been established to assess requirements, goals, and objectives of the Sikes Act for each installation with an INRMP:

1. INRMP project implementation
2. Federally listed species and critical habitat
3. Partnerships effectiveness
4. Fish and wildlife management and public use
5. Team adequacy

6. Ecosystem integrity
7. INRMP impact on the installation mission.

Prior to requesting participation from USFWS, California Department of Fish and Wildlife, National Oceanic and Atmospheric Administration Fisheries Service, and other appropriate stakeholders, information on the status of each established INRMP action from the previous year (Appendix P of this INRMP) should be compiled and provided to the cooperating partner agencies to aid in their assessment. Input for each of the Natural Resources Conservation metrics seven focus areas should also be requested. Once the partner agencies have reviewed and provided feedback to the installation, the annual INRMP review meeting will be conducted to discuss agency issues and concerns and come to a consensus regarding the Natural Resources Conservation Metrics. Meeting minutes can be developed into a Memorandum for Record and serve to memorialize the annual review meeting when signed by all parties. Table S–1 provides a step-by-step checklist and proposed timeline that may help facilitate the review process.

Table S-1. Checklist for Annual INRMP Review

Proposed Date/ Actual Date	Duration	Action	Responsible Party
Proposed: Actual:		Installation will develop information on specific INRMP action accomplishments from previous year and the status of each planned action.	Installation
Proposed: Actual:	No less than 30 days prior to meeting request	Installation will submit request for participation the annual INRMP review to the appropriate USFWS, NMFS, and state offices. Submittal should include cover letter, text, table, or matrix identifying INRMP action accomplishments, and overview of seven conservation metrics focus areas.	Installation
Proposed: Actual:	15 calendar days	Agency staff will acknowledge receipt and **accept/decline** request to meet to the installation within 15 calendar days of receipt.	USFWS/NMFS/ State
Proposed: Actual:	15 -30 calendar days	Agency staff will provide feedback on INRMP action accomplishments and conservation metrics to installation within a maximum of 30 calendar days, but preferably within 15 days, of receipt, unless the affected parties agree to a longer timeline for review.	USFWS/NMFS/ State
Proposed: Actual:	15 calendar days	Conduct **annual INRMP review meeting** to discuss agency feedback on accomplishments, metrics, and other concerns.	Installation/ USFWS/NMFS/ State
Proposed: Actual:	15 calendar days	Installation will submit **draft annual review meeting minutes** for agency review.	Installation
Proposed: Actual:	15 calendar days	Agency staff will review and respond to draft meeting minutes.	USFWS/NMFS/ State
Proposed: Actual:	15 calendar days	Installation will submit a **final meeting minutes** to the appropriate agency offices.	Installation
Proposed: Actual:	15 calendar days	Agency staff will respond and provide signature on the final meeting minutes.	USFWS/NMFS/ State
Proposed: Actual:	5 calendar days	Installation will enter consolidated results into Natural Resources Conservation Metrics Portal.	Installation
Proposed: Actual:		Once finalized, the annual INRMP review meeting minutes will be memorialized as a **Memorandum for Record**, and will restart the 1-year window for the next review period.	Installation

INRMP Updates

INRMP updates are minor changes to an INRMP that do not result in new biophysical effects, do not change the management prescriptions set forth in the INRMP, and do not require analysis under the NEPA nor associated public review, whereas a revision is any change to an INRMP that, if implemented, may result in a significant environmental impact.

Through a tripartite memorandum of understanding (MOU) on Integrated Natural Resources Management on Military Installations signed by the USFWS, DoD, and state fish and wildlife agencies as represented by the Association of Fish and Wildlife Agencies (AFWA) (Sikes Act Tripartite MOU, July 2013), the DoD, USFWS, and AFWA mutually agree to use the annual progress review of each INRMP as a means of facilitating and streamlining the INRMP review process. To more effectively respond and rapidly adapt to ongoing natural resource activities and to changes that are administrative, process-oriented, or minor, the three partners included a provision in the MOU to streamline the review process for incorporating minor changes or updates to existing and approved INRMPs. The USFWS will focus review on those parts of updated INRMPs that reflect changes from the previously reviewed version.

Once it is determined that an INRMP update is appropriate, installation personnel will notify the USFWS and state fish and wildlife offices with which they coordinate regarding their INRMP. This notification should be initiated by the DoD component or installation as soon as possible, and no less than 30 days prior to submitting the draft update for review. The streamlined review process should then proceed in accordance with a timeline mutually agreed upon by the USFWS, DoD, and AFWA with component leads taking responsibility for each step. The Deputy Assistant Secretary of Defense, Environment, Safety, and Occupational Health (2015) provided *Guidelines for Streamlined INRMP Review* (Enclosure 1), which are intended to clarify and describe the process for reviewing and concurring on updates to existing INRMPs. The guidelines were developed in cooperation with the USFWS and will:

- Facilitate faster review and approval of INRMPs requiring updates;
- Reduce the number of noncompliant INRMPs; and
- Improve coordination and collaboration among installation personnel and USFWS regional reviewers.

