Integrated Natural Resources Management Plan
Naval Air Weapons Station China Lake

Final
June 2014

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Naval Air Weapons Station
China Lake, California

Final
June 2014

Prepared for:

Naval Air Weapons Station China Lake, California
Environmental Management Division
Code OPDK
429 East Bowen Road Stop 4014
Point of Contact: Tom Campbell

Under Contract with:

Naval Facilities Engineering Command Southwest
1220 Pacific Highway
San Diego, California 92132-5190
Point of Contact: Robert Lovich

Contract No: N62473-06-D-2402, Delivery Order 0018

Prepared by:

Tierra Data, Inc.
10110 W. Lilac Road
Escondido, CA 92026
Point of Contact: Elizabeth M. Kellogg

INTEGRATED NATURAL RESOURCES MANAGEMENT PLAN
Naval Air Weapons Station China Lake, California

APPROVAL

This Integrated Natural Resources Management Plan (INRMP) fulfills the requirements for the INRMP in accordance with the Sikes Act (as amended), and DoDI 4715.03 and OPNAVINST 5090.1C CH-1. This document was prepared and reviewed in coordination with U.S. Department of the Interior, Fish and Wildlife Service, and California Department of Fish and Wildlife Central Region/Inland Deserts Region in accordance with the 2013 Memorandum of Understanding for a Cooperative Integrated Natural Resource Management Program on Military Installations.

For Plan Period: 2012–2032

Approving Official: U.S. Navy, Naval Air Weapons Station China Lake

Captain Dennis A. Lazar, U.S. Navy
Commanding Officer,
Naval Air Weapons Station China Lake
China Lake, California

Date

Approving Official: U.S. Navy, Naval Air Weapons Station China Lake

John O'Gara
Installation Environmental Program Director
Naval Air Weapons Station China Lake
China Lake, California

Date

Approving Official: U.S. Navy, Naval Facilities Engineering Command Southwest/ Commander, Navy Region Southwest

Doug Powers
Natural Resources Program Manager
Naval Facilities Engineering Command Southwest/
Commander, Navy Region Southwest
San Diego, California

Date

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Naval Air Weapons Station China Lake, California

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For Plan Period: 2012–2032

Concurring Agency:
U.S. Fish and Wildlife Service

Diane K. Noda
U.S. Fish and Wildlife Service
Ventura Fish and Wildlife Office
2493 Portola Road, Suite B
Ventura, California 93003

Date

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For Plan Period: 2012–2032

Concurring Agency:
California Department of Fish and Wildlife

Kimberly Nicole
Regional Manager, Region 6
California Department of Fish and Wildlife
3602 Inland Empire Boulevard, Suite C-220
Ontario, California 91764

Date

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Table of Contents

List of Figures

List of Maps

List of Tables

INRMP Cross-Walk to the U.S. Department of Defense Template

Office of the Under Secretary of Defense: Acquisition, Technology and Logistics Memorandum on the Integrated Natural Resources Management Plan Template, 14 August 2006.

DoD Template	NAWS China Lake Table of Contents
DoD Title Page	Title Page
DoD Signature Page	Signature Pages
DoD Table of Contents	Table of Contents
DoD 1 - Overview	1.0 Introduction and Overview
DoD 1.a - Purpose	1.1 Purpose and Scope
DoD 1.b - Scope	1.1 Purpose and Scope
DoD 1.c - Goals and Objectives	1.5 INRMP Vision, Goals and Objectives
DoD 1.d - Responsibilities	1.4.5 Roles and Responsibilities
DoD 1.d.1 - Installation Stakeholders	1.4.5.1 Installation Stakeholders
DoD 1.d.2 - External Stakeholders	1.4.5.2 External Stakeholders
DoD 1.e - Authority	1.2 Authority
DoD 1.f - Stewardship and Compliance Discussion	1.4.2 Mission Sustainability and the INRMP "No Net Loss" Requirement
DoD 1.g - Review and Revision Process	1.8 Annual Reviews and Revisions
DoD 1.h - Management Strategy	1.7 Management Approaches
DoD 1.i - Other Plan Integration	1.9 Integrating Other Plans 5.10 Integrating Other Internal Plans
DoD 2 - Current Conditions and Use	2.0 Land and Natural Resource Use at NAWS-CL
DoD 2.a - Installation Information	2.3 Current Operations and Activities 2.4 Other Land Uses
DoD 2.a.1 - General Description	1.4.3 Military Land Use Overview
DoD 2.a.2 - Regional Land Uses	2.1 Regional Land Use
DoD 2.a.3 - Abbreviated History and Pre-Military Land Use	2.2 Past Land Use
DoD 2.a.4 - Military Mission	1.4.2 Mission Sustainability and the INRMP "No Net Loss" Requirement 2.2.2 Military at NAWS-CL 2.3 Current Operations and Activities
DoD 2.a.5 - Operations and Activities	2.3 Current Operations and Activities
DoD 2.a.6 - Constraints Map	Map 5-2 Map 5-3
DoD 2.a.7 - Opportunities Map	Map 5-1
DoD 2.b - General Physical Environment and Ecosystems	3.1 Ecoregional Setting 3.2 Climate 3.3 Physical Conditions
DoD 2.c - General Biotic Environment	3.1 Ecoregional Setting 3.4 Vegetation Communities and Wildlife Habitat
DoD 2.c.1 - Threatened and Endangered Species and Species of Concern	3.5.8 Federally Listed Species Appendix J: Profiles of Management Focus Species
DoD 2.c.2 - Wetlands and Deep Water Habitats	3.3.5 Jurisdictional Waters of the U.S. and Wetlands
DoD 2.c.3 - Fauna	3.5 Plant, Fish and Wildlife Populations
DoD 2.c.4 - Flora	3.5 Plant, Fish and Wildlife Populations
DoD 3 - Environmental Management Strategy and Mission Sustainability	5.0 Sustainability and Compatible Use at NAWS-CL

DoD Template	NAWS China Lake Table of Contents
DoD 3.a - Supporting Sustainability of the Military Mission and the Natural Environment	5.1 Supporting Sustainability of the Military Mission in the Natural Environment
DoD 3.a.1 - Integrate Military Mission and Sustainable Land Use	5.1.1 Integrated Military Mission and Sustainable Land Use Decisions
DoD 3.a.2 - Define Impact to the Military Mission	5.1 Supporting Sustainability of the Military Mission in the Natural Environment
DoD 3.a.3 - Describe Relationship to Range Complex Management Plan or other operational area plans	2.3 Current Operations and Activities 5.1 Supporting Sustainability of the Military Mission in the Natural Environment 5.10 Integrating Other Internal Plans
DoD 3.b - Natural Resources Consultation Requirements	5.9 Natural Resources Consultation
DoD 3.c - NEPA Compliance	5.8 NEPA Compliance
DoD 3.d - Beneficial Partnerships and Collaborative Resource Planning	5.7 Beneficial Partnerships and Collaborative Planning
DoD 3.e - Public Access and Outreach	5.5.2 Public Access and Outreach
DoD 3.e.1 - Public Access and Outdoor Recreation	5.5 Outdoor (Wildlife-Oriented) Recreation and Environmental Awareness
DoD 3.e.2 - Public Outreach	5.5.2 Public Access and Outreach
DoD 3.f - Encroachment Partnering	5.1 Supporting Sustainability of the Military Mission in the Natural Environment 5.7 Beneficial Partnerships and Collaborative Planning
DoD 3.g - State Comprehensive Wildlife Plans	5.7 Beneficial Partnerships and Collaborative Planning
DoD 4 - Program Elements	4.0 Natural Resources Management Strategy and Prescriptions 5.0 Sustainability and Compatible Use at NAWS-CL
DoD 4.a - Threatened and Endangered Species management and species, benefit, Critical Habitat, and Species of Concern Management	3.5.8 Federally Listed Species 4.7.2 Special Status Plants 4.8.1 Threatened and Endangered Species Appendix O: Reporting on Benefits for Endangered Species and Critical Habitat Concerns
DoD 4.b - Wetlands and Deep Water Habitats Management	4.6.2 Wetland Habitats and Potential Jurisdictional Waters of the U.S.
DoD 4.c - Law Enforcement of Natural Resources Laws and Regulations	5.11 Law Enforcement
DoD 4.d - Fish and Wildlife Management	4.7 Plant, Fish, and Wildlife Populations
DoD 4.e - Forestry Management	4.5 Vegetation and Habitats
DoD 4.f - Vegetative Management	4.5 Vegetation and Habitats
DoD 4.g - Migratory Birds Management	4.7.6 Birds Appendix P: Reporting on Migratory Bird Management
DoD 4.h - Invasive Species Management	3.5 Plant, Fish and Wildlife Populations 4.7.3 Invasive Species
DoD 4.i - Pest Management	5.10.4 Integrated Pest Management Plan
DoD 4.j - Land Management	4.1 Managing with an Ecosystem Approach 4.2 Water Resources 4.3 Soil Resources 4.5 Vegetation and Habitats
DoD 4.k - Agricultural Outleasing	5.4 Management of Other Uses and Real Estate Outgrants
DoD 4.l - Geographical Information Systems Management, Data Integration, Access, and Reporting	5.12 Natural Resources Information Management and Reporting
DoD 4.m - Outdoor Recreation	5.5 Outdoor (Wildlife-Oriented) Recreation and Environmental Awareness
DoD 4.n - Bird Aircraft Strike Hazard	5.3.1 Bird/Wildlife Aircraft Strike Hazard Prevention
DoD 4.o - Wildland Fire Management	4.4 Wildland Fire Management
DoD 4.p - Training of Natural Resource Personnel	5.13 Training of Natural Resources Personnel

DoD Template	NAWS China Lake Table of Contents
DoD 4.q - Coastal / Marine Management	Not Applicable
DoD 4.r - Floodplains Management	4.2.3 Floodplains
DoD 4.s - Other Leases	5.4 Management of Other Uses and Real Estate Outgrants
DoD 5 - Implementation	6.0 Implementation Strategy
DoD 5.a - Summary of the Process of Preparing Prescriptions Driving Projects	6.1 Project Prescription Development and Priority Setting
DoD 5.b - Achieving No Net Loss	1.4.2 Mission Sustainability and the INRMP "No Net Loss" Requirement 6.3 Effectiveness of INRMP in Providing for "No Net Loss"
DoD 5.c - Use of Cooperative Agreements	6.4.5 Use of Cooperative Agreements
DoD 5.d - Funding	6.4 Funding Sources
Appendix 1 - List of Acronyms	Appendix A: Acronyms and Abbreviations
Appendix 2 - Detailed natural resources management prescriptions that drive the projects	4.0 Natural Resources Management Strategy and Prescriptions 5.0 Sustainability and Compatible Use at NAWS-CL
Appendix 3 - List of Projects	6.2 INRMP Project Summary, Schedule, and Implementation Tables
Appendix 4 - Surveys	3.0 Status of Natural Resources, Their Current Management and Management Issues Appendix R: Summary of Past Natural Resources Surveys
Appendix 5 - Research Requirements	Appendix Q: Research and Partnership Projects
Appendix 6 - Migratory Bird Management	Appendix P: Reporting on Migratory Bird Management
Appendix 7 - INRMP Benefits for Endangered Species	Appendix O: Reporting on Benefits for Endangered Species and Critical Habitat Concerns
Appendix 8 - Critical Habitat Issues	Appendix O: Reporting on Benefits for Endangered Species and Critical Habitat Concerns

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1.0 Introduction and Overview

1.1 Purpose and Scope

This Integrated Natural Resources Management Plan (INRMP)[1] provides Naval Air Weapons Station China Lake (NAWS-CL) with a long-term, viable framework for managing natural resources on lands it owns or controls. Required by the Sikes Act (as amended), an INRMP is the primary means by which natural resources compliance and stewardship priorities are set and funding requirements are determined for the U.S. Department of Defense (DoD). A commitment to implement priority projects, as funding permits, is provided with the signatures in the front of the INRMP.

The goals and objectives of the INRMP integrate regional ecosystem, military, social (community), and economic concerns. It establishes planning and management strategies; identifies natural resources constraints and opportunities; supports the resolution of land use conflicts; provides baseline descriptions of natural resources necessary for the development of conservation strategies and environmental assessment; serves as the principal information source for the preparation of future environmental documents for proposed NAWS-CL actions; and provides guidance for annual natural resources management reviews, internal compliance audits, and annual budget submittals.

The Sikes Act (as amended) stipulates that INRMPs provide for:

- Fish and wildlife management, land management, and forest management;
- Fish and wildlife habitat enhancement or modifications;
- Wetlands protection, enhancement, and restoration where necessary for support of fish, wildlife, or plants;
- Integration of and consistency among various activities conducted under the INRMP;
- Specific natural resources goals and objectives, and time frames for acting on them;
- Sustainable use by the public of natural resources to the extent that use is not inconsistent with the needs of the fish and wildlife resources;
- Public access that is necessary and appropriate for the use described above, subject to safety and military security requirements;
- Enforcement of natural resources laws and regulations;
- No net loss in the capability of military installation lands to support the military mission of the installation;
- Such other activities as the Secretary of the Navy determines appropriate;
- Conservation and rehabilitation of natural resources.

The DoD is required to ensure that ecosystem management is the basis for all management of DoD lands and waters (Office of the Under Secretary of Defense Memorandum of 08 August 1994, Implementation of

[1] Note that all acronyms and abbreviations are presented in Appendix A.

Ecosystem Management in the Department of Defense). Based on an ecosystem approach, the INRMP takes a large geographic view to ensure achievement of the overriding goal of protecting the properties and functions of natural ecosystems. Since ecosystem boundaries are rarely synonymous with property ownership, installations such as NAWS-CL are encouraged to form cooperative partnerships with nearby communities, as appropriate, and take part in public awareness initiatives in an effort to manage ecosystems more successfully. The Office of the Under Secretary of Defense Memorandum provides principles and guidelines for implementing ecosystem management on DoD lands. This is discussed further in Section 1.7.2, and in Chapters 4 and 5.

The INRMP replaces a previous INRMP completed for NAWS-CL (U.S. Department of the Navy [Navy] 2000a).

1.2 Authority

The Sikes Act (as amended) directs the DoD to take appropriate management actions necessary to protect and enhance land and water resources on all installations under its control. DoD Directive 4700.4 Natural Resources Management Program (DoD 1989) and DoD Instruction (DoDI) 4715.03 Natural Resources Conservation Program (DoD 2011) are implemented herein to establish fundamental land management policies and procedures for all military lands to preserve the military mission, while simultaneously protecting natural resources. The Naval Facilities Engineering Command (NAVFAC) Natural Resources Land Management Manual (NAVFAC MO-100.1) provides basic technical guidance for land management practices of all DoD land and water resources. Naval Operations Instruction (OPNAVINST) 5090.1C CH-1 Environmental and Natural Resources Program Manual, October 2007 Chapter 24 (Navy 2007), further sets forth program responsibilities and standards for complying with resource protection laws, regulations, and Executive Orders (EOs) to conserve and manage natural resources on Navy installations in the United States and its territories and possessions. Finally, the Chief of Naval Operations (CNO) INRMP Guidance for Navy Stations, How to Prepare, Implement, and Revise INRMPs (Navy 2006a), supplies guidelines on the process and procedure for developing an INRMP. Additional policy, regulations, and legislation regarding land management are contained in the remaining references listed in this chapter.

Since much of the land base at NAWS-CL is withdrawn for military use by Congress from the U.S. Department of the Interior (USDI) or Bureau of Land Management (BLM), the California Desert Protection Act (CDPA) of 1994 (Public Law [PL] 103-433 16 U.S. Code [USC] 410AAA et seq.) also applies. The CDPA combined all prior public land withdrawal legislative actions relating to NAWS-CL into one comprehensive instrument; re-authorized the Navy's continued use of public withdrawn lands for its Research, Development, Acquisition, Testing and Evaluation (RDAT&E) and training mission; and allowed the accommodation of compatible nonmilitary land uses subject to the approval of the NAWS-CL Commanding Officer (CO). The 1994 CDPA reauthorized the Navy's continued use of these withdrawn public lands for 20 years (The 1994 withdrawal of public lands for Navy use at NAWS-CL was due to expire after 20 years [in 2014], subject to potential renewal. Subsequent to the initial drafting of this EA, and pursuant to both the California Desert Protection Act of 1994 and a separate NEPA process, the Navy sought renewal of the 1994 withdrawal, and such renewed withdrawal of public lands for Navy use at NAWS-CL was approved for a further 25-year period [until 2039] with the signing of the National Defense Authorization Act for Fiscal Year 2014 on December 26, 2013.). The CDPA requires the development of a land use management plan for these withdrawn lands in accordance with the requirements of the Federal Land Policy and Management Act of 1976 (PL 94-579). Under provisions of the CDPA and through a Memorandum of Agreement, the USDI assigned management responsibility of these withdrawn lands to the Navy. See Appendix B for the Memorandum of Agreement Regarding Land Management Authority.

Organization of the INRMP contains all the elements of the DoD Template for INRMPs (DoD 2006). Since both DoD and Navy guidance (DoDI 4715.03, Navy 2006a, and OPNAVINST 5090.1C CH-1) are more comprehensive than that identified in the DoD Template, the outline has been re-worked so that additional material is added in the document to ensure compliance with all guidelines (Navy 2006a, 2007). A cross-walk between the DoD Template and the INRMP's contents is provided in the front of the INRMP.

The INRMP is covered under the National Environmental Policy Act (NEPA) by the Environmental Assessment (EA) appended to this document (Appendix C). The EA covers the INRMP as a planning document, and not specific project actions.

1.3 NAWS-CL Location and Real Estate Summary

Located in the Upper Mojave Desert of California, NAWS-CL is approximately 150 miles northeast of Los Angeles (Map 1-1). The Station is comprised of two large blocks of land: the North Range, portions of which are in Kern, Inyo, and San Bernardino Counties; and the South Range, which is entirely in San Bernardino County. The headquarters area, Mainsite, is located along the southern border of the North Range.

The city of Ridgecrest adjoins Mainsite. Other nearby communities are Inyokern, ten miles west of Mainsite, and Trona, 18 miles east of Mainsite. The primary north-south access is by way of State Route 14 and U.S. Highway 395 to the west. They provide access to and from Ridgecrest, as well as through-traffic inter-county connections and traffic to and from the Los Angeles region. Travel from southern California to the mountain recreation areas heavily uses both routes. State Route 178 is routed through the cities of Ridgecrest and Inyokern, providing east-west service using city streets (Inyokern Road, China Lake Boulevard, and Ridgecrest Boulevard).

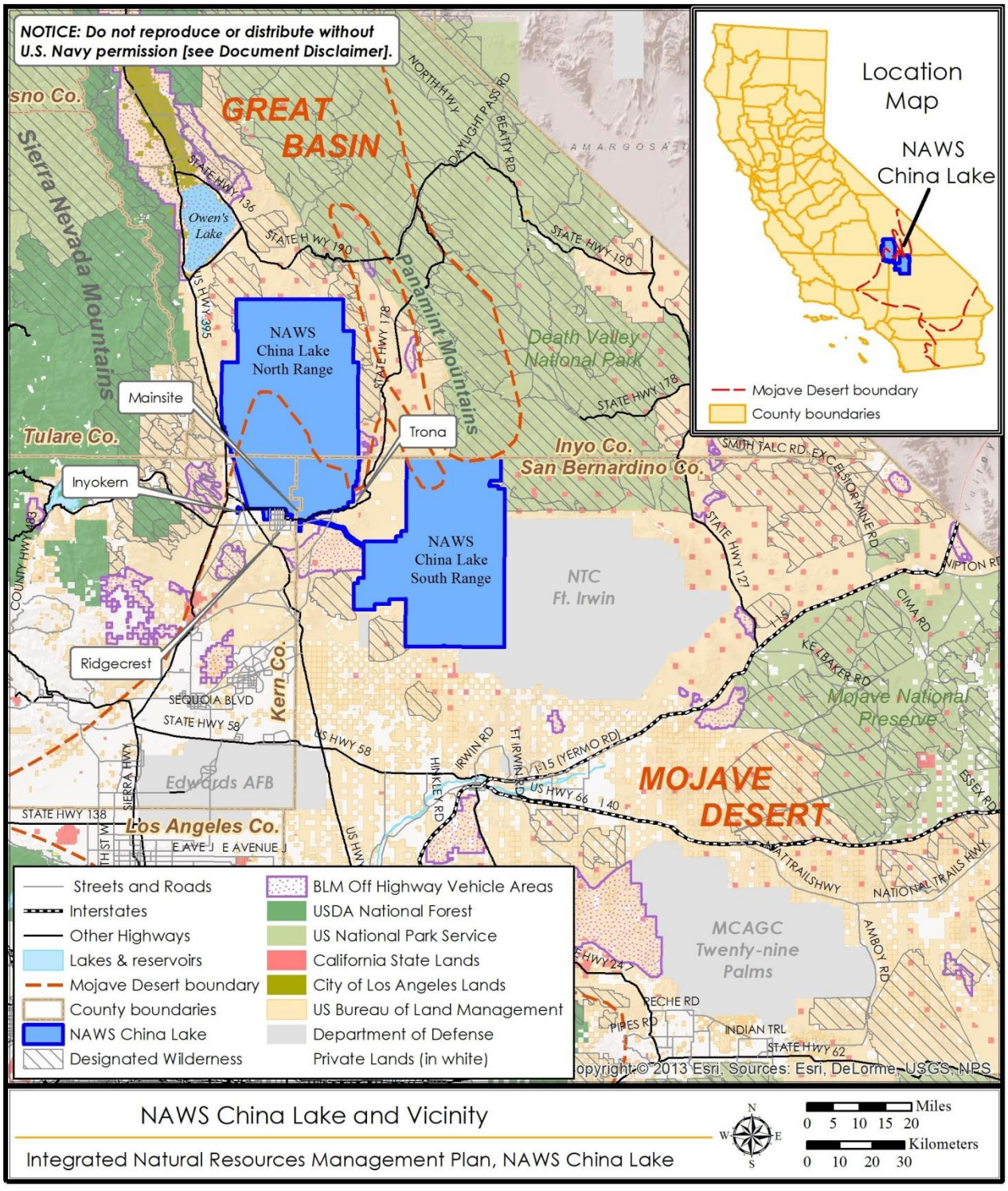
The Station covers 1,098,245.66 acres (1,716 square miles) of land based on the NAVFAC Real Estate Summary map (see Table 1-2). Of this, 98,567.54 acres are leased, and 74.96 acres are under easement. NAWS-CL is the Navy's largest land holding with more than 1.1 million acres, representing approximately 38% of the Navy's landholdings worldwide. The land assets are complemented by restricted military airspace of approximately 20,000 square miles, and extensive air and ground ranges. NAWS-CL includes a complex of laboratories and test-range facilities. See Map 1-2 for land acquisitions, and a summary of NAWS-CL land assets is shown in Table 1-1.