The update must clearly describe the location and scope of all proposed changes in an accompanying text, table, or matrix format, and the changes themselves must be captured in the INRMP using the track changes function. A transmittal letter to the states and USFWS summarizing the changes should accompany the package, which will include the tracked changes version of the INRMP and the text, table, or matrix describing the proposed update.

A worksheet provided in Table S-2 identifies the mutually agreed upon schedule of events and responsible parties for each action of the streamlined review process and may be used to help facilitate the process. A matrix template, provided in Table S-3, may help facilitate identifying proposed changes in the INRMP update.

Table S-2. Mutual Department of Defense and U.S. Fish and Wildlife Service Streamlined Review of Integrated Natural Resources Management Plan Update Schedule Worksheet

Proposed Date/ Actual Date	Duration	Action[1]	Responsible Party
Proposed: Actual:	No less than 30 days prior to submitting the draft update for review.	Installation will advise the lead USFWS field office and appropriate state fish and wildlife agency of intent to prepare or revise the INRMP and concurrently request that the field office participate in the development or review for operation and effect of the INRMP.	Installation
Proposed: Actual:		Installation will submit the **draft update** to the appropriate state and USFWS offices. Submittal should include cover letter, text, table, or matrix identifying scope and location of changes, and draft INRMP utilizing the track changes function.	Installation
Proposed: Actual:	15 calendar days	USFWS staff will acknowledge receipt to the installation within 15 calendar days of receipt.	USFWS
Proposed: Actual:	30 -60 calendar days	USFWS field offices and states will provide comments (if any) on the draft update to the submitting installation within a maximum of 60 calendar days, but preferably within 30 days, of receipt, unless the affected parties agree to a longer timeline for review.	USFWS/State
Proposed: Actual:	60 calendar days	If either state or federal review of a draft INRMP cannot be completed in the timeframe described above, then the USFWS and/or state office will notify the DoD component or installation, and provide an alternate timeline for the INRMP update review. If the parties cannot agree to a review timeline, the field office and/or installation may contact the Regional Sikes Act Coordinator who may help the field office(s) complete its review. If USFWS and/or the states do not provide notification that an alternative timeline is needed within 60 days, the installation may, at its discretion, finalize the update.	USFWS/State
Proposed: Actual:		Installation shall submit a **final update** to the appropriate USFWS and state field offices, and to the Sikes Coordinator.	Installation
Proposed: Actual:	30 -60 calendar days	The states and USFWS field offices will respond and provide signature on the final update within a maximum of 60 calendar days, but preferably within 30 days, of receipt, unless the affected parties agree that a longer timeline for review is acceptable.	USFWS/State
		Once finalized, the updated INRMP will be considered reviewed for operation and effect, and will restart the 5-year window for being compliant.	Installation

[1]See Deputy Assistant Secretary of Defense Environment, Safety and Occupational Health Guidelines, July 2015 for greater detail.

Table S – 3. Mutual Department of Defense and U.S. Fish and Wildlife Service Streamlined Review of Integrated Natural Resources Management Plan Update Proposed Changes Matrix

INRMP Section	Camp Pendleton Lead	Scope/Purpose of Change	Agency Response	Commenter/ Agency

ENCLOSURE 1

GUIDELINES FOR STREAMLINED INRMP REVIEW

OFFICE OF THE ASSISTANT SECRETARY OF DEFENSE
3400 DEFENSE PENTAGON
WASHINGTON, DC 20301-3400

ENERGY,
INSTALLATIONS
AND ENVIRONMENT

JUL 20 2015

MEMORANDUM FOR DEPUTY ASSISTANT SECRETARY OF THE ARMY
(ENVIRONMENT, SAFETY AND OCCUPATIONAL HEALTH)
DEPUTY ASSISTANT SECRETARY OF THE NAVY
(ENVIRONMENT)
DEPUTY ASSISTANT SECRETARY OF THE AIR FORCE
(ENVIRONMENT, SAFETY AND INFRASTRUCTURE)

SUBJECT: Guidelines for Streamlined INRMP Review

I am forwarding the attached final *Guidelines for Streamlined INRMP Review* for your dissemination and use. Your representatives have provided valuable comments on earlier versions of this document.

These *Guidelines for Streamlined INRMP Review* are intended to clarify and describe the process for reviewing and concurring on updates to existing Integrated Natural Resource Management Plans (INRMPs), as described in the recent *Memorandum of Understanding between the U.S. Department of Defense and the U.S. Fish and Wildlife Service (USFWS) and the Association of Fish and Wildlife Agencies for a Cooperative Integrated Natural Resource Management Program on Military Installations* (Tripartite MOU, July 2013).