Table 1-1. A summary of Naval Air Weapons Station China Lake's land assets (Navy 2005; Bureau of Land Management 2005).[2]

Land Asset Type	Approximate Area (acres)
Fee Simple (owned by Navy)	86,479
Withdrawn from Public Domain (expiration 30 September 2014)	1,023,777
License/Permit/Agreement	54
Easement (purchase and/or condemnation)	16
In-Leased (from various sources)	117

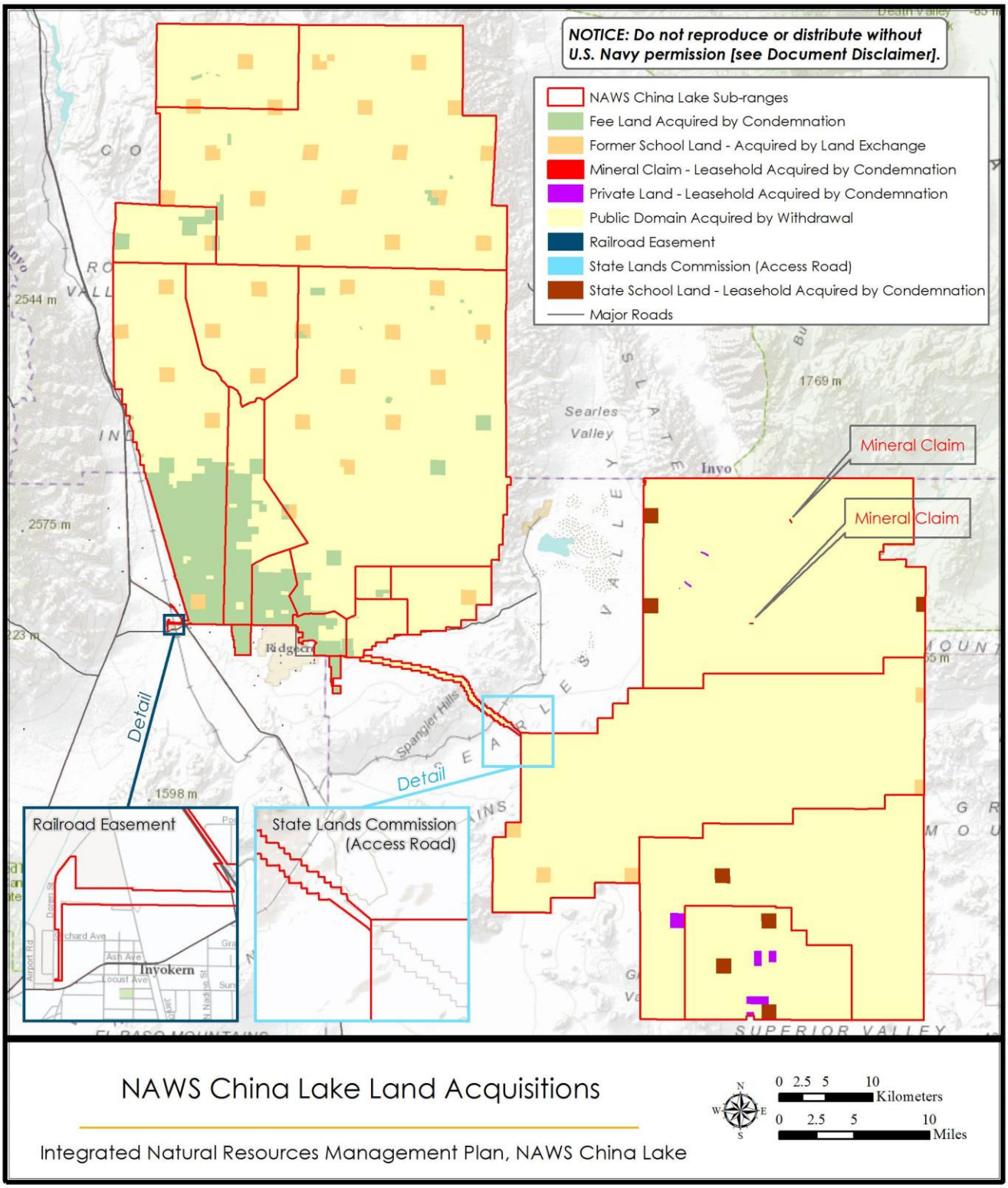
To acquire the land base of NAWS-CL, the federal government used public domain withdrawals, public land order partial revocations, public domain land exchanges, fee simple acquisitions, conveyance agreements, encroachment permits, revocable licenses and permits, leases, revocable permit agreements, easements and permits, right of way and site permits, encroachment permits, and easements.

[2] The Station covers 1,098,245.66 acres (1,716 square miles) of land, based on the NAVFAC Real Estate Summary map.



Map 1-1. The regional location of Naval Air Weapons Station China Lake.[3]

[3] All maps were compiled by Tierra Data Inc., except if noted, using data believed to be accurate at the time of publication. However, a degree of error is inherent in all maps. The maps are distributed "AS-IS," without warranties of any kind, either expressed or implied, including, but not limited to warranties of suitability to a particular purpose or use. No attempt has been made in either the design or production of the maps to define the limits or jurisdiction of any federal, state, or local government. The maps are intended for use only at the published scale. Detailed on-the-ground surveys and historical analyses of sites may differ from the maps.



Map 1-2. Naval Air Weapons Station China Lake land acquisitions based on Naval Facilities Engineering Command Real Estate Summary map.

Table 1-2. Real estate summary for Naval Air Weapons Station China Lake based on Naval Facilities Engineering Command Southwest Real Estate Summary map.

Contract No.	Contract Type	Agency	Contract	Description
N6871198RP08Q11	OG License	Indian Wells Valley Water District	30-Apr-03	Operate and maintain a waterline on Corridor Nocturn Road
N6871199RP09Q01	OG License	China Lake Museum Foundation	14-Nov-08	765 square foot office space and gift shop in Building 00500 SPSD N6247494RP00P27
N6871199RP09Q02	OG License	China Lake Mt Rescue Group	30-Nov-08	Approximately 1,325 square feet in Building 00080 for meetings and staging area for search and rescue group SPS 94RP00P25
N6871198RP08Q13	OG License	Indian Wells Valley TV Bo	31-Dec-08	To permit reception and rebroadcast of TV and FM signals to community of China Lake City Ridgecrest. Non-exclusive use of Building 01329 (B MT) and Building 50127 (LM)
N6871199RP09P45	OG License	The Alien Aviators	31-Jan-09	Non-exclusive use of site for flying model aircraft
N6871198RP08A12	IG Lease	Neil R. Arbegast & Dyrel Faulstick	31-Mar-09	Operation of a micro-earthquake monitoring system at Tunawee Ranch SPSD N62474RP00E15
N6871198RP08P78	OG License	China Lake Trap & Skeet Club	31-Mar-09	Use of skeet shooting club meetings and storage area. Non-exclusive use of Building 02650 and Building 91060 (91060 Not In NFADS)
N6871198RP08Q19	OG License	Sato Travel Inc.	30-Jun-09	375 square foot office space in Building 02481 to provide Joint Airlines Military Ticket off SPSDS 94RP00P67 (Rent Waived)
N6871199RP09Q03	OG License	Indian Wells Valley Search & Rescue	31-Aug-09	4,960 square foot training space, equipment storage and office space in Building 98004 for search and rescue efforts
N6871199RP09Q16	OG License	Indian Wells Valley Radio	31-Aug-09	Eight cubic feet in Building 50127 to install and operate an amateur digital radio transceiver and terminal node connector
N6871199RP09P63	OG License	Women, Infants & Children	31-Oct-09	Provide 490 square foot space within Family Service (Building 02308) Center for WIC activities
N6871199RP09P66	OG License	Embry-Riddle Aeronautical University	31-Oct-09	Provide 120 square foot space within Family Service Center (Building 02308) for office and classroom
N6871199RP09P70	OG License	Women's Center	31-Oct-09	Provide 225 square foot space within Family Service Center (Building 02308) for storage and general purpose
N6871199RP09P69	OG License	Laubach Literacy	31-Oct-09	Provide 238 square foot space within Family Service Center (Building 02308) for multi-subject tutoring and general purpose
N6871199RP09P67	OG License	Navy-Marine Corps Relief Society	31-Oct-09	Provide 1,022 square foot space within Family Service Center (Building 02308) for storage and general purpose
N6871100RP00P02	OG License	Trona Railway Company	31-Mar-10	Use of a portion of the Randsburg Wash Test Range SPS N6247495RP00P75
N6247485RP00P95	OG Easement	City of Ridgecrest	08-Apr-10	For the operation and maintenance of an existing ten-inch sewer pipeline
N6871100RP00P43	OG License	U.S. Department of Interior	30-Jun-10	Installation of 10 seismic stations to provide data SPSD N6247495RP00P52
N6871102RP02Q28	OG License	Boy Scouts of America	31-May-12	Non-exclusive use of Building 98033 (not in NGADS) for meetings, various craft projects and social activities
N6871102RP02Q30	OG License	Cerro Coso Community College	31-May-12	Use of Buildings 00465, 00947 and Facility 02499 (Golf Course) for science, technology and physical education classes SPSD N6247497RP00P92
N6247308RP00020	OG License	UNAVCO Plate Boundary Observatory	09-Dec-12	Use of property at Borehole Strainmeters Stations to monitor seismic activity
N6871102RP02Q37	OG AGMT	Verizon California	31-Dec-12	Use of 266 utility poles at no charge per pole SPSD N6247498RP00P13
N6247308RP00023	OG License	Desert Valley Vultures	14-Mar-13	Non-profit flying club to use existing model aviation field at Satellite Dry Lake
N6871103RP03P75	OG License	County of Kern	22-Mar-13	Maintenance of communication and ancillary equipment on Fm Hill SPSD N6871198RP08P91
N6247308RP00093	OG Lease	Altaone Federal Credit Union	30-May-13	Operation of an office building for a credit union (Rent Waived) SPSD N6247497RP00P83
N6871198RP08Q24	OG License	Wacom thrift shop/storage	30-Sep-13	2,835 square feet in Building 00054 and 540 square feet in Building 91064 for use of space for storage and distribution of domestic goods
N6871198RP08Q12	OG License	Inyokern Community Services District	30-Sep-13	To operate and maintain a booster pump and auxiliary waterline

Contract No.	Contract Type	Agency	Contract	Description
N6871199RP09P99	OG License	City of Ridgecrest	31-Oct-13	Use of Building 01329 (B MT) for installation and operation of a disaster preparedness radio network
N6247306RP06A05	IG AGMT	NASA Jet Propulsion Lab	20-Jun-16	Joint Use Agreement for use of telemetry receiving station and monitoring system at GDSCC
N6247307RP00006	IG Permit	U.S. Forest Services	31-Dec-16	Special use-sensor equipment, associated electronic communications equipment in the Mt. Whitney Ranger District SPSD N6247495RP00E32
N6247497RP00E14	IG AGMT	Bureau of Land Management	13-Jun-19	Right to use airspace over public land in the Counties of Kern and San Bernardino
N6871103RP03A13	IG Lease	U.S. Air Force	31-Dec-21	Use of Santa Ynez Optical Site Communication Site SPSD N6247495RP00E66 & N6247495RP00E67
NF(R)-32773	OG Easement	City of Ridgecrest	02-Jul-26	For a consolidated sewage treatment facility
N6247480RP00Q12	OG Easement	Caltrans	05-Aug-30	Installation, operation, and replacement of a park and ride commuter parking facilities
N6247482RP00R07	OG Easement	Continental Telephone	21-Sep-32	Construction, installation, and replacement of a telephone line
N6247306RP06P56	OG Lease	Sierra Sands Unified School District	31-Oct-33	Use of land by Murray Middle School, 921 East Inyokern Rd, Ridgecrest, CA SPSD Nf®-23460 (In-Kind Service $55,432.00)
N6247306RP06P57	OG Lease	Sierra Sands Unified School District	31-Oct-33	Use of land by Vieweg Elementary School, 348 Rowe St, Ridgecrest, Ca SPSD Nf®-23460 (In-Kind Service $39,572.00)
N6247306RP06P58	OG Lease	Sierra Sands Unified School District	31-Oct-33	Use of land by Richmond Elementary School, 1206 Kearsarge Ave, Ridgecrest, Ca SPSD Nf®-23460 (In-Kind Service $27,307.00)
N6247306RP06P55	OG Lease	Sierra Sands Unified School District	31-Oct-33	Use of land by Pierce Elementary School, 674 North Cold Canyon, Ridgecrest, Ca SPSD Nf® 23460 (In-Kind Service $36,004.00)
N6247306RP06P54	OG Lease	Sierra Sands Unified School District	31-Oct-33	Use of land by Burroughs High School, 500 French Ave, Ridgecrest, Ca SPSD Nf®-61115 (In-Kind Service $143,041.00)
N6247485RP00P56	OG Easement	Kerr-McGee Chemical Corp	05-Feb-35	Amendment for the installation of a cathodic protection system
N6247490RP00P11	OG Easement	Pacific Gas & Electric Co.	13-Dec-39	Construction, installation, and replacement of a gas main
N6247491RP00P04	OG Easement	So Cal Edison Co.	19-Oct-40	Construction, operation, and maintenance of a powerline
N6247491RP00P05	OG Easement	Contel of California	19-Oct-40	For the construction and installation of a telephone line
N6247493RP00P59	OG Easement	So Cal Edison Co.	10-Aug-43	Construction, installation, and replacement of a control-calectric 115
N6247494RP00P42	OG Easement	Pacific Gas & Electric Co.	09-Mar-44	Maintenance and repair of a gas regulator station and a power and telephone pole
N6247495RP00P01	OG Easement	Dept. of Transportation	11-Oct-44	Construction, maintenance, and replacement of a highway
N6247495RP00P03	OG Easement	Inyokern Community Services	19-Oct-44	Construction, maintenance, and replacement of a underground sewer line
N6247495RP00P19	OG Easement	City of Ridgecrest	17-Jan-45	Installation, operation, and replacement of a sewer line and drainage structure
N6247496RP00P11	OG Easement	So Cal Edison Co.	19-Nov-45	Installation, maintenance, and repair to relocate a 12 kV distribution line
N6247496RP00P09	OG Easement	Dept. of Transportation	20-Nov-45	Installation, operation repair, and replacement to widen State Route 178
N6247496RP00P10	OG Easement	Dept. of Transportation	20-Nov-45	Installation, maintenance and replacement for the expansion of a park and ride lot
N6247497RP00P41	OG Easement	Pacific Gas & Electric Co.	20-Dec-46	Installation, maintenance and repair of a gas pipeline
N6247497RP00Q11	OG Easement	So Cal Edison Co.	21-Jul-47	For the installation and maintenance of an electric substation
N6247497RP00Q10	OG Easement	City of Ridgecrest	21-Jul-47	For viewing school access roadway entrance
NOy(R)-46912	IG Permit	Trona Railway Company	31-Dec-99	For the use of a roadway across for installation of a fiber optic cable
NF(R)-7420	OG Easement	County of Kern	31-Dec-99	Quit claim deed for land to be used for parks, recreational education & other public purposes
NF(R)-1389	IG Permit	Dept. of the Interior	31-Dec-99	Use of a portion of Centennial Canyon Road
N6247498RP00P41	OG Easement	North American Chemical C	31-Dec-99	The Indian Wells Valley Water Pipeline on Navy fee lands (Quitclaim N6247498RP00E03 Is File In Folder)
N6871100RP00P49	OG Easement	GTE Network Services	31-Dec-99	Construct, operate, maintain a fiber optic cable on public land

Contract No.	Contract Type	Agency	Contract	Description
N6247497RP00Q27	OG AGMT	IMC Chemicals, Inc.	31-Dec-99	Right-of-Way grant -Incorporate an existing cathodic protection Q27- Q30 Same Folder
N6871199RP09P73	IG Permit	BLM	31-Dec-99	Operation and maintenance to terminate A Trident Safety
N6247480RP00A12	IG Easement	Mrs. Mary Ann Clodt	31-Dec-99	Easement for use of privately owned land in Kern County
N6247482RP00B11	IG Permit	BLM	31-Dec-99	For a communication site at Laurel Mountain
N6247482RP00P55	OG Easement	Dept. of Transportation	31-Dec-99	Construction, installation and replacement of a federal aid highway
N6247485RP00A12	IG Easement	So Cal Edison Co.	31-Dec-99	Installation of a fiber optic cable succeed easement and Permit NOy(R)-46914
N6247480RP00P57	OG Easement	Kerr-McGee Chemical Corp	31-Dec-99	Installation, operation and maintenance of two water storage tanks
N6247485RP00A02	IG AGMT	Kerr-McGee Chemical Corp	31-Dec-99	Operation and maintenance of a fiber optic cable
N6247491RP00P03	OG Easement	Dept. of Transportation	31-Dec-99	Construction, operation and maintenance of a road
N6247485RP00A24	IG Easement	Continental Telephone Co	31-Dec-99	Installation of a fiber optic cable succeed easement and Permit NOy(R)-46913
N6247480RP00P19	OG Easement	The Darwin Community Service	31-Dec-99	Construction and maintenance repair of a water pipeline
N6247484RP00V47	IG AGMT	Trona Railroad	31-Dec-99	For the connection of a railroad loading dock to the privately-owned
NOy(R)-46911	IG Permit	County of San Bernardino	31-Dec-99	For installation of a fiber optic cable

The 1,023,777 acres currently withdrawn from the public domain are operated under a Memorandum of Understanding with the BLM. This agreement is currently set to expire in 2014. NAWS-CL is in the draft stages of completing a Legislative Environmental Impact Statement (EIS) in order to continue the withdrawal of the lands from the public domain.

As of August 2012, the Station has granted 142 easements for access across portions of its land. Easements are granted for a variety of essential uses ranging from water pipelines and other utilities to the California Department of Transportation rights-of-way along State Highway 178. There is a Kerr-McGee pipeline that crosses the Station to Trona.

Facilities and infrastructure are located throughout North and South Ranges. Facilities occupy approximately 8,912 acres (1.5%) of the North Range and 527 acres (0.1%) of the South Range (Navy 2005).

1.4 Achieving INRMP Success

1.4.1 INRMP Implementation

Each DoD installation having custody of land and water suitable for the conservation and management of natural resources must prepare and implement a comprehensive INRMP that fulfills the requirements of the Sikes Act (as amended). All INRMPs will be prepared, revised, and implemented in accordance with DoD, Navy, and CNO policies and will address the Navy mission as well as the specific missions of those commands or tenants using the installation (Navy 2006a).

1.4.1.1 "Must Fund" Implementation

Formal adoption of an INRMP constitutes a commitment to seek funding and execute, subject to the availability of funding, all must fund projects and activities in accordance with specifics identified in the INRMP. Under the Sikes

Act (as amended), any natural resources management activity that is specifically addressed in the INRMP must be implemented (subject to availability of funds). Since the Sikes Act (as amended) requires implementation of the INRMP, there is a clear fiscal connection between INRMP preparation, revision, implementation and funding.

Each INRMP shall contain information needed to make appropriate decisions about natural resources management (DoDI 4715.03).

Must fund projects are defined and assessed based on four Navy Environmental Readiness Levels to enable capability-based programming and budgeting of environmental funding, and to facilitate capability versus cost trade-off decisions (see full Environmental Readiness Level 1-4 definitions in Chapter 6). Environmental Readiness Level 4 projects support all actions specifically required by law, regulation or EO (DoD Class I and II requirements) just in time (OPNAVINST 5090.1C CH-1).

1.4.1.2 Programming and Budgeting Priorities for Natural Resources Programs

Project rankings are assigned based on whether an activity complies with a statutory or other legal requirement. Alternatively, a project may be considered good land stewardship but is not considered an obligation for NAWS-CL to be found in compliance with environmental laws. Projects considered necessary to comply with the law are generally funded within budget constraints, whereas stewardship projects are ranked lower for funding consideration when projects are competed among multiple installations. Budget priorities, placed in this way, ensure a no net loss to the military mission by ensuring compliance and enhancing land management.

The budgeting plan for the INRMP is based on programming and budgeting priorities for conservation programs described in DoDI 4715.03. Funds will be requested for non-recurring tasks (actions) within the INRMP with priority given to current compliance, maintenance requirements and enhancement actions beyond compliance projects, in that order, based on this guidance. In this system of prioritization, compliance activities fall into the first two classes and stewardship activities fall into the third class. Accordingly, the projects recommended in the INRMP have been prioritized based on the criteria, as shown below. Funding is routinely programmed three years in advance of project implementation.

Current Compliance

1. Includes installation projects and activities to support:
    a. Installations currently out of compliance (e.g., received an enforcement action from an authorized federal or state agency or local authority).
    b. Signed compliance agreement or consent order.
    c. Meeting requirements with applicable federal or state laws, regulations, standards, EOs, or DoD policies.
    d. Immediate and essential maintenance of operational integrity or military mission sustainment.
2. 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 biological opinions, biological assessments, 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 the U.S. Fish and Wildlife Service (USFWS) or National Marine Fisheries Service.

e. Mitigation to meet existing regulatory permit conditions or written agreements, such as those required in the Biological Opinion for the Proposed Desert Tortoise Habitat Management Plan for the Naval Air Weapons Station China Lake, California (Appendix B).

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.

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, geographic information system mapping, and data management to comply with federal, state, and local regulations, EOs, and DoD policy.
3. Efforts undertaken in accordance with non-deadline specific compliance requirements of leadership initiatives.
4. Wetlands enhancement to minimize wetlands loss and enhance existing degraded wetlands.

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.

The various project ranking scenarios are described further in Chapter 6.

1.4.1.3 Anti-Deficiency Act

The Navy and NAWS-CL will work to implement recommendations in the INRMP within the framework of regulatory compliance, national Navy mission obligations, anti-terrorism and force protection limitations, and funding constraints. All actions contemplated in the INRMP are subject to the availability of funds properly authorized and appropriated under federal law. Nothing in the INRMP is intended to be, nor must be, construed to be a violation of the Anti-Deficiency Act (31 USC 1341 et seq.).

1.4.2 Mission Sustainability and the INRMP "No Net Loss" Requirement

The mission of NAWS-CL is to provide the highest quality facilities, products and services to the Navy aviation air weapons RDAT&E and training communities to meet current and evolving Navy and related DoD mission requirements (Navy 2005).

NAWS-CL is part of Navy Region Southwest, San Diego, under Commander, Navy Installations Command (CNIC) and is the host for Naval Air Warfare Center Weapons Division (NAWCWD) under the Naval Air Systems Command, along with other assigned tenants, activities and transient units. Testing and training functions performed on-Station include munitions delivery, tactics, electronic warfare, and Special Forces training. NAWS-CL operates and maintains the Station's facilities and provides support services, including airfields, and is responsible for managing all lands within the Station boundaries to support the mission of NAWCWD and other activities, maintaining environmental compliance, exercising responsible stewardship of public lands, providing safety and security services, and implementing the Navy's Air Installation Compatible Use Zone (AICUZ) program.