The USFWS finalized its own internal Guidelines on June 15, 2015. Their Guidelines also reflect this new streamlined process for review INMRP updates, as defined in the Tripartite MOU. DoD's new *Guidelines for Streamlined INRMP Review* do not apply to newly developed INRMPs or to INRMPs undergoing major changes (i.e., revisions). The new process established in the MOU and described and clarified in these Guidelines will:

- Facilitate faster review and approval of INRMPs requiring updates;
- Reduce the number of non-complaint INRMPs; and
- Improve coordination and collaboration among installation personnel and USFWS regional reviewers.

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Maureen Sullivan
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Environment, Safety and Occupational Health

Enclosures:
As stated

Mutual Department of Defense & U.S. Fish and Wildlife Service Guidelines for Streamlined Review of Integrated Natural Resources Management Plan Updates

PURPOSE: These *Guidelines for Streamlined Review* are intended to clarify and describe the process for reviewing and concurring on updates[1] to existing Integrated Natural Resource Management Plans (INRMPs), as described in the recent *Memorandum of Understanding between the U.S. Department of Defense (DoD) and the U.S. Fish and Wildlife Service (USFWS) and the Association of Fish and Wildlife Agencies for a Cooperative Integrated Natural Resource Management Program on Military Installations* (Tripartite MOU, July 2013). These Guidelines do not apply to newly developed INRMPs or to INRMPs undergoing major changes (i.e., revisions). Changes that are expected to result in significant biological differences from those identified in an existing INRMP typically require revision—rather than an update—of the INRMP as well as appropriate consideration under the National Environmental Policy Act (NEPA). These Guidelines will remain in effect until explicitly rescinded or superseded by mutual agreement of the signatories.

BACKGROUND: It is DoD policy to review INRMPs annually, and a statutory requirement to have INRMPs reviewed by the USFWS and the appropriate state fish and wildlife agency or agencies (hereafter "states") for operation and effect no less often than every five years. To more effectively respond and rapidly adapt to ongoing natural resource activities (e.g., monitoring, recreational fishing) and to changes that are administrative, process-oriented, or minor (e.g., expanding an existing trail, conducting biological surveys), the three partners (USFWS, DoD, and the states as represented by the Association of Fish and Wildlife Agencies) included a provision in the Tripartite MOU to streamline the review process for incorporating minor changes or "updates" to existing and approved INRMPs. INRMP updates are minor changes to an INRMP that do not result in new biophysical effects, do not change the management prescriptions set forth in the INRMP, and do not require analysis under the NEPA nor associated public review.[2] The use of updates is intended to reduce the workload for all involved agencies while maintaining both INRMP currency and mission flexibility.

FORMAT, COORDINATION, AND RESPONSIBILITIES

Format: When installations update an INRMP, the update should be clear and concise, and its format should match or be complementary to the INRMP. The update shall clearly describe the scope and location of all proposed changes in an accompanying text, table, or matrix format, and the changes themselves shall be captured in the INRMP using the track changes function. A transmittal letter to the states and USFWS summarizing the changes should accompany the package, which will include the track changes INRMP and the text, table, or matrix describing the proposed update. All proposed changes should be clear and easy to understand.

[1] See Appendix 1, page 5, for definitions.
[2] Sikes Tripartite MOU: http://denix.osd.mil/nr/upload/Sikes-Tripartite-MOU.pdf.

Coordination: Early coordination among the installation, states, and USFWS is essential to successful review and approval of INRMPs, Annual Reviews, Reviews for Operation and Effect, and INRMP updates. The installation will submit the draft update to the appropriate state and USFWS offices and, when needed, to the USFWS Regional Sikes Act Coordinator (Sikes Coordinator). Once finalized, the installation shall submit the final update to the states and to both the USFWS field office working with the installation and the Sikes Coordinator. The Sikes Coordinator will help marshal USFWS resources and coordinate with all parties when review timelines described below are in question or are unable to be met.[3]

Responsibilities: The assigned USFWS field office will coordinate review of the draft and/or final update with other USFWS programs or field offices (e.g., the Migratory Bird Program or Ecological Services Office) as appropriate. If requested to do so, the installation will provide copies of the update to other USFWS offices. If cross-program or multiple-office review of an update has occurred, the lead USFWS field office will specify any additional time needed to complete the expedited review and will, by the agreed-upon deadline, provide consolidated comments to the installation. When timing allows, INRMP update discussions should occur annually when metrics are discussed[4].

The existing/operational INRMP remains in effect while the update is under review. Once all parties agree to the requested changes, the designated states, USFWS, and DoD representatives will sign the update. The signed update will carry the full effect of the INRMP, and will be considered reviewed for operation and effect and approved as part of the compliant or operational INRMP. While not a signatory to the Tripartite MOU, when proposed changes affect resources managed by the National Oceanic and Atmospheric Administration (NOAA), NOAA will be included in the review process.