The Master Plan for NAWS-CL is currently being updated with an expected completion date of January 2014. The Master plan will update the current Airfield and Mainsite plans and combine the two into one document.

Under the Sikes Act (as amended), NAWS-CL must ensure that there is no net loss to the military mission from the implementation of the INRMP. To do this, the link between land use and the mission of supporting weapons research development, testing, evaluation, acquisition, and training needs to be identified and broken down into component parts, as well as the missions of tenant users.

How this is achieved specifically at NAWS-CL is described by description of military requirements in Chapter 2, and a strategy to sustain them in Chapter 5 (Section 5.1).

Each INRMP shall ensure no net loss to training and the testing capability and capacity of the installation and range and enhance those capabilities to the maximum extent practicable (DoDI 4715.03).

NAWS-CL and the Commander, Navy Region Southwest have a signed memorandum of agreement that describes the environmental duties and responsibilities of NAWCWD and their respective staff and personnel at NAWS-CL (Commander, Navy Region Southwest and NAWCWD 2010). The agreement discusses all environmental requirements for compliance by position at NAWS-CL. Many mission requirements are compatible with the Memorandum of Agreement's natural resources conservation, such as the need to establish safety and security buffers between Navy assets and other land uses. The large requirement for uninhabited open airspace required by the RDAT&E mission has allowed for sustainability, and precluded many potential conflicts between operational requirements and sensitive natural resources. Many of the land uses at NAWS-CL are not land-intensive. Existing test sites are routinely re-used and new tests often take advantage of existing instrumentation and infrastructure. The majority of high value natural resource areas are in locations not intensively used for ground-disturbing military activities.

Sustainability of NAWS-CL lands has five components: access to land as a military asset for use, soil and water resource protection, ecological integrity, cultural resource protection and security, and safety for current and future use.

Access to Land and Air Space. NAWS-CL land supports the mission with:

- Availability of sufficient space to test and evaluate weapons systems.

- Availability of infrastructure to support safe and secure weapons development, flight-testing, handling, and storage.
- Capability to support essential activity tempo and intensity to attain sufficient readiness to deploy under surge (high tempo) conditions.
- Capability to successfully coordinate environmental compliance, safety, and security requirements.

Soil and Water Resources Protection. Conservation of soil and water resources will allow disturbed ecosystems to more fully recover from disturbance and sustain the ability of undisturbed landscapes to maintain natural plant and animal communities. Soil surface stabilization is needed to minimize erosion, and maximize opportunities for soils to self-stabilize after disturbance. Water supply, natural hydrologic processes, and water quality are essential to all ecological functions, including recoverability from disturbance. Managing for sustainability means preventing damage that will eliminate an area from use for the foreseeable future, or for which restoration or mitigation is excessively costly. The threshold beyond which an area loses its capability to sustain military use and its stable natural condition is loosely termed the carrying capacity.

Ecological Integrity. Compliance under the Sikes Act (as amended) for mission sustainability (no net loss) is also defined in this Plan to include the ecological integrity of NAWS-CL lands, since this integrity will carry these lands into the long-term future with all the elements that allow self-recovery to remain intact. Routine monitoring of use of management focus (indicator) species (designated as NAWS-CL Special Status Species in the INRMP) along with physical or biological disturbance indicators can be used to track ecosystem health. A long-term monitoring program which tracks ecological integrity, soil and water status, and military use sustainability will allow the Navy to be responsive and adaptive in management approach and to respond to management and regulatory challenges in a timely and science-based manner.

Cultural Resources Protection. Long-term strategies include cultural resources surveys of areas that are not targeted for immediate use. Under Section 110 of the National Historic Preservation Act, federal land managers are directed to inventory cultural resources on lands under their control even when no activity or undertaking is planned. Such investigations aid in long-term planning and also contribute to the archaeological context that is developed to evaluate resources.

Security and Safety for Current and Future Use. Ability to keep the range clean of hazardous material and unexploded ordnance aids in assuring the safety of the range, not just for current training purposes, but potentially for an alternate future use. Maintenance of safety and security measures requires:

- Facilities for handling and storing ordnance safely, sea, land, and airspace to support the weapons testing mission.
- Security clear zones, including cooperation from neighboring landowners.
- Ability to secure water supply in emergencies.
- Control of encroachment from outside the fence line.
- Compliance with anti-terrorism force protection standards for construction which include landscaping described in DoDI 2000.16 DoD Antiterrorism Standards (14 June 2001).

1.4.3 Military Land Use Overview

Detailed descriptions of the military mission and use of the land and airspace is provided in Chapter 2. The NAWS-CL Ranges were established during World War II to test newly developed rockets and to train pilots in

the use of these weapons. Current Research and Development operations occur within the laboratories, while Testing and Evaluation (T&E) operations typically take place within the air and ground ranges. These ranges include the special-purpose ranges, such as the Junction Ranch Radar Cross Section facility and the Supersonic Naval Ordnance Research Track facility. Aircraft operations are staged from Armitage Airfield. The type and tempo of RDAT&E activities varies, depending on program demands and world events.

Security

Access to remote range areas is tightly controlled to reduce exposure to hazardous conditions and operations. Personnel required to access the ranges are logged in and out and closely controlled by the designated range control authority. Road blocks, barricades, locked gates, and guards are also used to prevent entry into areas with imminent hazards. Roving patrols regularly check remote areas for signs of unauthorized entry.

Airspace

NAWS-CL has over 20,000 square miles of restricted-use airspace. The Airspace Management Office is responsible for the preservation and enhancement of the airspace asset. In accordance with the Federal Aviation Act of 1958, the Federal Aviation Authority has total management authority and responsibility for all U.S. airspace. NAWS-CL has four assigned restricted air space designations (R-2505, R-2524, R-2506, and R-2508). R-2508 is shared with four other military installations in the region (see Map 2-5).

1.4.4 Relationship to Operational Area Plans

The INRMP integrates the principal objectives and guidelines from several key plans covering operational areas (areas where military operations take place), and establishes a unified approach to natural resources management. NAWS-CL has developed an EIS for Proposed Military Operational Increases and Implementation of Associated Comprehensive Land Use and Integrated Natural Resources Management Plans, completed in 2004. A Comprehensive Land Use Management Plan (CLUMP) was developed in 2005, and an AICUZ Study in 2011. This study led to the development of a Supplemental Noise Study in August 2009, which more accurately identified airfield operational profiles and subsequent noise analysis.

According to the 2005 CLUMP, NAWS-CL has established the following goals for managing public lands under its jurisdiction:

1. Maintain and enhance core RDAT&E, training, and mission-support capabilities;
2. Improve the efficiency of land use management practices to accommodate the ongoing and evolving military RDAT&E, training and support mission;
3. Ensure compliance with statutes and regulations to protect sensitive natural and cultural resources;
4. Ensure public health and safety by maintaining a secure military operating environment on NAWS-CL administered lands;
5. Maintain and enhance coordination and cooperation with neighboring communities, agencies, and organizations to ensure compatibility of off-station land uses with the Navy's mission;
6. Provide reasonable accommodation of compatible nonmilitary land uses to the extent practicable.

Other key documents include the following:

1. The NAWCWD China Lake Range Management Plan (RMP) (1996) describes the military T&E mission and land ranges at the NAWS-CL and the various types of military operations, land use, and available support assets employed throughout the ranges. The RMP also discusses test and environmental planning processes and the strategic objectives for continuing military T&E operations at NAWS-CL (Navy 1996).
2. The Final AICUZ Study (2011) provides enhanced management strategies for compatible land use development in the vicinity of NAWS-CL and the prevention of potential encroachment issues. The study offers recommendations and planning tools that can be applied by local agencies (e.g., Kern County and the City of Ridgecrest) to promote compatible land use development before encroachment becomes a serious problem at NAWS-CL. The AICUZ Study also examines various airfield planning parameters related to aircraft operations, noise and aircraft safety, and provides an analysis of land use compatibility in both on- and off-Station properties (Navy 2011).
3. The EIS/Legislative EIS (2013) for the land withdrawal of 1,030,000 acres of land from the BLM to the Navy. This document provides environmental analysis informing the decisions regarding the re-authorization of the BLM land for military use. Reviewed in the document are the current and projected needs for future military use and the consideration of limited nonmilitary uses that are compatible with military RDAT&E and training (Navy 2013).
4. The CDPA of 1994 (PL l03-433) requires the Navy to develop a plan for management of withdrawn lands at NAWS-CL. NAWS-CL developed a CLUMP, finalized in 2005, to meet this requirement, using natural resources management information from the 2000 INRMP.
5. The Federal Land Policy and Management Act of 1976 (PL 94-579) defines the planning approach and strategy for public lands, such as those withdrawn at China Lake (BLM 2001). The CLUMP (Navy 2005) is the overall land use plan for NAWS-CL; however, the INRMP also uses planning principles in Section 202(c) of the Federal Land Policy and Management Act.

1.4.5 Roles and Responsibilities

The CNO serves as the overall Navy program manager and advisor for the Navy in matters related to natural resources management, including but not limited to the development, revision, and implementation of the INRMP and associated documentation. The CNO approves all INRMP projects prior to submittal to regulatory agencies for signature (Navy 2006a).

The CNIC reviews the entire INRMP. Their role is to ensure that installations comply with DoD, Navy, and CNO policy on INRMPs and their associated NEPA documentation. They also ensure the programming of resources necessary to maintain and implement INRMPs, participate in the development and revision of INRMPs, and provide overall program management oversight for all natural resources program elements. CNIC reviews and endorses projects recommended for INRMP implementation prior, to submittal for signature, and evaluates and validates Environmental Program Requirements web project proposals (Navy 2006a).

Regional Commanders (e.g., Commander, Navy Region Southwest) under CNIC, ensure that installations comply with DoD, Navy, and CNO policy on INRMPs and their associated NEPA documentation. They ensure that installations under their control undergo annual reviews and formal five-year evaluations. They ensure the programming of resources necessary to maintain and implement INRMPs, which involves the evaluation and validation of Environmental Program Requirements web-based project proposals and the funding of installation natural resources management staff. Navy Region Southwest maintains close liaison with the INRMP signatory partners (USFWS, and California Department of Fish and Wildlife [CDFW]) and other INRMP stakeholders. They provide endorsement of the INRMP through the Regional Commander's signature (Navy 2006a). Additionally the Regional Commander is responsible for review of the INRMP's operational effect. INRMPs are

to be reviewed "as to operation and effect" by the primary parties "on a regular basis, but not less often than every five years" (Section 101(b)(2) of the Sikes Act) (as amended). The review is intended to ensure that the INRMP continues to meet the requirements of the Act, and contributes to the conservation and rehabilitation of natural resources. This review process is further detailed in Section 6.5.1.

The Installation CO ensures the preparation, completion, and implementation of the INRMP and associated NEPA documentation. Their role is to: act as stewards of natural resources under their jurisdiction and integrate natural resources requirements into the day-to-day decision-making process; ensure natural resources management and INRMPs comply with all natural resources related federal regulations, directives, instructions, and policies; involve appropriate tenant, operational, training, or Research and Development commands in the INRMP review process to ensure no net loss of military mission; designate a Natural Resources Manager/Coordinator responsible for the management efforts related to the preparation, revision, implementation, and funding for INRMPs, as well as coordination with subordinate commands and installations; involve appropriate Navy Judge Advocate General or Office of the General Counsel legal counsel to provide advice and counsel with respect to legal matters related to natural resources management and INRMPs; and endorse INRMPs via CO signature.

Figure 1-1 depicts the organizational structure of NAWS-CL. Many responsibilities of the CO, with respect to the day-to-day responsibilities of natural resources management are delegated to the internal stakeholders described below at NAWS-CL.

1.4.5.1 Installation Stakeholders

The internal stakeholders are the Navy departments and tenants supporting the NAWS-CL mission previously identified above.

Environmental Management Division

The Environmental Management Division (EMD) is responsible for management of natural resources at NAWS-CL, as designated by the NAWS-CL CO using an official letter of designation. The EMD, acting through its Natural Resources Manager, is responsible for preparation and implementation of the INRMP. See Appendix D for the Natural Resources Manager letter of designation.

Public Works Department

The Asset Management group within the Public Works Department is responsible for the comprehensive oversight and planning of all land use issues relating to NAWCWD China Lake, as designated by the NAWS-CL CO, using an official letter of designation.

Office of Legal Counsel

The Office of Legal Counsel provides legal services to host and tenant commands at NAWS-CL on a variety of environmental matters. Particularly pertinent to natural resources management are review of NEPA documentation, contract specification review, and legal interpretations involving compliance with natural resources laws.

Public Affairs Office

The Public Affairs Office is directly involved in aspects of the environmental program involving public use of lands at NAWS-CL. These include petroglyph tours, Christmas bird counts, public involvement with the NEPA process, and similar activities. The Weapons Division Public Affairs Office shares this responsibility and duties.

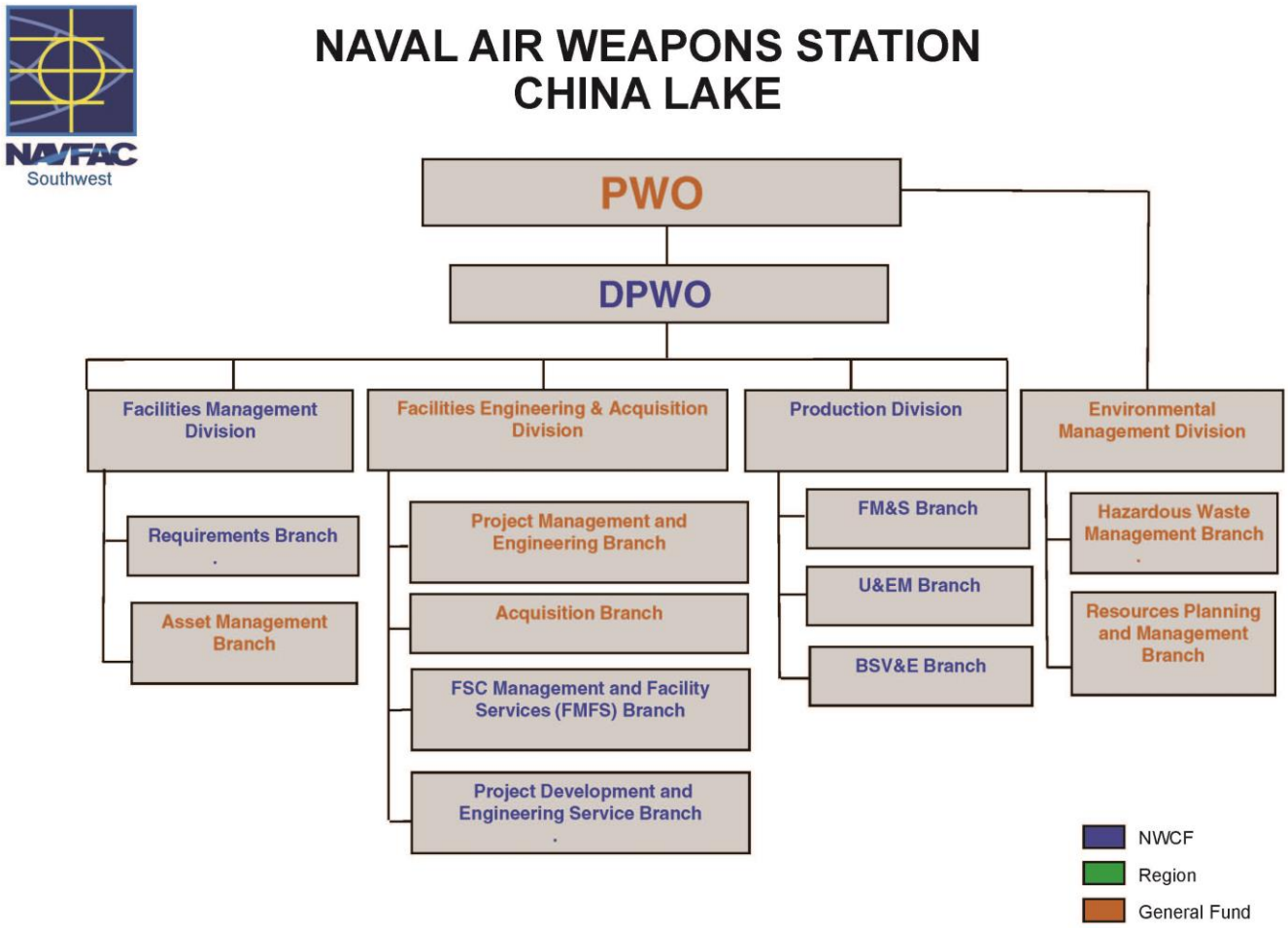


Figure 1-1. Naval Air Weapons Station China Lake organizational chart.

Pacific Ranges and Facilities Department

Pacific Ranges and Facilities Department is responsible for accomplishment of the military mission at NAWS-CL. As such, the Pacific Ranges and Facilities Department and NAWS-CL land and natural resources managers must coordinate to minimize conflicts between mission requirements and stewardship/compliance of natural resources. The Range Sustainability Office is a stakeholder under the Pacific Ranges and Facilities Department. Range Sustainability Office duties include encroachment and environmental issues related to RDAT&E.

Propulsion Laboratories

The Propulsion Laboratories Complex, made up of the China Lake Propulsion Laboratory and the Salt Wells Propulsion Laboratory, is located in the southeastern corner of the North Range. Propulsion Laboratory environmental personnel and natural resources managers at NAWS-CL coordinate to minimize conflicts between mission requirements and stewardship/compliance aspects of natural resources management.

Naval Facilities Engineering Command Southwest

NAVFAC Southwest provides technical support and contractual oversight in the development, revision, and implementation of the INRMP. In addition, NAVFAC Southwest is responsible for providing support for natural

resources management when requested. NAVFAC Southwest personnel, such as the NEPA and INRMP coordinators, have natural resources programming and/or technical support roles in developing the INRMP.

1.4.5.2 External Stakeholders

The INRMP planning process enables the Navy to address issues and concerns of its partner agencies and the public. External stakeholders can be (Navy 2006a): government agencies; tribal interest groups; lessees; environmental and conservation groups involved in local conservation activities; recreational groups; neighboring land owners; local government planning groups; scientists with expertise relevant to installation ecosystems; or other organizations who are impacted by and have some vested interest in the natural resources found on NAWS-CL.

INRMPs are to be developed in cooperation and concurrence with federal (USFWS) and state (CDFW) wildlife agencies. Signatures on the document reflect mutual agreement. The USFWS is a cooperative partner in the endangered species program at the NAWS-CL and is a signatory participant in approving the INRMP in accordance with the Sikes Act (as amended). Additional informal or formal consultations will be required for project proposals that may affect listed species.

Tripartite Agreement. The USFWS and CDFW have a statutory obligation to review and coordinate on INRMPs. Recognizing this key, three-way partnership in preparing, reviewing, and implementing INRMPs among the DoD, USDI, USFWS, and state fish and wildlife agencies, a Tripartite Agreement was signed in July 2013 (DoD et al. 2013). The CDFW and other state fish and wildlife agencies were represented by the International Association of Fish and Wildlife Agencies. The desire is for "synchronization of INRMPs with existing Fish and Wildlife Service and State natural resource management plans" and "mutually agreed-upon fish and wildlife service conservation objectives to satisfy the goals of the Sikes Act (as amended)" (see Appendix B).

The National Defense Authorization Act for Fiscal Year 2004 changed the Endangered Species Act regarding INRMPs, which were justified on the basis of the need to promote military readiness while protecting listed species. Under new Section 4(a)(3)(B)(i) of the Endangered Species Act, the Secretary of the Interior or Secretary of Commerce, as appropriate, is precluded from designating Critical Habitat on any areas owned, controlled, or designated for use by DoD where an INRMP has been developed that, as determined by the Interior or Commerce Secretary, provides a benefit to the species for which Critical Habitat designation is proposed. Because this rule was created after the listing of the Inyo California Towhee (*Pipilo crissalis eremophilus*) and the Mohave Desert Tortoise (*Gopherus agassizii*), both species have designated Critical Habitat at NAWS-CL (USFWS 2010, 2013).

Bureau of Land Management

Land at NAWS-CL that is withdrawn from the public domain is administered by the BLM. Per provisions within the CDPA, the USDI assigned management responsibility to the Navy via a Memorandum of Agreement (USDI-Navy 1996). See Appendix B for all memoranda of agreement between these two agencies regarding management of NAWS-CL land. The Navy conducts wild horse and burro gathers with the assistance of the BLM. The BLM currently manages the Wild Horse and Burro Adoption Program for horses and burros gathered from NAWS-CL lands. The BLM reviews land management actions that involve external parties, including the INRMP.

U.S. Fish and Wildlife Service

The USFWS is a signatory cooperator in implementation of the INRMP, in accordance with the Sikes Act (as amended). Due to this signatory responsibility, the USFWS is an external stakeholder at NAWS-CL. The USFWS is also a cooperative partner in the endangered species program at NAWS-CL (see Appendix B).

The USFWS has provided financial support for Mohave tui chub (*Siphateles bicolor mohavensis*) management, mark/recapture monitoring, and habitat enhancement work. In 2010, a Cooperative Management Agreement between the BLM, NAWS-CL, CDFW, and the USFWS was entered into to provide for long-term conservation efforts to the towhee, up to and subsequent to any state or federal delisting (USFWS 2010). Finally, the EMD works with the USFWS, CDFW, and other partners on conservation of the Mohave ground squirrel (*Spermophilus mohavensis*), a California threatened species.

California Department of Fish and Wildlife

The CDFW is responsible for managing most fish and wildlife within the State, including those on federal lands. The CDFW is an external stakeholder under the Sikes Act (as amended). This agency assists with Mohave tui chub management, including the chub habitat enhancement program. The CDFW also transplanted bighorn sheep (*Ovis canadensis*) onto NAWS-CL in 1983 and 1987, and installed numerous guzzlers for gallinaceous birds on-Station in the past. The CDFW coordinates the transplant program for Mountain Quail (*Oreortyx pictus*) and Chukar (*Alectoris chukar*) from NAWS-CL to the Nevada Division of Wildlife, the state of California, and other western states. The CDFW does not have authority to regulate hunting programs on federal military installations, but can play an advisory role, and has done so with respect to the Chukar hunting program on-Station.

National Park Service

With the expansion of Death Valley National Park, the National Park Service is an immediate neighbor of China Lake, sharing the northern border of the South Range. The National Park Service and NAWS-CL have collaborated in areas of mutual interest leading to management partnerships, such as the coordination of burro (*Equus asinus*) removal. The outcome of burro removal programs on NAWS-CL and Death Valley is dependent on removal success for both land parcels as well as that of adjacent BLM land.

California State Department of Public Health

NAWS-CL manages its own groundwater resources and is a signatory to the Indian Wells Valley Cooperative Groundwater Management Plan. The California State Department of Public Health is the regulatory agency that provides oversight to the Safe Drinking Water Act requirements, and therefore, is included as an external stakeholder for NAWS-CL.

California Department of Toxic Substance Control

The California Department of Toxic Substance Control has an interest in the NAWS-CL Installation Restoration Program, supported by the natural resources program. Some Installation Restoration sites were investigated due to their proximity to Mohave tui chub habitat. Some of these sites occur in Mohave Desert Tortoise habitat or in areas with Burrowing Owls (*Athene cunicularia*).

Kern County Water Agency

The Kern County Water Agency monitors over 200 groundwater wells on a semi-annual basis in the Indian Wells Valley.

City of Ridgecrest

The Station works with the City of Ridgecrest to ensure that its wastewater treatment operations have no adverse effects to the adjacent Mohave tui chub habitat. The sewage ponds are leased by the City. The City manages the plant and controls the ponds.

Desert Managers Group

DoD installations in the Mojave Desert have formed an Interagency Desert Environmental Resource Managers group to coordinate and discuss mutual land use issues. Team installations include: NAWS-CL, National Training Center Fort Irwin, Edwards Air Force Base, Marine Corps Air-Ground Combat Center Twentynine Palms, and Marine Corps Logistics Base Barstow. Particular interests involve ecosystem management of the Mojave Desert evidenced by the development of the Desert Tortoise Recovery Plan, Inyo California Towhee Recovery Plan, Mohave Tui Chub Recovery Plan, California Desert Conservation Area Plan, West Mojave Coordinated Management Plan, Northern and Eastern Mojave Planning Effort, and the Mojave Desert Ecosystem Program.

External Stakeholder Partnerships

External Stakeholder Partnerships are cooperative agreements between NAWS-CL and its external stakeholders. These agreements are constructed to benefit the natural resources at NAWS-CL and the broader resources of the region.

University Cooperative Agreements and Other Research Programs

Natural resources management benefits greatly from the work of local universities that are granted access to study NAWS-CL natural resources. Data from their work becomes part of the baseline condition understanding. The University of California Riverside (invertebrate surveys), University of California Davis (vole genetic studies), and University of California Berkeley (reptile surveys) are examples. In addition, the EMD hosts work of the DoD Legacy and Strategic Environmental Research and Development programs.

1.5 INRMP Vision, Goals and Objectives

Navy guidance describes the purpose for all INRMPs (OPNAVINST 5090.1C CH-1): "The INRMP is a long term planning document to guide the installation commander in the management of natural resources to support the installation mission, while protecting and enhancing installation resources for multiple use, sustainable yield, and biological integrity. The primary purpose of the INRMP is to ensure that natural resources conservation measures and military operations on the installation are integrated and consistent with stewardship and legal requirements."

The vision for the INRMP is to ensure the continued ability of NAWS-CL to support its current and evolving mission requirements while conserving its natural resources, by applying the principles of ecosystem management, adaptive management and cooperative management in an integrated approach. The INRMP protects the health and condition of natural resources that are dedicated to the support of national security, and maintains the long-term viability of the Navy mission at NAWS-CL. The INRMP seeks maximum ecological health, productivity, biodiversity, and recovery of habitats and species at risk. The INRMP will fully comply with regulatory requirements while taking advantage of opportunities to enhance natural resources.

The goals are:

- Navy mission accomplishment;
- Stable or improving status of ecosystem services;
- Natural resources that are resilient and self-recoverable with minimal human intervention;
- Navy projects that are not delayed, and contribute no net loss to conservation goals;
- Interagency partnerships that result in mutual benefits and improved cost-effectiveness of the work undertaken;

- Growing internal (NAWS-CL) and external (public) conservation awareness as measured by volunteerism, public interest, and participation;
- Funding strategies that allow progressive implementation of goals for ecosystem health.

INRMPs have specific goals that are shaped by DoD guidelines and directives, pertinent laws and regulations, ecological theory and practice, and management experience. These goals were created by the INRMP working group. This group consisted of the NAWS-CL environmental staff and NAVFAC Southwest with comments provided by stakeholders. A Goal Statement is necessary for setting the course towards a successful plan (see Table 1-3 for definition of a goal). The planning terms used in this document such as goal, objective, strategy, and task (action) covers a gradient of specificity and durability, ranging from a very broad, enduring goal to specific actions. Strategies are developed and presented using a step-down approach, using the planning definitions in Table 1-3; see Chapters 4 and 5 for examples.

The INRMP's goal is to:

> Provide the guidelines, means, and mechanism for assuring long-term sustainability and vitality of both the military mission and NAWS-CL's ecosystem health. Natural resource conservation, restoration, and enhancement will be conducted consistent with internal and regional ecosystem management goals without current or future compromise or loss to the military mission. All available Navy and non-Navy resources, the consensus of resource agencies and the public, and effective communication will be employed to secure seamless management across jurisdictions for the benefit of sustainable land use, habitats, and populations of endangered, threatened, and management focus species.

Table 1-3. Planning definitions.

Hierarchy	Definition
Goal	Broad statement of intent, direction, and purpose. An enduring, visionary description of where you want to go, an end outcome. A goal is not necessarily completely attainable. It does, however, describe a desired outcome related to the mission, rather than an activity or a process.
Objective	Specific statement that describes a desired future condition or successful outcome. Can be quantitative. Should be followed by a "standard," which is an observable indicator by which successful attainment of a condition stated in the objective is measured. "How do we know we are making progress or have attained the desired condition or successful outcome?" Should be good for at least five years.
Strategy	Explicit description of ways and means chosen to achieve objectives or standards. "What are we going to do about it?"
Action	Specific step, practice, or method to get the job done, usually organized sequentially with timelines and duty assignments. These go out of date quickly and should be updated annually.

Table 1-4 summarizes the objectives contained in the management chapters (Chapters 4 and 5) of the INRMP within the framework of this goal.

Table 1-4. Goals and objectives of this Integrated Natural Resources Management Plan.

Goal: The INRMP will provide the guidelines, means, and mechanism for assuring long-term sustainability and vitality of both the military mission and ecological health of NAWS-CL's natural resources.	
Topic	**Objective**
Ecosystem Management	Protect the natural health and integrity of the NAWS-CL ecosystem by conserving whole, native ecological processes as well as the parts, and by recognizing the connection among all the components. Ensure the full achievement of present and future military mission requirements. Ensure social and community values that depend on NAWS-CL land and waters are protected.
Supporting Sustainability of the Military Mission and the Natural Environment	Anticipate and protect against all encroachment on resources available for fulfilling the military mission, and provide for the conservation of environmental resources that are key to sustaining the military mission.

Goal: The INRMP will provide the guidelines, means, and mechanism for assuring long-term sustainability and vitality of both the military mission and ecological health of NAWS-CL's natural resources.	
Topic	**Objective**
Management Emphasis Units	Control encroachment and manage natural resource use compatibility by adopting management units already in use for operational control. The use of these management units is intended to provide a finer spatial scale for sustaining military mission needs, while maximizing NAWS-CL's contribution to conserving high-value, scarce habitats and species and a viable regional ecosystem in the northern Mojave Desert/southwestern Great Basin.
Water Resources	Protect and enhance springs, seeps, other water sources, and adjacent habitats. Continue the management of groundwater resources through the implementation of the Indian Wells Valley Cooperative Groundwater Management Plan. Improve the sustainability of energy, water use, and stormwater management in the interface between the built and natural environment, and as part of an Environmental Management System, as required under the EO on Federal Leadership in Environmental, Energy, and Economic Performance [05 October 2009] (see Section 5.1).
Soil Conservation	Conserve soil productivity, nutrient functioning, water quality, air quality, and wildlife habitat through effective implementation of Best Management Practices to prevent and control soil erosion related to construction or other uses of natural resources.
Habitat Conservation and Management	Conserve and enhance the attributes of habitat that sustain diverse and abundant wildlife, as well as ecological roles in food web support.
Plant Communities	Conserve the structure of each native plant community and the function it supports in the desert ecosystem, such as wildlife habitat, biodiversity, watershed protection, productivity, and nutrient cycling/storage.
Plant and Wildlife Protection and Management	Ensure that all elements of the ecosystem and biodiversity are healthy by focusing management attention on a set of species that represent a full set of ecological niches, and that operate at a full range of spatial and temporal scales.
Aquatic and Terrestrial Invertebrates	Conduct a baseline inventory and determine the health and trend of invertebrate populations in the context of ecosystem health and management. Identify and protect the abundance, biomass, and diversity of invertebrate functional groups that reflect health in each habitat and the ecosystem as a whole.
Reptiles and Amphibians	Inventory and determine the health and trend of amphibian and reptile populations, emphasizing those that may indicate ecological trends or may become federally listed, and control exotic species that threaten this health. Determine if slender salamanders are present; if so, determine their taxonomy and delineate procedures to protect this habitat-restricted species.
Birds	Conserve and enhance habitats used by resident and migratory terrestrial and water dependent birds, emphasizing Birds of Conservation Concern and other special status species. Comply with military readiness waiver under the Migratory Bird Treaty Act.
Terrestrial Mammals	Provide for healthy populations of native mammals with both large and small habitat ranges by managing for a diversity of native habitats and habitat conditions, and ensuring that trade-offs between all military and natural resource projects as they affect native mammals are considered in planning, with emphasis on special status mammals.
Special Status Species	Protect and enhance special status plant and animal populations including the Mohave ground squirrel populations as practicable, while ensuring compatible land use and flexibility to fulfill mission requirements. Inventory plant and animal taxa to determine changes in distribution and abundance according to priorities relative to seasonal factors as practicable. Continue to resolve baseline biological data gaps.
Inyo California Towhee	Support recovery plan efforts to establish stable towhee populations and the proposed delisting as an endangered species. Ensure long-term population viability of the Inyo California Towhee. Continue to resolve baseline, biological data gaps and continue habitat enhancement.
Mohave Tui Chub	Maintain a viable and genetically diverse population of the Mohave tui chub in the Lark Seep system. Provide support and take actions favoring Mohave tui chub recovery and down-listing by the USFWS.
Mohave Desert Tortoise	Maintain a viable population of Mohave Desert Tortoises on NAWS-CL by implementing actions identified in the recovery plan. Support Recovery Plan efforts to maintain the integrity of Mohave Desert Tortoise Critical Habitat and support delisting efforts.

Goal: The INRMP will provide the guidelines, means, and mechanism for assuring long-term sustainability and vitality of both the military mission and ecological health of NAWS-CL's natural resources.	
Topic	**Objective**
Wild Horses and Burros	Maintain the Centennial Horse Herd within a range of 100 to 168 animals, consistent with the appropriate management level identified in the Wild Horse and Burro Management Plan. Achieve and maintain the burro population at zero. Keep the Herd healthy, genetically viable, and self-sustaining by maintaining and improving rangeland condition. Minimize the cost of reducing and maintaining desired population levels. Minimize damage to water resources, riparian areas, uplands, and cultural resources through Herd reduction, and thereby facilitate and increase the rate of native plant and animal population recovery, including federally listed species.
Animal Damage Control, Feral Animal Removal, Urban Wildlife	Develop safe and efficient procedures for preventing and controlling animal pests that affect human health and safety and to avoid negative impacts to native wildlife and habitats. Promote safe aircraft operations on the NAWS-CL by reducing and controlling bird/animal aircraft strike hazards.
Invasive or Non-Native Species	Control the spread and introduction of invasive and noxious species with priority on those with the greatest potential for impacting special status species populations or degrading habitat, and restore to native habitat when feasible.
Baseline Inventories	Conduct baseline and Management Focus Species (species with individual management plans) inventories to establish management responsibilities.
Military Mission Sustainability	Achieve the mission of the Navy into the future without decline to the natural resource assets that support this mission. Achieve no net loss of military value by aligning current and future land use (location, extent, timing, and intensity) with protection of environmental values into the future, while minimizing the cost of environmental conflict resolution and mitigation. Enhance mission sustainability and contribute to the further conservation of a viable regional ecosystem in the greater China Lake area.
Cultural Resources Management Plan Integration	Conserve and protect significant prehistoric, historic, and Native American resources in concert with natural resources management as per the Integrated Cultural Resources Management Plan.
Outdoor Recreation	Promote compatible, sustainable outdoor recreation opportunities which enhance quality of life for military personnel, while conserving natural resources, and without compromising the military mission.
NEPA Compliance	Seek opportunities for streamlining and coordinating multiple site approval and environmental assessment procedures.
Landscaping	Implement Low Impact Designs where feasible and use landscaping in an integrated fashion to reduce energy use and enhance wildlife habitat values where possible. Improve the visual and aesthetic environment for both civilian and military personnel living, working, or visiting NAWS-CL, while avoiding the introduction of invasive exotic species, decreasing water use, improving drought tolerance of plant communities, and maintaining the integrity and character of cultural resources.
Collaborative Regional Planning	Support cooperative resources planning partnerships to create regional conservation, ecosystem-based solutions of mutual benefit, while also protecting the military mission.
Information Management	Ensure the most effective integration, analysis, and dissemination of monitoring and research on NAWS-CL lands, and communication of this information to all concerned, so resources are allocated effectively. Ensure the technically sound, practical and appropriate use of library and computer technology to organize, analyze, and communicate natural resource information in support of management decisions.
INRMP Implementation	Provide the organizational capacity, communication, planning functions, staffing, budgeting, and innovative technology support to ensure compliance with environmental laws, stewardship of natural resources, and continued use of NAWS-CL's land by the Navy. Ensure that all appropriate avenues and partnerships are investigated and sought for achieving the goals and objectives of the INRMP for the best possible management and most efficient use of funds.
INRMP Annual Review	Incorporate a dynamic, continuous process for decision-making, including future changes or additions to the INRMP. Improve and refine natural resources management by adaptively adjusting success criteria and priorities based on past accomplishments, new risks and threats, new biological information and changes in policy.

1.6 Regional Land Ownership

Map 1-3 shows the location of NAWS-CL in relation to its neighbors. Established land use patterns in the regional vicinity of NAWS-CL are not expected to change in the foreseeable future. The property is surrounded by federally owned lands interspersed with pockets of private and state lands. The Los Angeles Department of Water and Power owns much of the Owens Valley land to the north and west.

National Training Center Fort Irwin lies contiguous to the eastern and southern boundaries of the South Range. Death Valley National Park is directly north of the South Range and east of the North Range (separated by BLM land from NAWS-CL). The Park's boundary was realigned to be contiguous with portions of the South Range boundary as part of the CDPA of 1994. Sequoia and Kings Canyon National Parks are located approximately 50 miles northwest. The Sequoia National Forest areas are west of the Station's boundary. The Inyo National Forest is composed of two parcels located to the west and north of NAWS-CL. The BLM manages approximately 12 million acres of public land throughout the CDPA, including ten wilderness areas adjacent to the NAWS-CL boundary.

Other military installations in the region include the Air Force Flight Test Center at Edwards Air Force Base, the Marine Corps Air Ground Combat Center at Twentynine Palms, and the Marine Corps Logistics Base in Barstow.

1.7 Management Approaches

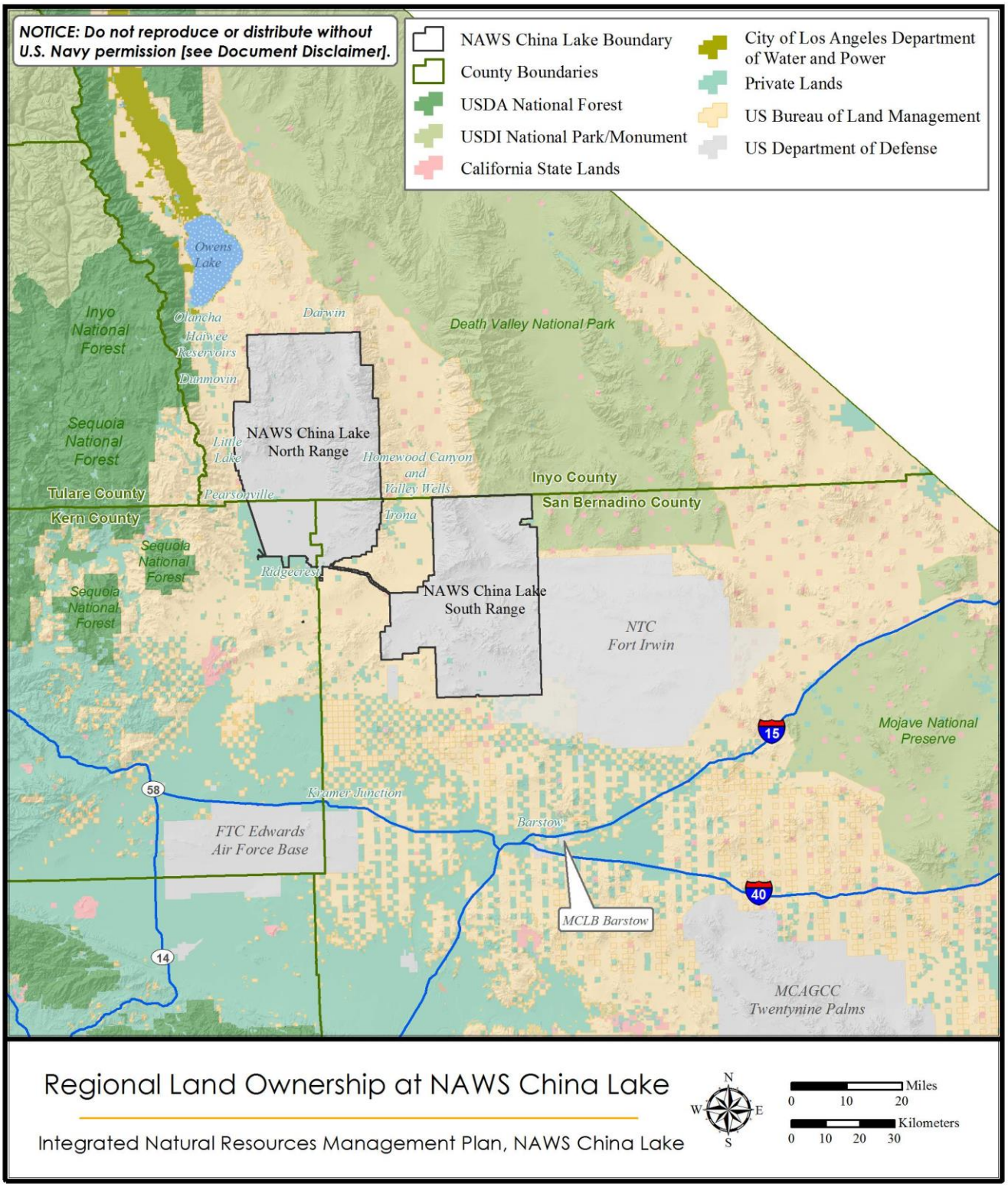
The Sikes Act (as amended) requires specific natural resources goals and objectives, and time frames for acting on them, and it is Navy and DoD policy that this be accomplished with an ecosystem approach for INRMPs. DoDI 4715.03 describes ecosystem management as "a goal-driven approach to managing natural and cultural resources that supports present and future mission requirements; preserves ecosystem integrity; is at a scale compatible with natural processes; is cognizant of nature's timeframes; recognizes social and economic viability within functioning ecosystems; is adaptable to complex and changing requirements; and is realized through effective partnerships among private, local, state, tribal, and federal interests. Ecosystem-based 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 a part of the whole."

1.7.1 Ecosystem Management

DoD and Navy Instructions mandate an ecosystem framework and approach for the INRMP (DoDI 4715.03 and OPNAVINST 5090.1C CH-1).

Ecosystem management in the DoD draws on a long-term vision of integrating ecological, economic and social factors. This approach shall take a long-term view of human activities, including military uses, and biological resources as part of the same environment. Managing for sustainability and ecosystem management are both approaches that attempt to integrate long-term goals with short-term project lists.

Ecosystem-based management will: 1) Avoid single-species management and implement a multiple species management approach that is consistent with the requirements of the Endangered Species Act. 2) Use an adaptive management approach to manage natural resources. 3) Evaluate and engage in the formation of local or regional partnerships that benefit the goals and objectives of the INRMP. 4) Use the best available scientific information in decision-making and adaptive management techniques in natural resource management. 5) Foster long-term sustainability of ecosystem services (DoDI 4715.03).



Map 1-3. Naval Air Weapons Station China Lake regional land ownership.

Consistent with Navy policy, ecosystem-based management shall include (OPNAVINST 5090.1C CH-1):

- A shift from single species to multiple species conservation.
- Formation of partnerships necessary to consider and manage ecosystems that cross boundaries.
- Use of the best available scientific information and adaptive management techniques.

Besides a component of ecosystem management, "Adaptive Management" is also a separate requirement for INRMPs under DoDI 4715.03, when it states "whenever practicable to manage and monitor resources over sufficiently long time periods to allow for adaptive management and assessment of changing ecosystem dynamics (i.e. incorporate a monitoring component to management plans)."

1.7.2 Environmental Management System

DoD policy states that "DoD Components shall adopt an environmental management system and work to integrate it in all core business areas." The goal is to "establish robust systems that sustain compliance, avoid risk and pollution, inform the public, and promote interoperability among the DoD components, other nations' militaries, and with industry." The remainder of this policy is found in the memorandum from the Office of the Under Secretary of Defense for Acquisition, Technology and Logistics dated 05 April 2002.

The Navy's Environmental Management System (EMS) integrates environmental considerations into day-to-day activities across all levels and functions of Navy enterprise. EMS incorporates best practices for the use of renewable and non-renewable resources and how pollution and wastes are prevented and processed. It is a formal management framework required under the EO on Federal Leadership in Environmental, Energy, and Economic Performance (05 October 2009) that provides a systematic way to review and improve operations, create awareness, and improve environmental performance (CNO Policy 06 December 2001). Systematic environmental management as an integral part of day-to-day decision making and long-term planning processes is an important step in supporting mission readiness and effective use of resources. The most significant resource for every organization is their senior leadership's commitment and visibility in EMS implementation and sustainability. A robust EMS is essential to sustaining compliance, reducing pollution and minimizing risk to the mission. The Navy EMS conforms to the International Organization for Standardization 14001:2004 EMS standard.

A working EMS "should be a tool to help organizations not only stay in compliance with legislated and voluntary environmental requirements, but also continuously improve their overall environmental performance" (https://www.denix.osd.mil/denix/Public/Library/EMS/emswhat.html).

The INRMP should "integrate the DoD Natural Resources Conservation Program with other (Deputy Under Secretary of Defense Installations and Environment) activities, including, but not limited to, business enterprise integration, environmental management, safety, occupational health, facilities, global climate change, ecosystem services, renewable energy, installation requirements, geographic information systems, EMS, the Readiness and Environmental Protection Initiative, project planning programs, and range and training area management and sustainment programs" (DoDI 4715.03).

The EO cited above requires that each federal agency conduct a self-audit of pollution prevention practices using an accepted EMS framework. Components of the approach include advancing the national policy that, whenever feasible and cost-effective, pollution should be prevented or reduced at the source. Funding for regulatory compliance programs shall emphasize pollution prevention as a means to address environmental compliance. Each agency must reduce its use of toxic chemicals and hazardous substances; reduce the toxic release inventory and off-site transfers of toxic chemicals for treatment and disposal; develop a plan to phase out the procurement of Class I ozone-depleting substances for all non-excepted uses; and promote the sustainable management of federal facility lands through the implementation of cost-effective, environmentally sound landscaping practices, and programs to reduce adverse impacts to the natural environment.