These guidelines need not apply to DoD components or installations that have already implemented a successful method for updating INRMPs with their USFWS field offices and state agencies.

DRAFT AND FINAL UPDATE REVIEW AND CONCURRENCE

1) Once the DoD component or installation determines that an INMRP update is appropriate, personnel will notify the USFWS and/or state offices with which they coordinate regarding their INRMP. This notification should be initiated by the DoD component or installation as soon as possible, and no less than 30 days prior to submitting the draft update for review.

2) The installation will submit a **draft update** to the appropriate state and USFWS field offices.

    a) The USFWS staff will review the draft update and respond to the installation within 15 calendar days of receipt.

[3] http://www.fws.gov/fisheries/sikes_act/documents/Regional_Sikes_Coordinators_and_Military_Liaisons.pdf See http://www.fws.gov/fisheries/whatwedo/sikes_act/index.html/Sikes for list of Regional Sikes Act coordinators.
[4] See DoDI 4715.03, Enclosure 5.

b) The USFWS field offices and states will provide comments (if any) on the draft update to the submitting installation a maximum of 60 calendar days, but preferably within 30 days, of receipt, unless the affected parties (i.e., the DoD component or installation and the states and/or USFWS offices) agree to a longer timeline for review.

c) If either state or federal review of a draft INRMP cannot be completed in the timeframe described above, then the USFWS and/or state office will notify the DoD component or installation, and provide an alternate timeline for the INRMP update review. If the parties cannot agree to a review timeline, the field office and/or installation may contact the Regional Sikes Act Coordinator who may help the field office(s) complete its review.

d) If there is disagreement concerning the conservation, protection, and management of fish and wildlife resources proposed in an INRMP update, all efforts will be made by the DoD component or installation, involved agencies, and Regional Sikes Act Coordinator to resolve those issues within the stated review timelines.

e) If USFWS and/or the states do not provide notification that an alternative timeline is needed within 60 days, the installation may, at its discretion, finalize the update.

3) Once complete, the installation shall submit a **final update** to the appropriate USFWS and state field offices, and to the Sikes Coordinator.

a) The states and USFWS field offices will respond and provide signature on the final update within a maximum of 60 calendar days, but preferably within 30 days, of receipt, unless the affected parties (i.e., the DoD component or installation and the states and/or USFWS offices) agree that a longer timeline for review is acceptable.

b) If the states and/or USFWS are unable to provide signature coordination within the applicable timelines, that agency will advise the DoD component or installation and the Regional Sikes Act Coordinator, explaining why the review and signature process cannot be completed within the designated timeframe, and offering an alternate date by which the review and signature can be completed. This notification will be given to the installation and the Regional Sikes Act Coordinator within 10 days of receipt of a final update. The Regional Sikes Act Coordinator will then coordinate with the states and the USFWS field office to ensure review and comment on the final update, discuss comments with the Regional Director, and prepare the Regional Director's response to DoD, if needed.

c) Once finalized, the updated INRMP will be considered reviewed for operation and effect, and will restart the five-year window for being compliant.

4) The USFWS field office will return the original concurrence letter or signature page to the DoD component or installation, and provide a copy of such (by mail, facsimile or electronic mail) to the Regional Sikes Act Coordinator and to the states.

APPENDIX 1: KEY DEFINITIONS

Compliant INRMP: An INRMP that has been both approved in writing, and reviewed, within the past five years, as to operation and effect, by authorized officials of DoD, USFWS, and each appropriate State fish and wildlife agency.

INRMP Revision: Any new natural resources management actions necessitated by changes to the military mission, the condition of the land, or the status of the species present and not previously considered by the parties to the INRMP when the plan was last approved and/or reviewed as to operation and effect. All such revisions require approval by all parties to the INRMP, and will usually call for a new or supplemental NEPA analysis.[5]

INRMP Transmittal Letter: A cover letter to an INRMP Update that summarizes changes to the compliant or operational INRMP.

INRMP Update: Any change to an INRMP that, if implemented, is not expected to result in consequences materially different from those in the existing INRMP and analyzed in an existing NEPA document. Such changes will not result in a significant environmental impact, and installations are not required to invite the public to review or to comment on the decision to continue implementing the updated INRMP.

Operational INRMP: The most recent version of an installation's INRMP that was reviewed for operation and effect. The USFWS will consider that INRMP currently being used to guide natural resource management on a given installation, irrespective of signature date, to be the operational equivalent of a compliant INRMP.

[5] At the request of the Military Services, this definition has been modified from the one developed in collaboration with USFWS. Modifications are intended to add clarity, and do not contradict the premise of the agreed upon definition.