1.8 Annual Reviews and Revisions

DoD policy requires installations to review INRMPs annually in cooperation with the two statutory parties to the INRMP (USFWS and CDFW) Annual reviews facilitate "adaptive management" by providing an opportunity for the parties to review the goals and objectives of the plan, as well as establish a realistic schedule for undertaking proposed actions.

The Office of the Secretary of Defense guidance (17 May 2005) states that joint review should be reflected in a memorandum or letters between "the parties" (Navy, USFWS, National Marine Fisheries Service, and state fish and wildlife agencies) at least every five years. Section 101(b)(2) of the Sikes Act (as amended) [16 USC 670a(b)(2)] specifically directs that the INRMPs be reviewed "as to operation and effect" by the statutory parties "on a regular basis, but not less often than every five years," emphasizing that the review is intended to determine whether existing INRMPs are being implemented to meet the requirements of the Sikes Act (as amended) and contribute to the conservation and rehabilitation of natural resources on military installations. Informal annual reviews are mandatory to facilitate adaptive management. At a minimum, reviews shall assess conservation goals and objectives and the status of the Natural Resources Conservation metrics (DoDI 4715.03). This written documentation should be jointly executed or in some other way reflect the parties' mutual agreement and summarize the rationale for the conclusions the parties have reached.

1.8.1 Public Review and Comment

Public review and comment on updates to existing plans is required at different times during the planning process. According to Public Comment on INRMP Reviews Legislative Language Section 2905 of the Sikes Act (as amended) Improvement Act of 1997 [16 USC 670a note], the Secretary of each Military Department is required to provide the public an opportunity for the submission of comments on the initial INRMPs prepared pursuant to the new Section 101(a)(2) of the Sikes Act (as amended) [16 USC 670a(a)(2)]. An INRMP is a public document that requires the mutual agreement of the installation, USFWS, and CDFW; therefore, it is crucial that a common understanding be reached regarding which projects contained in a draft INRMP are most likely to be funded under existing policy. The installation shall provide the public with a meaningful opportunity to review and comment upon the initial draft INRMP and initial draft INRMP revision. Barring extraordinary circumstances, the public should be afforded a minimum of 30 days to review and comment (Navy 2006a).

There is no legal obligation to invite the public either to review or to comment upon the parties' mutually agreed upon decision to continue implementation of an existing INRMP without revision (Deputy Under Secretary of Defense Installations and Environment Memorandum, 10 October 2002). If the parties determine that substantial revisions to an INRMP are necessary, public comment shall be invited in conjunction with any required NEPA analysis.

1.9 Integrating Other Plans

The INRMP is fully integrated with the installation planning processes of NAWS-CL, including NEPA documentation, Biological Opinions, and all existing plans and documents. DoD policy seeks to ensure that current and planned installation activities (e.g., site development plans, construction requests, site approval requests, host-tenant agreements, and outleases) are effectively coordinated and consistent with activities described in the INRMP.

Activity Master Plan

The NAWS-CL Activity Master Plan (1989), also referred to as the Naval Weapons Center Master Plan, is a descriptive account of the Station's real estate, land use, facilities, utility and circulation systems, and environmental resources (Navy 1989a, 1989b, 2005). The Activity Master Plan addresses planning and management of the Station's facilities and infrastructure and serves as its general land use plan (Navy 2005). The CLUMP has subsequently replaced that portion of the Activity Master Plan defining NAWS-CL land use planning and management processes.

Range Management Plan

The NAWCWD China Lake RMP (1996) describes the military T&E mission and land ranges at NAWS-CL and the various types of military operations, land use, and available support assets employed throughout the ranges (Navy 1996, 2005). The RMP also discusses test and environmental planning processes and the strategic objectives for continuing military T&E operations at NAWS-CL.

Integrated Cultural Resources Management Plan

The Draft Integrated Cultural Resources Management Plan (2012) describes cultural resources at NAWS-CL and the regulatory framework affecting these resources, and prioritizes Station management objectives and the programs and processes used to accomplish these objectives (SWCA 2011).

Air Installation Compatible Use Zones

The Final AICUZ Study (2011) supersedes the Station's 1977 plan (Navy 2011). The updated AICUZ identifies current noise-related footprints associated with military airfield operations at NAWS-CL. The AICUZ identifies operational and noise abatement objectives and recommends land use planning guidelines for NAWS-CL and NAWCWD operations and local and regional planning agencies.

Comprehensive Land Use Management Plan

In response to the CDPA, the Navy chose to develop a CLUMP as the implementing vehicle for the INRMP, the Integrated Cultural Resources Management Plan, and the RMP. The CLUMP was developed by NAWS-CL in partnership with the BLM. The CLUMP incorporates an update to the airfield AICUZ report. The CLUMP establishes a planning and management framework to facilitate environmental compliance for natural and cultural resources management, assures no net loss of military mission support capability by defining and controlling compatible land uses on-station, and effectively supports the evolving military mission at NAWS-CL.

The CLUMP establishes a formal corporate process for land use management at the NAWS-CL that meets current and evolving military mission requirements and ensures compliance with the CDPA and Navy regulations contained in the Navy's Environmental and Natural Resources Program Manual (OPNAVINST 5090.1C CH-1). The CLUMP provides a strategic planning and management vehicle to support the Navy's military mission for land use and environmental resource management.

Integrated Pest Management Plan

The NAWS-CL Integrated Pest Management Plan puts pesticide management within the framework of the DoD and Navy EMS (see Section 1.7.2). The Integrated Pest Management Plan provides the tools and products to include pesticide management in the installation's overall EMS program. An environmental impact log is used to identify the practices to be managed in an EMS. Personnel responsible for the practice, specific aspects of each practice, and the impacts on installation vulnerable assets (such as natural resources) are also identified for each practice.

Bird/Wildlife Aircraft Strike Hazard Plan

Bird/Wildlife Aircraft Strike Hazard (BASH) plans are required by the DoD for military installations, where there is a potential for conflict between military activity and wildlife at airfields. BASH plans contain installation-specific information and guidelines to minimize collisions between aircraft and birds or other animals.

In September 2002, NAWS-CL developed and formally implemented a BASH plan for air operations. The plan complies with DoD and Navy directives, and is implemented through Naval Air Weapons Instruction 3750.2. Designed to reduce the potential for collision between aircraft and birds and other animals, the BASH plan established a Bird Hazard Working Group to monitor and implement the BASH program.

The BASH Avian Use Survey Report (2007) outlined procedures to reduce known and potential bird hazards on and around NAWS-CL. The report identified high hazard situations and areas to aid air crews in altering flight operations when warranted by avian use survey findings. The BASH Plan minimizes potential collisions between aircraft and birds through careful aerodrome land management practices and analyses of bird migrations within low-level aircraft operating areas (Epsilon Systems Solutions, Inc. 2007).

Environmental Impact Statement

The EIS for Proposed Military Operational Increases and Implementation of Associated Comprehensive Land Use and Integrated Natural Resources Management Plan (2004) analyzes the potential environmental consequences that may result from the Navy's proposed increase in the tempo of military T&E and operational training activities conducted at NAWS-CL (Navy 2004a). The EIS outlines alternatives concerning land use changes resulting from the proposed action; this information is incorporated into the CLUMP and INRMP.

A new EIS is currently underway and will be completed in 2014.

Wild Horse and Burro Management Plan

The NAWS-CL Wild Horse and Burro Management Plan (2011) analyzes various scenarios for cost-effective management of wild horses (*Equus caballus*) and burros. The INRMP addresses horse and burro management and integrates the recommendation of the Wild Horse and Burro Management Plan; the EA on the INRMP also analyzes the choices made for management of these animals. Implementation and continuation of animal control efforts will be in accordance with the Wild Horse and Burro Management Plan, once it is signed, and the EA prepared for the INRMP (Tierra Data Inc. and Resource Concepts 2011).

Base Exterior Architecture Plan

The NAWS-CL Base Exterior Architecture Plan (BEAP) relates to transportation planning for NAWS-CL roadways (Navy 2004a). The transportation planning for NAWS-CL roadways is included in the Station's Master Plan, which also includes the BEAP. The Master Plan describes transportation facilities in each planning area and recommends improvements to those identified as deficient or deteriorated. The BEAP provides design guidelines related to vehicle circulation on-Station. All NAWS-CL roads are classified as either primary, secondary, or service, and the BEAP provides guidelines for each classification. The Capital Improvement Plan identifies projects necessary to successfully carry out the proposals of the Master Plan. Most of the projects included in the Capital Improvement Plan are funded by military construction project funds that require congressional approval (Navy 2004a). Funding for roadway improvements is provided separately for administrative and range uses (Navy 2004a).

City and County General Plans

Beginning in 2010, the City adopted a new General Plan (City of Ridgecrest 2010) with the development philosophy of the city to continue as a support community for NAWS-CL. The City's General Plan Advisory Committee included the optional military sustainability element in the newly adopted General Plan.

The three county general plans (San Bernardino, Kern, and Inyo) all support airspace and ground activities that occur at NAWS-CL by providing long-term development restrictions in overflight areas and in certain borderland areas.

Desert Renewable Energy Conservation Plan

On 17 November 2008, Governor Arnold Schwarzenegger signed a California EO that sets California's goal of 33% of electricity coming from renewable resources by 2020 and improves processes for licensing renewable projects. In addition, the Governor ordered the development of the Desert Renewable Energy Conservation Plan for the Mojave and Colorado Deserts that would, when complete, provide binding, long-term endangered species permit assurances and facilitate renewable energy project review and approval processes. This regional plan will influence the pattern of solar facility and urban growth in the Mojave.

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2.0 Land and Natural Resources Use at NAWS-CL

Nearly every significant airborne weapons system in use by the U.S. Department of the Navy (Navy) (consisting of the U.S. Navy and U.S. Marine Corps) over the past several decades was developed or tested at Naval Air Weapons Station China Lake (NAWS-CL). The vast size and lack of human settlement has made it an ideal location for this type of use. Prior to Navy ownership, the natural resources were used by Native Americans, miners, ranchers, and others.

2.1 Regional Land Use

The NAWS-CL property occupies portions of three rural counties, all of which align along the California-Nevada border: Inyo, Kern, and San Bernardino. The northern two-thirds of the North Range are in Inyo County, and the southwestern and southeastern portions of North Range are in Kern and San Bernardino Counties, respectively. The South Range is entirely in San Bernardino County (Map 2-1).

NAWS-CL is surrounded by wilderness, parks, forests, open space, and conservation areas. Wilderness and park lands are not open to exploration or development of resources, and motor vehicles must stay on designated roads. A major regional landowner is the Los Angeles Department of Water and Power, which manages its lands for water supply for citizens of Los Angeles. Such land is generally not available for development or consumptive use. National Forest land of the Sierras is also constrained for consumptive use. The remainder of the federal land in the region is managed by the Bureau of Land Management (BLM) for multiple uses. Only about 2% of land in the greater region surrounding NAWS-CL is under private ownership.

The regional economy depends on the natural resources, including military use, and commercial and business activities such as the economic recovery of minerals, the production of energy, agriculture, and recreation.

The undeveloped nature of the area surrounding the Station and the fact that the majority of the land surrounding NAWS-CL is administered by local, state or federal government agencies furthers the mission of NAWS-CL. It allows for the continued use of the Station for research and testing purposes and allows for the operation of an airspace entirely clear of local impediments.

Inyo County

Land use adjacent to the Station in Inyo County includes federal wilderness, open space and conservation, undeveloped and non-wilderness, and small, widely dispersed populated areas. The Inyo County General Plan identifies land use designations for all land in the county (Inyo County 2001). These established land use patterns are not expected to change in the foreseeable future. The unincorporated residential community of Darwin was originally an 1875 mining camp and is directly north of the North Range, approximately 2.5 miles from the Station boundary. The unincorporated communities of Homewood Canyon and Valley Wells are located east of North Range.

There are six unincorporated rural communities west of North Range: Pearsonville, Little Lake, Coso Junction, Dunmovin, Haiwee, and Olancha. These communities are primarily residential, surrounded by large expanses of open space with some highway commercial use at Coso Junction. Coso Junction has a public land use designation because of its proximity to, and association with, a California Department of Transportation rest area. Little Lake is a rural community with a commercial land use designation. Pearsonville is a rural community at the Inyo/Kern County boundary and has industrial, commercial and residential land use designations. All these communities lie within ten miles of the NAWS-CL boundary. Haiwee Reservoirs, which are part of the Los Angeles Department of Water and Power aqueduct system, are west of the Station.

Kern County

The southwest portion of the North Range, which includes Mainsite and Armitage Airfield, is in Kern County. The Kern County General Plan (Kern County 2009) identifies land use guidelines and designations for all of its land, and contains a Desert Region section for land use management in the eastern portion of the county. Eastern Kern County is a rural area made up predominately of federal lands intermixed with private lands.

Ridgecrest and Inyokern are located in the Desert Region of Kern County, and are contiguous with the southern boundary of the North Range and southwest of the North Range. Inyokern's economic base consists primarily of service-oriented establishments located along State Highway 178. Most of Inyokern is residential with many of its residents employed at NAWS-CL or at businesses in Ridgecrest.

San Bernardino County

The southeast portion of North Range and all of South Range are in the Mountain-Desert Planning Area of San Bernardino County. The County General Plan (County of San Bernardino 2007) identifies land use guidelines and designations for all of its land. More than half of the eastern edge of the South Range borders the National Training Center (NTC) at Fort Irwin, and the remaining northeastern corner abuts Death Valley National Park. The unincorporated community of Trona is located between the North and South Ranges. The community accommodates residential, commercial, and industrial land uses. Trona's largest employer, IMC Chemicals, Inc., is a mineral processing plant that has been in operation since the 1870s.

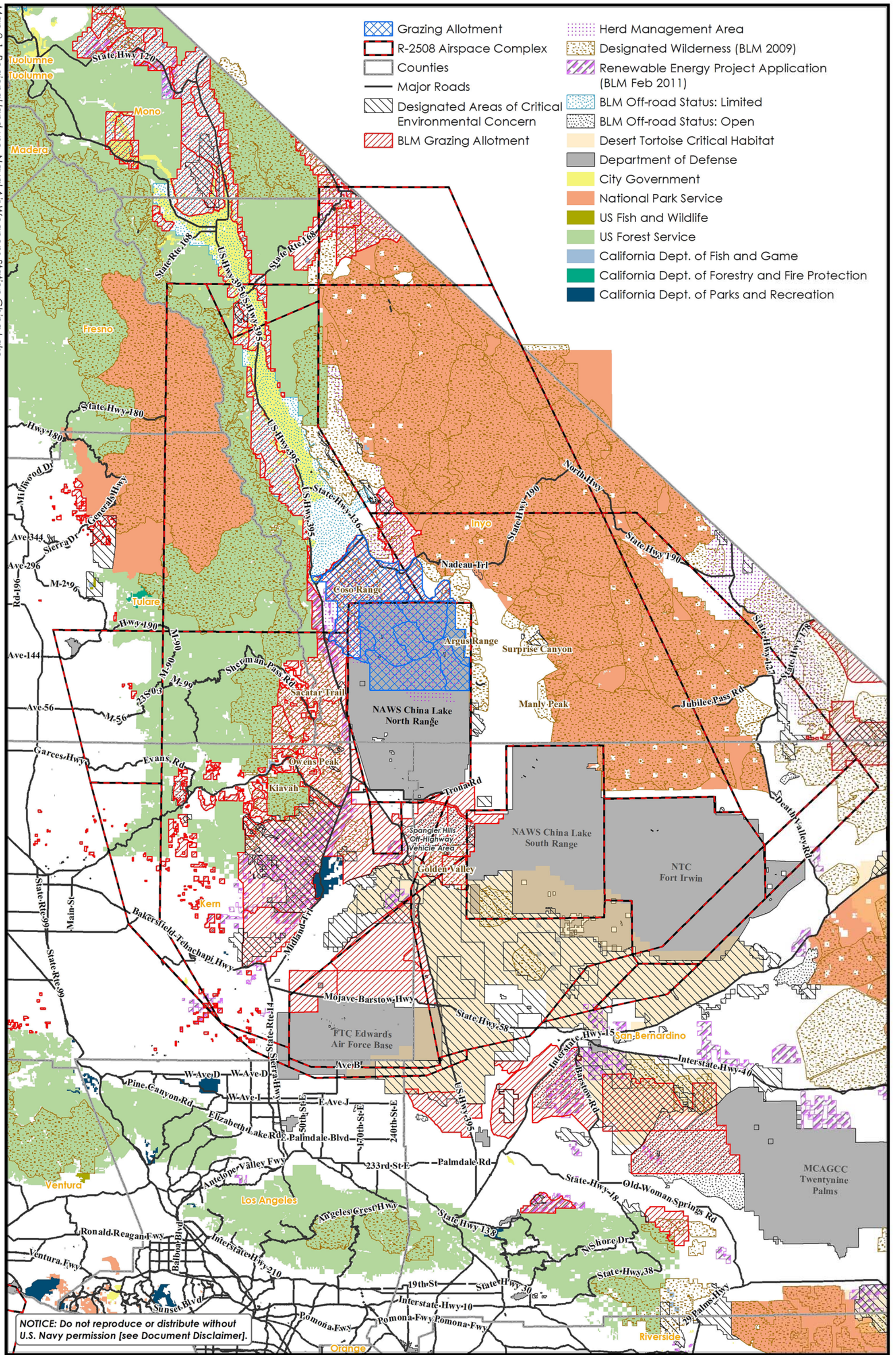
City of Ridgecrest

With a population of 27,616 (U.S. Census Bureau 2012), Ridgecrest is the only incorporated city near NAWS-CL. The city is a mixture of residential, commercial, institutional, industrial, and recreational land uses. Ridgecrest provides housing, shopping, recreation, and other services and facilities for NAWS-CL and Naval Air Warfare Center Weapons Division (NAWCWD) personnel, contractors, and their dependents. Land uses in the proximity include commercial and office, industrial, as well as low-, medium-, and high-density residential areas.

Other Military Lands

The Army's NTC at Fort Irwin is located adjacent to the east boundary of the South Range, as are lands managed for the National Aeronautics and Space Administration Goldstone Complex. Since 1981, the NTC has been the Army's principal training facility for armored maneuver and other training; its training operations simulate full-scale air and land combat situations on more than 600,000 acres of land. The no longer active Cuddeback Lake Gunnery Range (U.S. Air Force) is located within five miles of the south boundary of the South Range, west of Mojave B South on the South Range.

Map 2-1. Regional land use, Naval Air Weapons Station China Lake.



Regional Land Use at NAWS China Lake

Integrated Natural Resources Management Plan, NAWS China Lake

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Bureau of Land Management Resource Areas

The BLM-administered land surrounding NAWS-CL is part of the Ridgecrest Resource Area and managed by the Ridgecrest Field Office of BLM's California Desert District. Under the Federal Land Policy and Management Act, the land is managed for multiple uses including grazing, mining, wilderness, and recreation. Grazing includes yearly and intermittent allotments for cattle and sheep. Mining sand, gravel, gold, and trona (a mineral consisting of hydrous acid sodium carbonate) have been historic uses. Recreational use includes hunting and target shooting, camping, sightseeing, rockhounding and hobby prospecting, hiking and backpacking, rock climbing, picnicking, skydiving and hang gliding, and off-highway vehicle use. The Spangler Hills Off-Highway Vehicle Area offers over 57,000 acres of open public land with four-wheel drive trails, and competitive off-road skill events.

There has been a recent increase in applications for use of BLM lands for renewable energy, including solar and wind facilities. Both California and the federal governments have set high targets for renewable production. As a result, the U.S. Department of the Interior has made renewable energy production a top priority for the BLM. As of January 2011, in the California Desert the BLM processed 12 applications for wind energy development on 59,853 acres. For solar, it has 22 applications on 194,846 acres. It has authorized six solar developments on 21,324 acres (BLM 2011).

Uses permitted within particular tracts of BLM-managed land are designated by the California Desert Conservation Area Plan land use classifications. In accordance with California Desert Conservation Area Plan guidelines, the BLM also exchanges federal land for private land when it results in greater compatibility with existing and proposed uses and plans.

Bureau of Land Management Wilderness Areas

The California Desert Protection Act (CDPA) designated 69 individual study areas covering 3.6 million acres as wilderness, within the eastern Mojave Desert. Ten of these wilderness areas are directly adjacent to NAWS-CL (see Map 2-1), and all of which may include other federal, state, and private land. Table 2-1 lists the wilderness areas and related data. In addition to these wilderness areas, the CDPA of 2011 (Feinstein Bill) proposes three more wilderness areas adjacent to NAWS-CL lands: Great Falls Basin on the eastern border of the North Range; bordering the South Range to the southwest is the proposed Golden Valley Wilderness (in two separate parcels); and a proposed wilderness area on the northeast corner of the South Range, which would connect NAWS-CL, NTC Fort Irwin, and Death Valley National Park.

Table 2-1. Bureau of Land Management wilderness areas with boundaries adjoining Naval Air Weapons Station China Lake (acreages from Navy and Bureau of Land Management 2004). Three wilderness area additions adjoining Station lands are proposed in the 2011 Feinstein Bill, California Desert Protection Act of 2011 (see text).

Area	Acres (hectares)	Nominating Resource
Argus Range	74.890 (30,308)	Biological, Geological, Cultural
Golden Valley	37,700 (15,257)	Biological
Surprise Canyon	29,180 (11,809)	Biological, Cultural
Coso Range	50,020 (20,445)	Biological, Cultural
Sacatar Trail	51,900 (21,004)	Biological, Cultural
Owens Peak	74,640 (30,207)	Biological, Cultural
Kiavah	88,290 (35,731)	Biological
Manly Peak	16,105 (6,518)	Biological, Cultural, Geological
Great Falls Basin Study Area	8,485 (3,434)	Biological

Death Valley National Park

The National Park Service has jurisdiction over Death Valley National Park, which is directly north and east of NAWS-CL. The CDPA realigned the park's boundary and changed its status from National Monument to National Park. The boundary is now contiguous with the northeast boundary of the South Range. The park encompasses 3.2 million acres.

National Forests

The U.S. Forest Service has jurisdiction over Inyo National Forest, located approximately eight miles west and north of the North Range. Management of national forest land is for sustained yield and multiple uses including logging, mining, grazing, and recreation such as fishing, camping, and hunting.

2.2 Past Land Use

Evidence of past settlement is marked by thousands of archaeological sites, cabins and mining structures scattered throughout the 1.1 million acres of NAWS-CL. Some of the oldest archaeological sites occur around the China Lake basin, indicating use of the lowland lakeside environments during a wetter climatic regime. The earliest broadly accepted cultural complex in the Mojave Desert is the Clovis Complex (Sutton et al. 2007; SWCA Environmental Consultants 2011). The Clovis Complex is characterized by fluted points, large side scrapers, blades struck from prepared cores, and a mixture of expedient tools (Justice 2002; SWCA Environmental Consultants 2011). Paleo-Indian populations associated with fluted point (Clovis) technology consisted of small, highly mobile groups, who hunted and gathered around pluvial lakes. There is archaeological evidence to suggest that populations indicative of the Clovis Complex occupied areas around China Lake during the terminal Pleistocene (Davis and Panlaqui 1978; Giambastiani and Berg 2008; SWCA Environmental Consultants 2011).

2.2.1 Native American Use of Natural Resources

Prehistoric Archaeological Resources

The rock drawings, or petroglyphs, at NAWS-CL are considered one of the world's greatest collections of rock art. There are various positions on the age of the Coso petroglyphs; however, many recent researchers agree that an intensification in rock art production occurred during the last three to four thousand years. Though these same researchers disagree as when this event began and ended (Whitley 1994, 1998; Gilreath and Hildebrandt 2008; Garfinkel et al. 2010). Despite competing anthropological theories, most agree that this concentration of pecked art is the most spectacular in North America. In 1964, the U.S. Department of the Interior designated Petroglyph and Renegade Canyons (Big and Little Petroglyph Canyons) as a National Historical Landmark. It was expanded in 2001 to a National Historical Landmark district covering 36,450 acres. Only 7% of this acreage has been systematically surveyed to identify and record archaeological sites, with almost 200 individual sites documented so far (Whitley and Hale 2010).

The Coso Volcanic Field, south of Owens Lake, on the northwest portion of the North Range, contains thousands of separate quarry areas on its steep, glassy, rhyolite domes and surrounding ridges and fans. Primary outcrops, such as Sugarloaf Mountain, are extensive, with hundreds of tons of large obsidian boulders and cobbles (Gilreath and Hildebrandt 1997). The Coso obsidian quarry at Sugarloaf Mountain was first exploited 9,000 to 7,000 years ago by some of the first people in the area. Mining at Sugarloaf intensified between 4,000 and 1,500 years ago when Native Americans traded obsidian, used in making tools. From 800 to 150 years ago, when pine nuts and seeds became an easily found staple in their diet, less mining took place there (American Association of University Women 2002; Hildebrandt and Jones 1997).

In addition to the high-profile prehistoric archaeological resources, NAWS-CL has hundreds of undisturbed rock shelters and open-air living and working sites. The rock shelters often contain preserved organic materials, such as plant and animal remains, hides, baskets, and other textiles. A few prehistoric burials discovered at NAWS-CL were recovered from the dry rock shelters, contributing to the sensitivity of such sites (Panlaqui 1974; Gilreath 2000).

Ethnographic Information

Aboriginal occupation through seasonal shifting land use of what is now NAWS-CL has been extensive, but not intensive. Limited plant (no single crop dependence) and animal food sources at varying elevations were exploited by a nomadic, hunting and gathering lifestyle from early prehistoric times to the period of the latter 1800s and somewhat into the 20th century.

At the time of historic contact, five ethnolinguistic groups were using what is now NAWS-CL: Kawaiisu; Tubatulabal (a southern Paiute band, "pine-nut eaters"); Owens Valley Paiute (a northern Paiute band, "Nuwii"); Koso (a western Shoshone band); and Chemehuevi (a southern Paiute band). Although legalistic notions of land tenure are not appropriate for this area, core territories and associated spheres of use can be designated for the several tribes who inhabited the area (NAWS-CL 1999).

The Koso Shoshone (also known as Panamint Shoshone), including the Death Valley Timbisha Shoshone, lived in the Argus and Coso ranges and portions of the Indian Wells Valley (IWV) on what is now the North Range. The Owens Valley Paiute lived to the north and used many areas of the North Range. The Kawaiisu and Tubatulabal used the territory to the west and southeast, including Death Valley and the North and South Ranges (American Association of University Women 2002) to hunt and gather resources unavailable in the mountains. The Chemehuevi lived along the Colorado River and may have accessed the South Range in their desert travels.

Native Americans visited Coso Hot Springs, on the north part of the North Range, for spiritual and medicinal reasons, believing that Coso, which stands for 'Creator', was endowed with a religious spirit or power. Easily acquired obsidian flakes were part of the prayer ritual to rid oneself of sickness. Offerings of pinyon nuts and seeds were spread on the ground to signify feeding the spirits of the dead to be free of them at Coso (Brooks et al. 1979). Coso Hot Springs was used for ceremonies by the healthy as well. In the last decade of the 19th century, commercial resorts were established, capitalizing on the medicinal properties of the hot springs and mud. With improved transportation, Coso Hot Springs became more accessible during the 1920s. Before NAWS-CL closed Coso Hot Springs to the public in 1943, Paiutes and Shoshones continued to visit the springs, although less so than before commercialization. The springs continue to be valued today for their healing powers, and the site is recognized as a Traditional Cultural Property, where traditional indigenous practices continue.

The economy of the region has always been, and is today, largely dependent upon the availability and utilization of natural resources and reasonably accessible water supplies.

Mining and Transportation

The earliest noted historic resources are affiliated with prospecting and mining, followed by homesteading and ranching (Jackson Research Projects 1997).

In 1860, gold deposits were discovered in the Coso Mountains, which led to the initiation of mining on the North Range and the settlement of Coso mining camp. The small village had about 200 inhabitants until the late 1870s. It was abandoned and used intermittently through the 1880s and 1890s (Navy 2004a). There are still remnants of this community on the Coso Range.

In 1862, borax and trona were discovered by John Searles. The development of transportation systems soon followed. At this time, the closest transshipment point from 'Searles' Valley to reach a market was Los Angeles, 150 miles away. The chemicals were transported by freight wagon and mule team, until 1876, when the Southern Pacific Railroad completed its line. Mojave then became the transshipment point for Searles Valley borax as well as for the "twenty-mule-team" borax from Death Valley. The famous twenty-mule-team borax route crossed the South Range.

Chinese settlers who worked on the railroad, and subsequently prospected for borax were the inspiration for the name 'China Lake' (Andrews and Gianbastini 2006).

On or near the North Range, there are two routes depicted on a first map produced by Lt. George Wheeler in 1871. As mining of the area for silver, zinc, lead and other minerals progressed, more roads were built, using the few springs or wells to replenish water supplies and to rest stock. Prospectors and others stopped at Coso Hot Springs on their way to mines, such as Wilson. The network of roads remaining shows the desert freighting period's impact on the NAWS-CL ranges. These roads are still used today by residents of the region and by Navy personnel (Navy 1997).

When Epson salts were rediscovered in a remote and largely waterless area of what is now Death Valley National Park, entitled Crystal Hills, a decision was made by the American Magnesium Company to build a monorail to transport the salts to the standard gauge railroad at Trona. The line operated for two years, ceasing in 1926. The line has deteriorated significantly since. Much of the system is on Navy land today, where under Navy stewardship, restricted access has preserved those remains. In 2000, the Navy contracted with Jackson Research Projects Historical Consulting Services and the line was identified as a system that is unique in the country. It is a formally designated archaeological site, CA-SBR-3806-H, Primary Number P-36-003806.

Archaeological surveys in the Coso Mountain pinyon zone revealed the remains of an extensive charcoal production industry that dates from the late 1800s (Hildebrandt and Ruby 1999). Federal homesteading acts passed in the late 1800s and early 1900s encouraged the development of public land. Homesteads and ranches were built in both the North and South ranges (Maniery and Baker 1996). In the 1940s, the area was developed into the current military use (Navy 2004a).

Ranching

Ranching became an important industry in the area starting around 1865. The Junction Ranch, owned by Domingo Etcharren and Jean Carricut, was established in the late 1800s, as was the Howard Ranch southeast of Junction Ranch (Whitley 1981), operating from the 1880s to the early 1900s. The Sterling Ranch raised pack mules and owned and operated several mines, including the Sterling Queen Mine at B-Mountain (Navy 2008a). In 1914, Domingo Etcharren sold the Junction Ranch to Sumner and Butler from Big Pine.

Sumner and Butler grazed cattle over much of NAWS-CL, including Mountain Springs Canyon. About 200 head of cattle were kept in IWV near Mountain Springs Canyon during this period. Eaton Land and Cattle Company apparently maintained a very large herd (about 5,000 head) that frequented the Argus Mountains, Mountain Springs Canyon, and Wilson Canyon on a year-round basis from approximately 1920 to 1924. Ranching from the Hidden Springs area apparently dates from the 1920s as well. Eaton Land Co. sold its holdings on NAWS-CL in 1924 to Alfred Giraud, who raised 1,000 to 2,000 sheep. George Hansen raised 600 to 700 goats in the Argus Mountains near Junction Ranch (Whitley 1981).

The IWV area was settled starting in 1908 when the area was opened to federal homesteading. Shortly after, a branch of the Southern Pacific Railroad was extended into the IWV. The railroad facilitated the development of the valley and its population grew until a drought in 1921 drove most families out of the area (Navy 2006b).

Airfield Development

In the mid-1930s, the airfield at Inyokern was initially used as a provisional emergency landing field for the Trans-Sierra Airlines flight between Fresno, California, and Phoenix, Arizona. In 1942, the airfield was taken over by the Army, which used it for cross-country flights.

Lacey-Cactus-McCloud Livestock Grazing Allotment

Evidence of past livestock grazing is present on many acres of the Station, and the following history is provided to help interpret the plant communities and soil condition on these lands.

The Lacey-Cactus-McCloud Allotment is on the north half of the North Range. Elevations range from 2,500 feet (south end) to 8,835 feet (Maturango Peak), averaging about 6,500 feet. This grazing allotment, while not currently active on NAWS-CL, is depicted in Map 2-2, along with others in the vicinity.

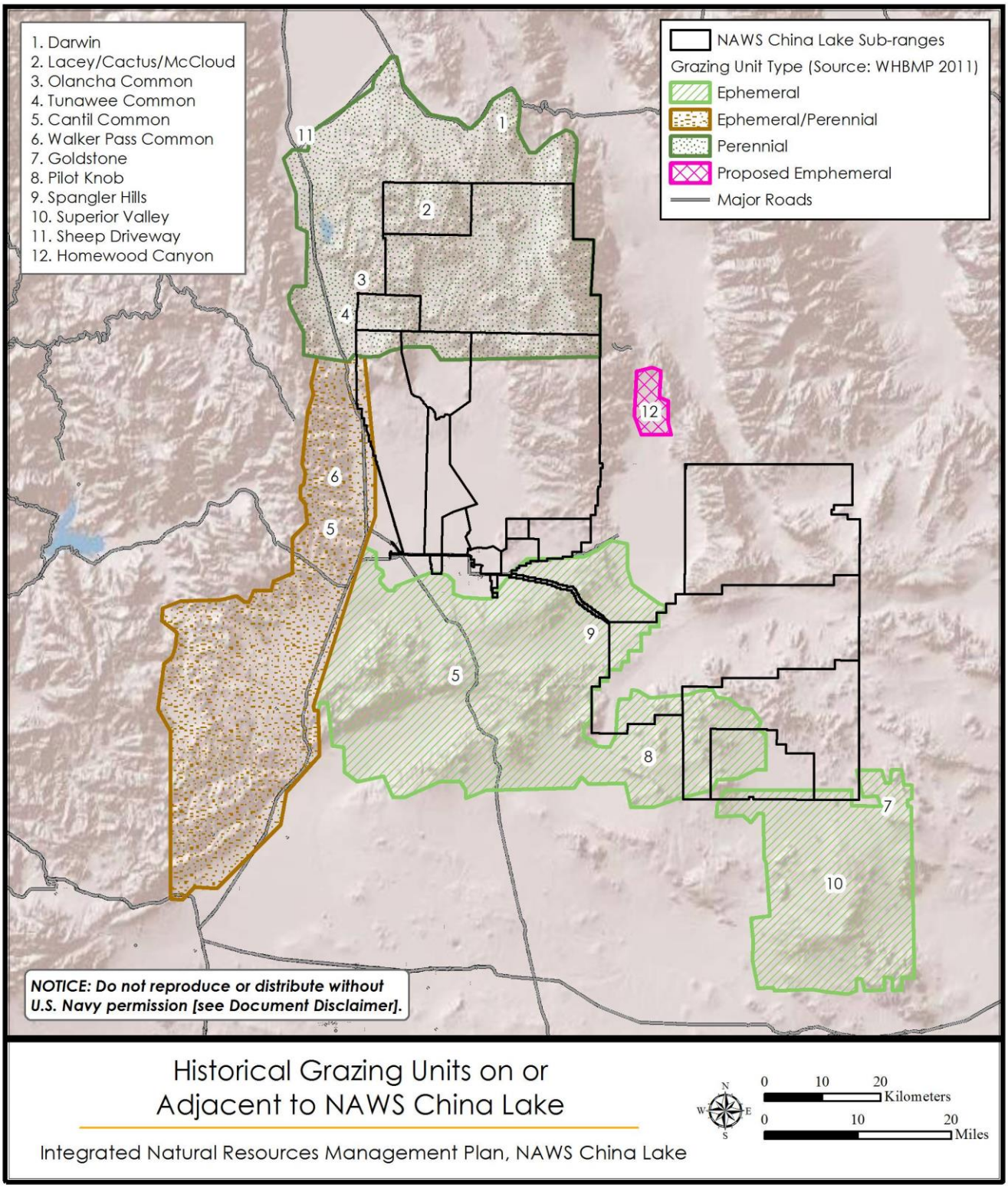
Starting in 1959, NAWS-CL accommodated cattle grazing on these Station-administered lands through a formal management agreement with BLM. Since 1998, cattle grazing was accommodated on portions of the North Range under a two-year interim permit issued by BLM with concurrence from the NAWS-CL Commanding Officer. The permit expired in June 2000. Cattle grazing had occurred on-Station and adjoining BLM lands approximately seven months each year.

Total acreage grazed by livestock (allotment acreage less the Petroglyph Canyon and Junction Ranch pastures) had been about 116,768 acres. The remainder of the allotment is on BLM land and totals 187,637 acres. The Lacey-Cactus-McCloud Allotment originally included 233,535 acres on NAWS-CL; however, a 1985 Grazing Program called for a reduction in acreage of the grazing allotment from 233,535 to 116,768 acres for mission-related reasons, protection of natural and cultural resources, and mitigation for geothermal development.

The livestock grazing approach employed over the recent past involved a rotational system with alternating portions of the allotment used each year. Cattle were excluded from Etcharren Valley (Allotment Areas 5 and 6) since the early 1980s with some drift, and from Mountain Springs Canyon, due to potential conflicts with the Inyo California Towhee (*Pipilo crissalis eremophilus*). These ranges are considered winter-spring ranges, a link in a system where summer (higher elevation) range tends to be nearby and abundant.

Records from 1997 document that of the forage consumed by grazers, 51% was by cattle, 12% by burros, and 38% by horses. Historic assessment by the BLM (ca. 1980) document that cattle made up 10% of the ungulates on the range.

The rangeland condition of the Lacey-Cactus-McCloud Allotment was rated as "fair" in the California Desert Conservation Area Plan (BLM 1980a). A 1995 grazing evaluation (BLM 1995) indicated that the range condition had gone from "fair" to "poor," that the range was in a downward trend, and that it was being over-utilized. Heavy use by wild horses (*Equus caballus*) and burros (*Equus asinus*), which have "severely reduced cover and forage near water and have trampled the riparian areas," contributed to this rating (along with historical overuse 50 to 100 years ago by livestock) (BLM 1982). The BLM reported that, at the same time, about 25% of the allotment was in excellent condition because low water availability prevented both livestock and feral equine use. A decline in wildlife numbers and probable extirpation of the desert bighorn sheep (*Ovis canadensis*) from the allotment was also attributed to heavy horse and burro grazing. Unmanaged domestic livestock was expected to delay the recovery of habitats damaged by heavy burro use, allowing "continued degradation of a number of riparian areas." Supporting the assessment of range over-use were records, such as photographs and surveyors' notes, indicating that the area historically supported fewer pinyon pine (*Pinus monophylla*) and Joshua tree (*Yucca brevifolia*), and more perennial grasses than found today. Sagebrush (*Artemesia* sp.) and blackbrush (*Coleogyne ramosissima*) also reportedly increased due to grazing pressure (BLM 1982).



Map 2-2. Lacey-Cactus-McCloud and other Bureau of Land Management livestock grazing allotments in the vicinity.

The rangelands experienced years of overpopulation by wild horses and burros, when the entire range was grazed at 50% above its assessed carrying capacity. The historical overuse by livestock is documented during the early 1920s on NAWS-CL, and most likely occurred during the latter years of the 19th century, as it did in most of the western U.S. The BLM concluded that even with control of horses and burros, the range is unlikely to return to its pre-grazed condition.

The data collected by the BLM on range condition showed that the range failed to meet standards. However, the data were based almost entirely on field measures of frequency using quadrat placement methods, or the number of times a species was "hit" during randomly placed, protocol plant transect surveys. Such methods are outdated, currently replaced by federal agencies in favor of a rangeland health standard that compares vegetation, soil, and water parameters to a standard based on recoverability and resilience to disturbance (National Research Council 1994; Pellant et al. 2005).

As of 2004, cattle grazing was determined as no longer compatible with Station operations. Grazing was terminated on Station land in 2000. The BLM is currently finalizing an Environmental Assessment to re-establish cattle grazing on the remaining portion of the allotment that is outside the Station fence line. Table E-1 (Appendix E) shows a chronology of grazing use and related activities on NAWS-CL property.

2.2.2 Military at NAWS-CL

Throughout its history, NAWS-CL has been able to support expanding military test and evaluation requirements.

World War II Era Land Acquisition

In the midst of World War II, adequate facilities were needed for test and evaluation of rockets being developed for the Navy by the California Institutes of Technology in Pasadena, California. The Navy was urgently searching for a new and larger range to support an increasingly technology-dependent weapons development and testing program. Navy requirements for air-to-air and air-to-ground ordnance testing, including explosive warheads and aircraft rockets, had outstripped the capacity of existing test sites. Surveys of California's inland deserts were quickly narrowed down to the IWV area. Its ability to support the requirements for such a facility (large size and suitable geography; availability of water, electricity, and telephone service; road, air, and rail access) was apparent. Excellent visibility, due to the area's good air quality, was also important. Equally important was the area's relative lack of human inhabitants, making land acquisition feasible. It had an existing airfield near Inyokern.

Implementing the decision to obtain the Inyokern site as a West Coast Navy proving ground was not without difficulties. The Inyokern airfield had been nominally assigned to the U.S. Army Fourth Air Force as a dispersal field and glider school several years prior, and the Army did not willingly give up their claim. Private land ownership or use claims (including a large number of mining stakes and grazing licenses on public lands within the proposed reservation area) also had to be adjudicated, both for initial acquisition and subsequent expansions. However, the Navy eventually prevailed, setting the stage for construction of the Naval Ordnance Test Station (NOTS), established in 1943.

The NOTS mission was defined in a letter by the Secretary of the Navy as "...a station having for its primary function the research, development and testing of weapons, and having additional function of furnishing primary training in the use of such weapons." The NOTS had an "annex" at Pasadena staffed by professors from the California Institutes of Technology who had left their classrooms to support the war effort. The group was tasked with improving performance of the Navy's airdropped Mark 13 torpedo. The result of their efforts was a highly reliable torpedo that figured prominently in the 1944 Battle of Leyte Gulf, where Navy aviators launching Mark 13s accounted for most of the 60 Japanese ships sunk.

The vast, sparsely populated desert around China Lake and Inyokern, with near perfect flying weather and practically unlimited visibility, proved an ideal location. The early Navy-California Institutes of Technology partnership established a pattern of cooperation and interaction between civilian scientists and engineers and experienced military personnel that, in the ensuing decades, has made NAWS-CL one of the preeminent Research, Development, Acquisition, Testing and Evaluation (RDAT&E) institutions in the world. The isolated location of the facility attracted other missions almost from its inception, and in 1944 an additional 380 square miles were added to the Station (Christman 1971).

1960s–1990s

In the years following World War II, China Lake projects included development of the famed Sidewinder air-to-air missile, the Shrike anti-radiation missile, the Zuni rocket, a series of aircraft rockets, an entire family of free fall weapons, torpedoes and the TV-guided Walleye glide bomb. Additionally, the Polaris missile concepts were developed by NOTS weapons-planning teams, and the first submarine-launched ballistic missile motors were tested at China Lake.

In recognition of its ever-expanding mission and increasing capabilities, NOTS was renamed the Naval Weapons Center China Lake in 1967. During the Vietnam War, 75% of the air-to-air and air-to ground missiles used were developed at the Naval Weapons Center. During the 1970s, the Navy shifted to more advanced, computer-intensive systems, including optical and laser systems, advanced propulsion technologies, and anti-radiation guidance systems. Throughout the history of the China Lake ranges, numerous technology transfer events have occurred as a result of original research and development of new technologies at China Lake, later applied to commercial purposes. The Electromechanical Shuttered Video Camera, invented in 1975 by China Lake range personnel to improve images of test events, was ultimately applied to professional sports and is responsible for the high quality stop-action video images now commonly used in sports broadcasting. Other examples include artificial neural networks and energetic materials. In 1979, the National Parachute Test Range at El Centro, California was relocated with its mission and personnel to China Lake (Navy 2000a). In the 1980s, China Lake's Advanced Sidewinder missiles were used in the Middle East and the Falklands, and the Tomahawk Cruise Missile was developed. Sidewinder, Tomahawk, and Shrike weapons systems developed at the Naval Weapons Center were used in Operation Desert Storm.

In January 1992, NAWS-CL and the Pacific Missile Test Center Point Mugu were disestablished and combined as a single command, the NAWCWD, an operational division of Naval Air Systems Command (NAVAIR). NAWCWD's mission is to provide Naval forces with effective and affordable integrated warfare systems and life cycle support to ensure battle space dominance. In 1993, the station name was changed to the current Naval Air Weapons Station China Lake.

Historic Ordnance Use

NAWS-CL lands have been used extensively for missions that involved the use of high explosive ordnance, especially during World War II, the Korean Conflict, and the Vietnam War. The testing and training that occurred on NAWS-CL lands during those early years were not restricted to any particular target site and resulted in unknown quantities of ordnance, both live and inert, released throughout the Station. In past practice, little or no ordnance cleanup was conducted on the ranges, leaving behind debris and unexploded ordnance. Unexploded ordnance is defined as explosive ordnance that has been primed, fused, armed, or otherwise prepared for action and has been fired, dropped, launched, projected, or placed in such a manner as to constitute a hazard to operations, personnel, or material, and remains unexploded. Collectively, unexploded ordnance and ordnance debris is referred to as range residue. NAWS-CL addresses environmental and explosives safety for range residue through U.S. Department of Defense (DoD) Directive 4715.11. As a result of this use and as an ongoing safety

consideration, all remote areas of NAWS-CL are considered potentially contaminated by unexploded ordnance (Navy 2005). The Station has implemented extensive efforts in recent years to manage range residue throughout the ranges to ensure the safety of persons using the ranges.

The principal source of general ordnance on the North Range Complex was the testing and training activities during the first few years (1943-1947) of the Station's history. The complex was established during World War II to provide an area to test newly developed rockets and to train pilots in the use of these weapons. Because these weapons were urgently needed for the war effort, tests and training commenced before the ranges were fully established or instrumented. Range boundaries were not clearly established in these early days, and the failure rate of early rockets was very high compared to experimental weapons of today. With inexperienced pilots flying over unfamiliar terrain, attempting to locate target areas that were hastily established and not clearly delineated, target misses were inevitable. Therefore, numerous unexploded ordnance items can be found across the Station's test ranges.

Unexploded ordnance from early use on the South Range Complex is likely more pervasive than on the North Range. Originally established as an aerial gunnery range to support World War II training operations for Marines, the entire area was principally devoted to training from 1943 until the Randsburg Wash Test Range was established in 1950. As basically a free play training area, there were few, if any, restrictions on where ordnance was dropped. After the Randsburg Wash Test Range was established, this central area was mainly devoted to testing of guns, fuses, and rockets. Training in the Randsburg Wash Test Range area was then restricted to specific sites, thus minimizing additional general unexploded ordnance. However, free play training activities continued in the North and South Mojave B areas until the early 1970s. Training after 1950 usually used inert rounds, but training rounds often have small explosive charges to expel smoke puffs and to actuate fuses. Since these devices do not always function, even debris from inert training rounds can constitute an explosive hazard. Records do not exist for the type and amount of ordnance expended on Mojave B ranges in those early days.

By the early 1950s, test ranges were well delineated, and tests were more closely controlled than they had been in the 1940s. This helped minimize additional ordnance contamination. However, additional unexploded ordnance is probable, due to the increased testing and training tempos during the Korean Conflict (early 1950s) and the Vietnam Era (late 1960s and early 1970s).

2.3 Current Operations and Activities

The following information on military uses of NAWS-CL lands is derived from the Draft Environmental Impact Statement (EIS)/Legislative EIS (Navy 2013). RDAT&E, Training, and Support are the major components of military mission-related work that occur on NAWS-CL. These operations include an expansion of unmanned systems and directed energy operations.

2.3.1 Military Users

NAWS-CL is part of Navy Region Southwest, San Diego, under the Commander, Navy Installations Command (CNIC). The Station operates and maintains the Installation's facilities and provides support services, including airfield operations for the NAWCWD organization, other assigned tenants, and transient units. NAWS-CL is responsible for managing all lands within the Station's boundaries to support the mission of NAWCWD, maintain environmental compliance, manage cultural and natural resources, provide safety and security services, and exercise responsible stewardship of public lands. Table 2-2 shows the various major tenants at NAWS-CL and their respective missions (Navy 2012a).

Table 2-2. Naval Air Weapons Station China Lake organizations and missions.

Organization	Mission
NAWS-CL Installation Command–Part of Navy Region Southwest, San Diego, which is part of CNIC	Operate and maintain base facilities and provide base support services, including airfields, for the NAWCWD organization at NAWS-CL, assigned tenants and activities, and transient units.
NAWCWD–A division of NAVAIR and a tenant of NAWS-CL	Execute full-spectrum weapons and warfare systems RDAT&E.
Navy Explosive Ordnance Disposal Mobile Unit 3–A division of Navy Expeditionary Combat Command and a tenant of NAWS-CL	Support primary research, design, development, test, and evaluation of air and ground weapon systems for NAVAIR Weapons Department and provide weapons test and unexploded ordnance support for the NAVAIR Range Department. In addition, provide Explosive Ordnance Disposal response to federal, state, and local agencies.
Navy Explosive Ordnance Disposal Training and Evaluation Unit 1–A tenant of NAWS-CL	Provide and conduct rigorous, relevant and realistic training for explosive ordnance disposal forces to persevere and triumph in all operating environments for the protection of American personnel, property and mission accomplishment.
Naval Facilities Engineering Command Southwest China Lake Detachment–A tenant of NAWS-CL	The repair, maintenance, and construction of facilities and infrastructure at NAWS-CL.
Naval Construction Training Center Port Hueneme Detachment China Lake (Seabees)–A tenant of NAWS-CL	Prepare Seabees and airmen for success by providing top-notch training efficiently and safely.
Branch Health Clinic–A tenant of NAWS-CL	Deliver quality medical, dental, psychological healthcare and services in a safe environment and be ready to deploy.
Navy Munitions Command Detachment China Lake–A tenant of NAWS-CL	Support NAWS-CL, tenants and visiting units with fleet ordnance support.
Naval Facilities Engineering Command Service Center Geothermal–A tenant of NAWS-CL	Explore for and oversee development of geothermal energy on DoD installations.

2.3.2 Research and Development Overview

Weapons Research and Development (R&D) supports all phases of weapon systems development from the earliest concepts of a weapon to engineering and manufacturing, to fleet use, and finally to the disposal of systems no longer needed by the military. The goal of weapons R&D is to explore promising technology for the fulfillment of the war-fighter's needs (Navy 2013).

At NAWS-CL research activities focus on weapons guidance and control, warheads, explosives, propellants, pyrotechnics, propulsion systems, airframes, and the basic chemistry and physics that support these areas. R&D activities generally take place in laboratories, where basic and applied research is performed. NAWS-CL laboratory facilities are primarily within the developed areas at Mainsite and in the Propulsion Laboratories areas. Seven main laboratories are situated between Mainsite and the Airfield: Michelson Laboratory, the Engineering Laboratory, Lauritsen Laboratory, Thompson Laboratories, Advanced Weapons Laboratories, and the Propulsion Laboratories Complex, which is made up of the China Lake Propulsion Laboratory and the Salt Wells Propulsion Laboratory (Navy 2013).

2.3.3 Acquisition Overview

Acquisition involves acquiring weapons systems. NAWS-CL supports the full spectrum of the NAVAIR acquisition programs by linking R&D with Test and Evaluation (T&E) throughout the entire acquisition process. NAWS-CL participates from early involvement (R&D) through pre-production, post-production, and sustainment (T&E) efforts to ensure successful acquisition programs (Navy 2013).

2.3.4 Test and Evaluation Overview

T&E is a continuous process throughout the weapons system life cycle. Open-air ranges are used to evaluate the systems under natural conditions and, to the extent practicable, replicate realistic employment and operations scenarios. The North and South ranges can accommodate a wide variety of open-air test requirements (Navy 2013).

Weapons systems and components are tested and evaluated under natural operating conditions to replicate realistic employment and operational scenarios to the maximum extent practicable. General categories of T&E operations include, but are not limited to, air and surface launched weapons, communications, directed energy, electromagnetics, electronic warfare and countermeasures, T&E, sensor, weapons survivability, and track tests. Target areas are designated for delivering ordnance such as bullets, missiles, rockets, and bombs, and may include the use of a physical object such as a billboard, tank, or electronic target. Test sites where weapons are tested under simulated conditions may include testing to determine how weapons would react to artillery fire, weather conditions, or other scenarios. Additional T&E capabilities include the following (Navy 2013):

1. High-speed test tracks, which aid in testing weapons at operational speeds;
2. Testing of weapons-related systems, such as parachutes;
3. Environmental and safety test facilities, where tests are performed to evaluate a weapon or weapon system's reaction to atmospheric elements, such as vibration, impact, pressure, and extreme temperatures;
4. Nondestructive test facilities, such as large x-ray facilities.

Surface Tests. Surface tests take place on the North and South Ranges. These tests encompass surface-to-air, surface-to-surface, and ground tests, and may involve missile launching, gun and artillery firing, and mass detonation testing of energetic materials (bombs and explosives) (Navy 2013).

North Range surface tests are conducted primarily on George Range, at the high-speed test tracks, aircraft survivability facilities, and other ordnance T&E facilities. South Range surface tests occur primarily in the Randsburg Wash area and include the testing of electronic combat systems, threat emitters, light assault vehicles, surface-launched missiles, and large-caliber gun ammunition fuse testing (Navy 2013).

Air Tests. Air tests of weapons at NAWS-CL occur primarily on the North Range. Air tests include air-to-air and air-to-surface events. Air-to-air events generally employ aircraft, a weapon system, a target, countermeasure devices such as flares or chaff, instrumentation sites, and range support facilities. Air tests can also employ unmanned aerial vehicles and/or target drones. Air-to-air testing assesses and evaluates weapons and weapon systems and the integration of weapon systems with the aircraft. At NAWS-CL, air-to-air testing occurs primarily at George Range with other areas providing maneuver space, and safety and security buffers (Navy 2013).

Air-to-surface testing assesses and evaluates weapon systems, the integration of air-to-surface weapons or weapon systems to the aircraft, warhead effectiveness, and weapon systems and/or aircraft software and hardware modifications or upgrades. At NAWS-CL, air-to-ground testing occurs primarily at George Range, Charlie Range, Airport Lake, Baker Range, and Coso Range (Navy 2013).

2.3.5 Training Activities Overview

NAWS-CL also provides facilities and support for aircrew and ground-based training activities by military units from all branches of DoD. These activities are accommodated on a noninterference basis with the primary RDAT&E mission. The varied terrain and environmental conditions throughout the North and South ranges

support training in air-to-air and air-to-surface combat skills, including parachute systems training. Ground troop training (GTT) is also an element of NAWS-CL activities that uses the North and South Range targets and test areas, roads, and facility sites (Navy 2013).

Aircrew Training. Aircrew training addresses requirements for proficiency in the use of evolving aircraft and weapons system technologies and warfighter tactics for navigation, target acquisition, weapons systems delivery, threat evasion, and battle damage assessment in realistic combat scenarios and threat environments throughout the varied terrain on the NAWS-CL ranges. Aircrew training occurs over both the North and South ranges. On the North Range, aircrew training takes place over the Coso Military Target Range, Baker Range, Charlie Range, George Range, and Airport Lake. Aircrew training in electronic combat over the South Range uses impact targets at Charlie Airfield in Randsburg Wash, Wingate Airfield in Mojave B North, and the Superior Valley Range. The Superior Valley Tactical Training Range is the most heavily used area for tactical training with air-to-surface weapon systems for fleet squadrons. This range is used primarily to deliver inert ordnance, including practice bombs, rockets, flare, chaff cartridges, and gun projectiles (Navy 2013).

Parachute Testing and Training. Parachute drop zones are located on both the North and South ranges. They are typically used to support RDAT&E and all types of parachute proficiency training (personnel or equipment) (Navy 2013). A drop zone in Randsburg Wash on the South Range is typically used for drops of harness packs and pallet cargo stores. The drop zone in George Range, which is on the North Range, accommodates RDAT&E and parachute crew training.

Ground Troop Training. NAWS-CL provides limited opportunities to perform individualized GTT missions. This involves theater-relevant combat training of relatively small groups (with wheeled and small-tracked vehicles) with emphasis on Special Forces, explosive ordnance disposal, expeditionary force, construction battalion (Seabees), and reconnaissance. The need for GTT on the varied terrain conditions and against contemporary threat environments at NAWS-CL is also shared by regional ground forces from Naval Amphibious Base Coronado, Marine Corps Air Ground Combat Center at Twentynine Palms, Marine Corps Base Camp Pendleton, NTC Fort Irwin, and other ground forces training units. The proximity of the NAWS-CL ranges to other home bases and the diversity of the NAWS-CL terrain and threat assets provide an ideal environment for meeting ongoing and evolving aircrew and GTT needs (Navy 2013).

GTT may be on foot, with or without military support animals (i.e., horses, mules, or military working dogs), and may involve multiple support vehicle types. GTT may also involve support aircraft (manned or unmanned; fixed or rotary wing) and access to distinct terrain such as mines, caves, tunnels, sloped areas, or vegetated areas to satisfy unique training requirements (Navy 2013).

Small group training (approximately eight troops) without support vehicles may be conducted in currently approved areas as well as undisturbed areas throughout the North and South ranges. GTT activities occurring in undisturbed areas would have no associated ground disturbing activities. These activities occur on an as needed basis. GTT involving larger groups (not to exceed 40 troops) or using support vehicles may only occur in previously approved areas or roadways. These training activities may expand by up to 25% annually. Small group training with support vehicles occur on an as-needed basis (Navy 2013).

2.3.6 Support Activities Overview

Most of the lands currently used for military support (administrative buildings, public works, family housing, community center, and other support facilities) are within developed areas at Mainsite and other developed areas in the southern portion of the North Range. Administrative offices, industrial buildings, laboratories, and storage areas are

primarily located at Mainsite, Armitage Airfield, and the Propulsion Laboratories area. Mainsite facilities include the headquarters, administrative offices, Public Works Department compound, industrial buildings, and testing/research buildings. Operations, maintenance, medical, administration, housing, recreation, supply, public schools, fire and police, childcare, religious, and exchange/commissary facilities are also located at Mainsite (Navy 2013).

Facilities at Armitage Airfield include three runways, aircraft facilities, aircraft fuel storage facilities, ordnance handling and storage facilities, ground support equipment maintenance facilities, a fire station, and aviation supply warehouses. The Propulsion Laboratories consist of building and test facilities dedicated to RDAT&E of propellants and explosives. A few administrative facilities are also at the Range Operations Center in Randsburg Wash, at the Supersonic Naval Ordnance Research Track (SNORT) facility on Charlie Range, and at Junction Ranch (Navy 2013).

2.3.7 Summary of RDAT&E and Training Operations

DoD guidance (DoD Instruction 4715.3) requires that Integrated Natural Resources Management Plans identify activities that may affect natural resources to plan for the conservation of those resources. RDAT&E and training events at NAWS-CL generally fall into one of seven major mission areas: 1) air-to-air, 2) surface-to-air, 3) air-to-ground, 4) surface-to-surface, 5) energetics/ordnance, 6) electromagnetics (including directed energy), and 7) track test. Additional Fleet and DoD training operations support include air combat, aircrew, combat skills, and GTT. Descriptions of each mission area and the range use areas that may be required to support them are provided in Appendix E, Table E-2 (Navy 2013).

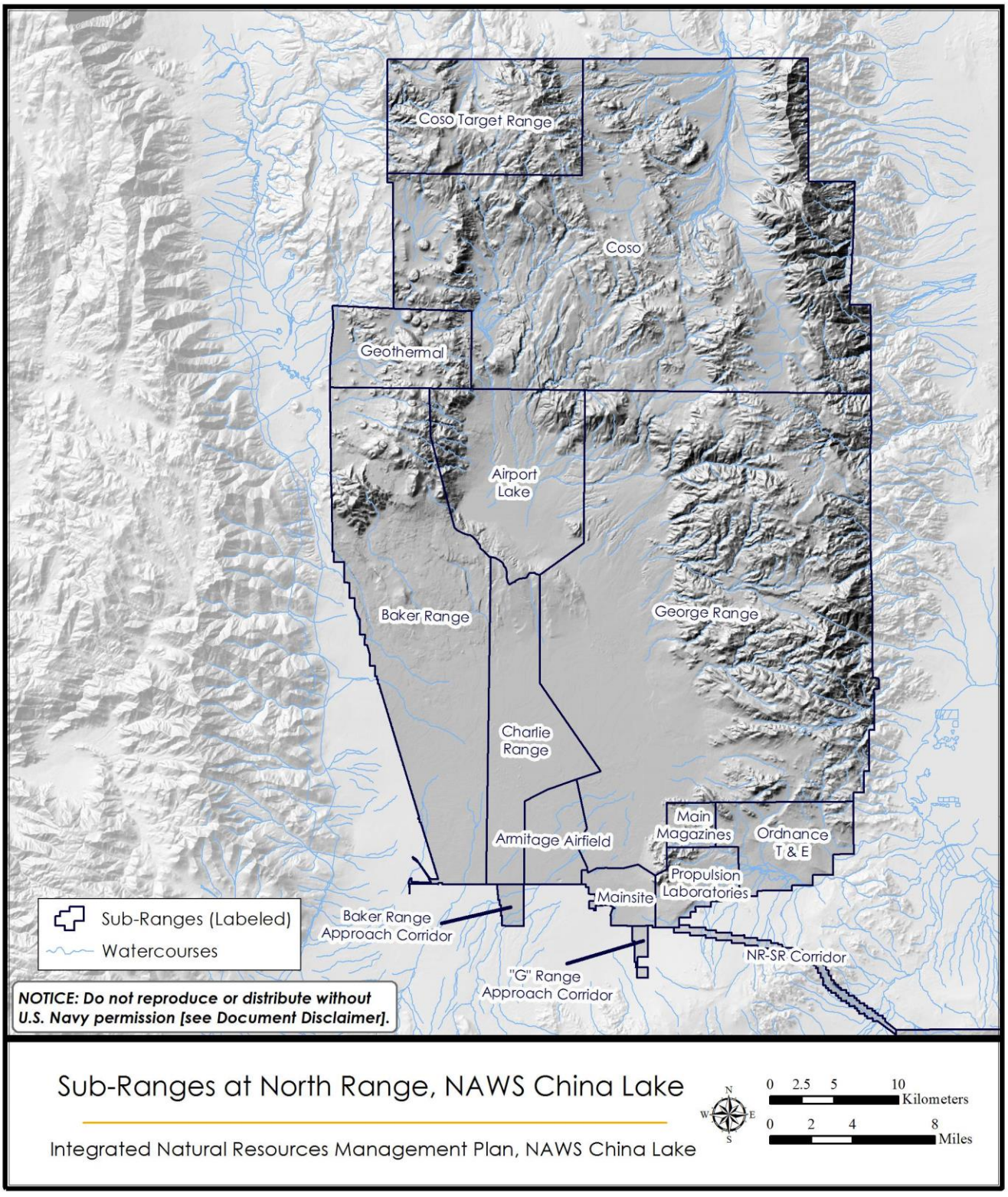
2.3.8 Land and Range Use Area Patterns

At the broadest scale, NAWS-CL is divided into the North and South Ranges. These land ranges are further divided into multiple sub-ranges according to historic range use. Sub-ranges, or range use areas, allow the scheduling of concurrent operations, thereby optimizing range utilization and maximizing the ability to satisfy customer requirements. North and South Range sub-ranges are illustrated in Map 2-3 and Map 2-4, respectively. Typical uses for each are summarized in Appendix E, Table E-3.

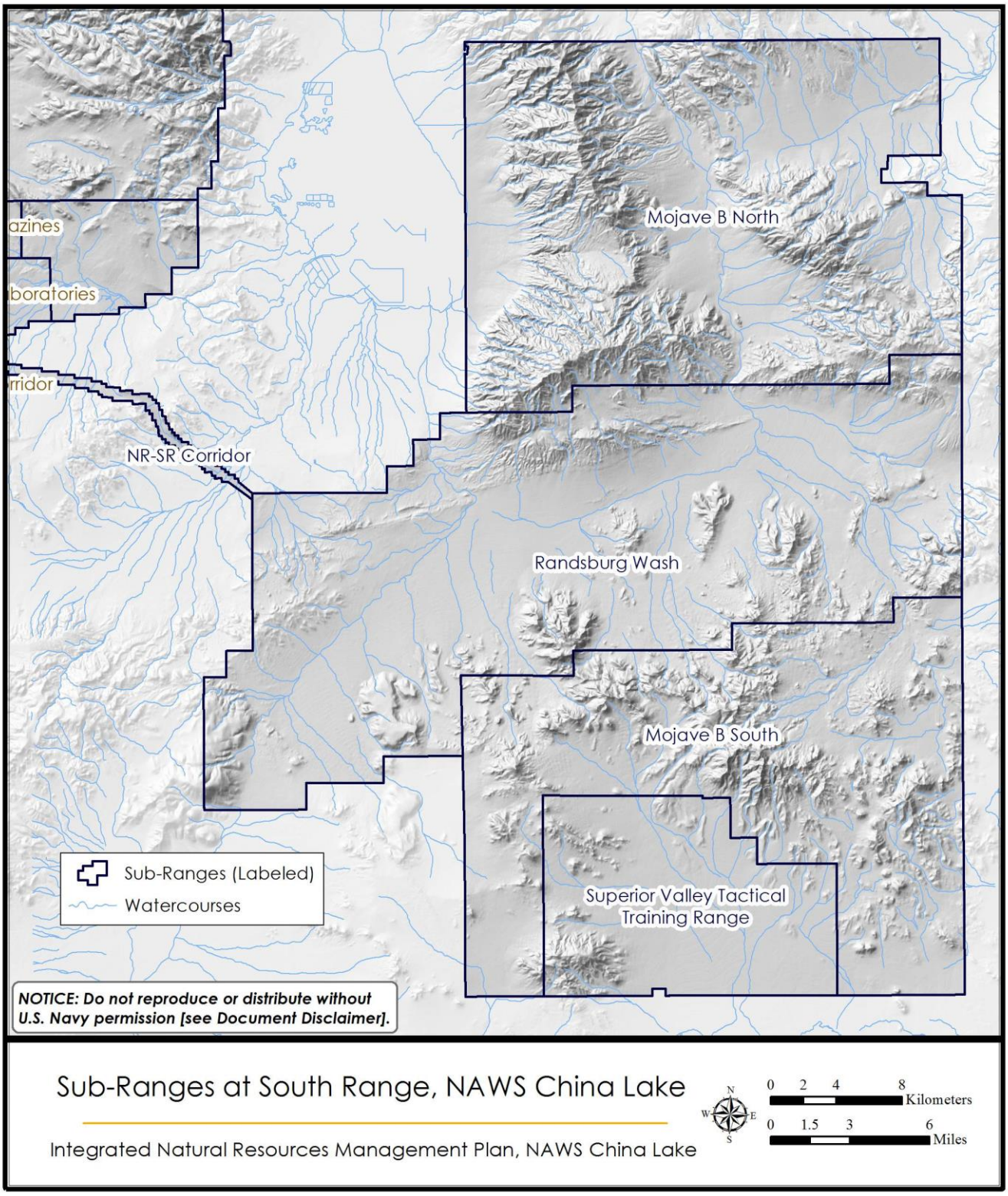
These areas are used singularly or in combination to meet specific test or training requirements. For instance, operations not involving the release of ordnance or other expendables and with no associated ground disturbance activity may be conducted throughout the NAWS-CL, although certain areas may be preferable due to terrain or the availability of ground test support facilities. Examples include flight operations (manned and unmanned, fixed and rotary wing) and various electromagnetic tests.

Operations with large hazard patterns, such as air-to-air, surface-to-air, air-to-ground, and surface-to-surface tests, may involve multiple range use areas, an entire range (e.g., North Range), or even cross-range scenarios (i.e. across the North and South Ranges or across the NAWS-CL and Sea Range). All range use areas within a given hazard pattern may be subject to intermittent test impacts. These associated impacts result from unexpected article performance, ordnance skips, fragment-throw patterns, and/or test item recovery activities.

Target and test areas may include impact areas for ordnance use; instrumentation sites; weapon and target launch sites; weapon firing sites; special purpose ranges and facilities; roads; and right-of-ways.



Map 2-3. Sub-ranges at North Range, Naval Air Weapons Station China Lake.



Map 2-4. Sub-ranges at South Range, Naval Air Weapons Station China Lake.

Target areas provide impact areas for delivered ordnance such as bullets, missiles, rockets, and bombs, and may include the use of stationary or mobile targets. Test areas are used to evaluate a weapons system or subsystem's reaction to a variety of conditions. Both target and test areas may have a high degree of surface disturbances and are generally cleared of naturally occurring surface features. Ground disturbing activities associated with targets include construction and set-up, recovery, and clean up, and may require the use of mechanical equipment. Targets are used in existing target areas to the extent feasible, based on specific test or training requirements.

A broad range of surface vehicles may be used to support RDAT&E and training operations, as well as range, facility, and road maintenance activities. Examples include, but are not limited to, pickup trucks and all-terrain vehicles; tactical vehicles such as high mobility multipurpose wheeled vehicles and mine resistant ambush protected vehicles; construction-related vehicles such as bulldozers, road graders, and heavy equipment; and unmanned ground systems that are both wheeled and tracked.

RDAT&E events require surface vehicles for instrumentation/support equipment set-up and teardown, target construction and placement, test article and/or target recovery, and target and test clean up. GTT operations involve surface vehicles to support training requirements.

All wheeled vehicles will utilize existing roadways, previously disturbed areas, and/or areas approved for construction to the extent feasible, based on specific test or training requirements. Off-road requirements will be analyzed on a case-by-case basis.

2.3.8.1 Range Safety Zones, Ordnance Facility Management Areas, Explosive Safety Quantity Distance Arcs

Explosive Safety Quantity Distance arcs are safety buffer zones established by DoD for storage or handling of various quantities and types of ammunition and explosives. Minimum safety distances are prescribed for separating explosives from inhabited structures, public roads, and other explosives. In general, these distances are proportional to the quantity of ammunition at each location. Procedures to safely manage ordnance debris and unexploded ordnance on ranges are implemented in accordance with DoD Directive 4715.11, Environmental and Explosives Safety Management on Department of Defense Active and Inactive Ranges. Activities at NAWS-CL require a wide variety and large quantity of ordnance. NAWS-CL has more than 100 magazines and other explosives storage facilities located throughout the Station.

2.3.9 Support Activities Overview

A broad range of management, planning and oversight activities are conducted by NAWS-CL to provide requisite support for the RDAT&E, and training missions of NAWCWD. Airfield operations and services, resident Test Squadron support, environmental management, safety, financial management, procurement, security and intelligence, public affairs, and legal services are some major support activities resident within the NAWS-CL support structure. Base host services, such as medical, police, and fire services; civil engineering; personnel, logistics, communications, and real property management; and maintenance/repair, are also provided. The resourcing for and maintenance of test and range equipment and instrumentation to support range activities are also part of the overall support category.

2.3.10 Services and Utilities

2.3.10.1 Fire Protection

NAWS-CL manages and operates fire stations at Mainsite and Armitage Airfield. There are 67 firefighting personnel, including 60 firefighters, two chief officers, four fire prevention inspectors, and a fire chief. Assistance is also available through a mutual-aid agreement with the Kern County Fire Department stations in Ridgecrest and Inyokern. These stations can provide support for fires in the Mainsite area.

2.3.10.2 Groundwater and Surface Water Use

Groundwater use, water use efficiency for all uses of water at NAWS-CL, and surface waters developed for use at NAWS-CL are addressed here, and in Chapter 5. Water as a natural resource, including groundwater that comes to the surface at seeps and springs, is addressed in Chapters 3 and 4 (see also Appendix F for a summary of documentation on individual springs).

NAWS-CL owns and operates its own water supply, storage, and distribution systems, supplied from local groundwater. Agreements with the IWV Water District and the Inyokern Community Services District provide for additional water to be supplied to all parties in emergency situations through a water system "intertie."[1] These connections are near the NAWS-CL geodesic water reservoirs in the Intermediate Well Field on the North Range and in Inyokern (Navy 2005, 2008a).

North Range

Groundwater Characteristics

On the North Range, at a minimum, there appears to be a shallow aquifer and a deep aquifer, separated by a clay zone (Dutcher and Moyle 1973). However, the sole source of water for NAWS-CL North Range is the IWV deep groundwater aquifer (also known as the Deep Hydrogeologic Zone). In addition to the Deep Hydrogeologic Zone, the IWV is characterized by a Shallow Hydrogeologic Zone and an Intermediate Hydrogeologic Zone (Table 2-3) (Tetra Tech-EMI 2003).

This groundwater resource depends on recharge originating in the Sierra watershed to the west of the Station boundary. Currently, recharge is roughly estimated to be approximately 10,000 acre-feet per year (between 5,000 acre-feet per year and 55,000 acre-feet per year), while total groundwater in-storage is conservatively estimated at 2.2 million acre-feet (M. Stoner, pers. com. 2010).[2]

Connections between groundwater basins have also been confirmed, though their extent and exact location are still under investigation. For example, it is hypothesized that there may be some groundwater flow out of the IWV and into Salt Wells Valley; such leakage is estimated as limited and slow. Groundwater production for agriculture irrigation (primarily alfalfa) along the western boundary of NAWS-CL has also had a significant impact on the direction of flow and groundwater gradients in the Deep Hydrogeologic Zone in the northwest area of the Valley (Tetra Tech-EMI 2003).

[1] An "emergency intertie" or water system "intertie" refers to a connection (piping with valves) between two or more water systems that allows water to flow from one system to another in response to emergency situations requiring water.
[2] The groundwater storage estimate factors in the dewatering of the top 200 feet of usable water in the aquifer (M. Stoner. pers. com. 2011).

Table 2-3. Indian Wells Valley groundwater aquifer characteristics.

Hydrogeologic Zone	Characteristics
Shallow Hydrogeologic Zone	▪ Pleistocene and Holocene alluvium and Holocene playa deposits. ▪ Zero to 250 feet below ground; approximately 65 feet thick near Main Gain Area. ▪ Unconfined aquifer. ▪ Groundwater flow is from basin margins to the center of China Lake Playa. ▪ There is high variability in water quality due to interaction between groundwater and different types of sediments. Generally, water quality declines eastward and northward. Natural water softening occurs. ▪ Elevated Total Dissolved Solids levels near some wells are attributed to Installation Restoration Program activities.
Intermediate Hydrogeologic Zone	▪ Lacustrine sediments - primarily low permeability silts and clays. ▪ Top of the Intermediate Hydrogeologic Zone is generally around 2,150-2,200 meters above mean sea level (50-100 feet below ground surface). ▪ Groundwater flow is generally to the south toward a cone of depression created by pumping for the City of Ridgecrest and NAWS-CL. ▪ Downward vertical gradient between the Shallow Hydrogeologic Zone and the Intermediate Hydrogeologic Zone. ▪ High potential for large quantity of groundwater along the southern boundary of the basin near the City of Ridgecrest. ▪ Generally good water quality.
Deep Hydrogeologic Zone	▪ Coarse sand and gravel with some interbedded clay. ▪ Characterized by unconfined, semi-confined and confined conditions depending on location. ▪ Groundwater is generally of good quality. However, Total Dissolved Solids concentrations increase northward and eastward. ▪ Cone of depression created in the Intermediate Wellfield due to high amount of pumping. There is potential for deterioration of groundwater quality with continued pumping in this area.
Source: Adapted from Tetra Tech-EMI 2003.	

Groundwater Pumping and Permitting

There are a total of nine groundwater wells that serve the North Range Complex. Six of these are major production wells that serve Mainsite, Supersonic Naval Ordnance Research Track, Airfield, Weapons Survivability, Magazines, China Lake Propulsion Laboratory, Salt Wells Propulsion Laboratory, and Skytop areas (refer to Map 3-7). Water for fire protection is provided by this same system. The wells pumped 558 million gallons in 2010-over 95% of the Navy's groundwater use in the IWV. Two remote wells serve the Baker Test Range (20 miles north of Mainsite) and another serves the Darwin Wash Test Range (approximately 60 miles north of Mainsite) (M. Stoner, pers. com. 2011). Peak demand for water in calendar year 2010 was 10.9 million liters per day (2.9 million gallons per day). By comparison, in calendar year 2006 the peak demand for water on NAWS-CL was 19.6 million liters per day (5.2 million gallons per day) (Halpin 2007; Navy 2008a; M. Stoner, pers. com. 2011).

IWV groundwater pumping has the opportunity to draw on various wellfields:

- Intermediate Area (24 square miles [mi^2]) - located between the City of Ridgecrest and the community of Inyokern;
- Northwest Area (40.5 mi^2) - located northwest of Ridgecrest and north of Inyokern;
- Southwest Area (28 mi^2) - located southwest of Ridgecrest and south of Inyokern.

Pumping has been concentrated in areas where aquifer characteristics, water quality, and water elevations are known throughout the IWV (except China Lake Playa); this has historically been in the Intermediate Area, which is the traditional groundwater extraction area for IWV. However, the high amount of pumping here has led to the development of a cone of depression that creates potential for groundwater quality deterioration if pumping continues. The Northwest Area groundwater was historically used for agriculture, but has high reported Total

Dissolved Solids concentrations, making it generally unfit for domestic use unless it is treated or blended with water with lower Total Dissolved Solids concentrations. The Southwest Area maintains generally good water quality.

Groundwater elevation data for the IWV shows a gradual decline in most areas. Currently, the water level in the aquifer is dropping at a rate of one foot per year (M. Stoner, pers. com. 2010). Local water experts have been debating the meaning of this decline as well as the quantity of natural recharge and safe yield from groundwater aquifers underlying the IWV, some of which is within the boundaries of NAWS-CL. Current groundwater withdrawals by all users, including the Navy (1,900 acre-feet per year), are approximately 25,000 acre-feet per year. Based on current groundwater recharge and conservative storage estimates, the aquifer system within the IWV is projected to meet demands for at least the next 60 to 70 years, and is considered adequate to meet current demands for up to about 160 years if certain management activities are implemented (U.S. Bureau of Reclamation 1993) (see Table 2-4 and Table 2-5).

In general, deep groundwater pumping does not impact the springs on NAWS-CL since there is no hydrological connection between them (M. Stoner, pers. com. 2010).

Permits for drinking water wells are administered by Kern County. Requirements for lead and copper sampling are outlined in the federal Safe Drinking Water Act, 42 U.S. Code (USC) § 300f et seq. The Navy's Environmental and Natural Resources Program Manual (Naval Operations Instruction [OPNAVINST] 5090.1C CH-1) identifies requirements and responsibilities for protecting drinking water supplies at Navy facilities.

Surface Water

There are two reservoir ponds near Junction Ranch in the North Range that have been developed for firefighting purposes in remote areas, and they are also accessible to wildlife. They are located in Etcheron Valley in the northeast corner of the North Range. A stone reservoir pond is currently being developed for similar purposes at Cole's Flat (M. Stoner, pers. com. 2010).

South Range

Groundwater underlying the South Range has not been studied in much detail. The depth to groundwater ranges from about 250 to 300 feet below the surface. Groundwater flow recharge into groundwater systems occurs by direct infiltration of any precipitation, subsurface flow from adjoining basins, and percolation of infrequent runoff that occurs during flash floods from surrounding mountains.

There are five groundwater production wells that serve the South Range Complex. Two wells provide water for industrial and domestic use at the Mainsite Area (in the Pilot Knob Valley). The remaining three serve the Superior Valley Test Site, the Sea Site #3 Test Site and the Sea Site #1 Test Site, respectively (M. Stoner, pers. com. 2011).

Current Management of Water Resources

Management of water resources at NAWS-CL involves the identification, monitoring, permitting, use, maintenance, protection, and enhancement of surface waters and groundwater.

Local agencies responsible for water resources management include NAWS-CL Public Works Department, which operates and maintains the Station's water supply system and provides services regarding flood control; local municipal agency public works departments; the IWV Water District; and other water purveyors in the region.

Protecting groundwater resources is considered a key program element for NAWS-CL. Groundwater provides the Station and local community with its only source of potable drinking water.

Actions by the Station to reduce its use of groundwater include achieving more than a 20% reduction in water use, in compliance with Executive Order 13123, as well as collaborating with neighboring water users to achieve a decrease in overall use of IWV groundwater. For example, before 2010 (the year by which Executive Order 13123 required 20% reduction of water use), NAWS-CL had already decreased their water use by 23% to 1,900 acre-feet/year through a series of water conservation measures (M. Stoner, pers. com. 2010). The local water district also has reduced its water use by implementing landscape ordinances (i.e. no more than 50% turf for private lawns), and restricting lawn watering times (at night) (M. Stoner, pers. com. 2010).

NAWS-CL has also conducted groundwater characterization and exploration projects, including utilizing Navy Seabee water well drilling crews to complete monitoring wells. Semi-annual and annual groundwater sampling is also conducted throughout the Valley to contribute to a trend analysis. In general, the Navy has been active in partnering with neighbors and securing funds to characterize and help sustain groundwater resources in the region (see below).

Management Framework for Indian Wells Valley Groundwater

NAWS-CL and other local entities are cooperating under the terms of a Memorandum of Understanding to manage groundwater resources in the IWV Basin (Navy 2004a). In March of 2006, an updated IWV Cooperative Groundwater Management Plan was signed by the major water producing entities within the Valley to extend the useful life of groundwater resources to meet the needs of users in the IWV. The 11 signatories are: NAWS-CL, IWV Water District, Searles Valley Minerals, BLM, City of Ridgecrest, County of Kern, Kern County Water Agency, Eastern Kern County Resource Conservation District, Inyokern Airport District, Inyokern Community Services District, and Quist Farms. The signatories are committed to conserving, protecting, and managing groundwater resources within the IWV. The water purveyors take an active role in resource management and meet monthly to discuss groundwater issues occurring at the local and state levels, and to share groundwater data collected and analyzed by the various entities. Subcommittees are established as needed to investigate issues such as groundwater sampling protocols, water level monitoring programs, water banking/transfers, and other supplemental water supplies for the IWV. However, the responsibility for managing the production and distribution of groundwater to meet each agency's needs remains with the individual water producer.

Groundwater monitoring conducted by the IWV signatories relies upon an agreed-upon sampling strategy and usually occurs every six months. Data on water quality and the creation of a groundwater flow model for the IWV have resulted from this regular monitoring.

A U.S. Bureau of Reclamation study (1993) was completed to refine estimates of the life of groundwater resources in the IWV and to identify management scenarios that would help to conserve and extend the useful life of groundwater resources. The various scenarios include combinations of groundwater pumping from various wellfields of the IWV. Certain assumptions define pumping parameters that are qualified into Conservative, Intermediate and Optimistic conditions (Table 2-4).

Table 2-4. Indian Wells Valley pumping parameter assumptions for conservative, intermediate and optimistic conditions.

Evaluation Parameter	Conservative Condition	Intermediate Condition	Optimistic Condition
Future Withdrawals	1990 projections	50% increase in 18 years for some IWV pumpers	No change from current pumping quantities
Extractable Water Volume	100 foot dewatering depth	200 foot dewatering depth	300 foot dewatering depth
Total Recharge	3,000 acre-feet/year	6,000 acre-feet/year	9,000 acre-feet/year
Source: U.S. Bureau of Reclamation 1993			

The resulting scenarios for groundwater resource life are presented in Table 2-5. The monitoring wells drilled for this study are still used for water level measurements and as water quality sampling points for the IWV.

Table 2-5. Groundwater resource life for Indian Wells Valley according to various pumping scenarios.

Resource Development Alternative	Resource Life, Years		
	Conservative Condition	Intermediate Condition	Optimistic Condition
No. 1 - Pump Intermediate Area	14	29	52
No. 2 - Pump Intermediate Area, expand into the Southwest Area	26	68	134
No. 3 - Pump Intermediate Area, blend treated water from the Northwest Area	19	42	77
No. 4 - Pump Intermediate Area, expand into the Southwest Area, blend treated water from the Northwest Area	33	92	169
No. 5 - Pump Intermediate Area, blend treated water from the Northwest Area	19	42	77
No. 6 - Pump Intermediate Area, expand into the Southwest Area, blend treated water from the Northwest Area	33	92	169
Source: U.S. Bureau of Reclamation 1993			

Management Actions

Since NAWS-CL signed the IWV Cooperative Groundwater Management Plan, only two production wells remain in the Intermediate Wellfield of the IWV (Navy Well #18 and Navy Well #28). In line with the resource development alternatives presented in the 1993 Bureau of Reclamation Study, NAWS-CL is exploring opportunities to expand the IWV Water District's use of groundwater to the Southwest Wellfield, which contains a significant amount of high quality groundwater. NAWS-CL has already drilled eight monitoring wells (in addition to the two production wells already installed by the IWV Water District there in the late 1990s) in order to characterize that area and the groundwater for possible Water District use (IWV Cooperative Groundwater Management Committee Signatory Achievements, provided by M. Stoner 2011).

In addition, NAWS-CL routinely prevents interference between pumping from its wells and private domestic wells by drilling its wells to 1,000 feet to extract water from the Deep Hydrogeologic Zone (typical private domestic wells pump from a depth of 250-350 feet). New wells are also placed at least one half-mile apart from each other to reduce possible interference (both water level and water quality).

Some current groundwater projects and activities in which NAWS-CL participates are:

- California State Groundwater Elevation Monitoring Plan, which is in progress with the State Department of Water Resources. The Navy contributes via the IWV Cooperative Management Group.
- Continuing to run groundwater model simulations for the IWV.
- Conducting aquifer tests.
- Publication of a study on the lithology and hydrogeology of the IWV.
- Brackish Water Resources Characterization Study is projected, pending funding. Possible participants include the IWV Water District, Searles Valley Minerals and NAWS-CL.

2.3.10.3 Wastewater

The City of Ridgecrest leases and operates the on-Station wastewater treatment plant (at Mainsite) and maintains the plant to meet water quality standards and future loads. The plants operate under the jurisdiction of the Lahontan Regional Water Quality Control Board. Individual septic systems are under the jurisdiction of the San Bernardino and Kern County health departments. The City's plant operates under two Board orders: Waste

Discharge #6-93-85 (Waste Discharge Identification Number #6B150116001), and Reclamation #6-93-86 (Waste Discharge Identification Number #6B159101001) (Navy 2004a, 2008a).

Monthly reports are submitted to the Regional Water Quality Control Board regarding reclaimed water use rates, chlorine residuals, and water quality.

The City of Ridgecrest processes wastewater from the NAWS-CL and the Ridgecrest area. NAWS-CL pays for the cost of disposal based on the measured wastewater flow from entities on-Station. Primary treatment consists of removing grit and primary sediment. Secondary treatment is provided by seven oxidation ponds and four evaporation/percolation ponds on approximately 220 acres. Most of the effluent is evaporated or percolated; however, up to 5.30 million liters per day (1.4 million gallons per day) of effluent is used to irrigate the NAWS-CL golf course (Navy 2004a, 2008a).

2.3.11 Transportation, Circulation, and Utilities

Transportation planning for NAWS-CL roadways is included in the Station's Master Plan, which also includes the Base Exterior Architecture Plan. The Master Plan describes transportation facilities in each planning area and recommends improvements to those identified as deficient or deteriorated. The Base Exterior Architecture Plan provides design guidelines related to vehicle circulation on-Station. All NAWS-CL streets are classified as either primary, secondary, or service, and the Base Exterior Architecture Plan provides guidelines for each classification. The Capital Improvement Plan identifies projects necessary to successfully carry out the proposals of the Master Plan. Most of the projects included in the Capital Improvement Plan are funded by Military Construction funds that require congressional approval. Funding for roadway improvements is provided separately for administrative and range uses.

Management of the Station's roadway system includes ongoing maintenance and some roadway reconstruction. All roadways are inspected every three years. Most roads are two-lane dirt and graded every year, although some roads are graded more frequently to accommodate increased activities (e.g., GTT).

Major utility-based systems at NAWS-CL, including water, wastewater treatment, flood control, electrical service, natural gas, propane, and steam distribution, are mostly at Mainsite and immediately adjacent areas. Facilities located on the North and South Ranges are served by a limited, local distribution network. Typically, utilities are buried adjacent to the roads on each range (Navy 2005a, 2008a).

2.3.11.1 Electricity and Natural Gas

Electricity

Southern California Edison provides electrical service to NAWS-CL from its Inyokern substation (Navy 2004a). Southern California Edison maintains service easements for operations and maintenance of electrical lines. The substations have a total capacity of 57,212 kilovolt amperes, which equates to 45.7 megawatts (MW). The distribution system has an even greater capacity of 111,862 kilovolt amperes, which equals 89.5 MW. As a result, NAWS-CL is at approximately 50 percent of its electrical capacity. Electrical distribution throughout NAWS-CL is performed by on-installation substations, which then distribute electricity to each building via power lines. The electrical system at NAWS-CL is within system capacity (Navy 2004a).

In 1986, NAWS-CL developed its geothermal energy resources at Coso Known Geothermal Resource Area (KGRA) through a third-party contractor. The contractor produces geothermal energy at Coso, which is sold to

Southern California Edison at the Inyokern and Kramer Junction substations. Southern California Edison continues to supply electric power to NAWS-CL. Total generating capacity at the Coso KGRA amounts to more than 250 MW, enough electricity to service approximately 300,000 homes.

Natural Gas

Pacific Gas & Electric provides natural gas service to NAWS-CL. Pacific Gas & Electric maintains natural gas service easements for operation and maintenance of natural gas lines. Natural gas is the primary fuel used for space, process, and water heating in the more populated areas. Approximately 1,000 natural gas service connections supply NAWS-CL through a gas main transmission line installed in the late 1970s. Typical natural gas usage at NAWS-CL is approximately 57,000 deca therms per month. The natural gas distribution system is reported to be in good condition, and the capacity is more than adequate to meet both existing demand and an increase in demand (Navy 2004a).

2.3.11.2 Propane

Propane is used for space heating, water heating, and other domestic uses in remote areas on NAWS-CL. Propane is delivered by a private contractor to a series of on-installation storage tanks with a total capacity of 400,000 gallons (1,514,000 liters). Propane is distributed by truck throughout NAWS-CL by the Navy. NAWS-CL has approximately 200 propane service connections, and the tanks are installed above ground near the end users. The lines are installed primarily below ground, except where they come off the tank. Propane usage is reported by the amount delivered from the contractor. January is the highest use month, with approximately 76,610 gallons (289,968 liters) of propane delivered. In general, the individual propane distribution systems are reported to be in poor condition. There are ongoing projects to convert many of the propane connections to the natural gas system where feasible (Navy 2004a).

2.3.11.3 Solid Waste

NAWS-CL's Pollution Prevention Program aims to reduce the amount of solid waste generated on-Station. The Pollution Prevention Program includes requirements to develop integrated waste management procedures and to document these procedures in a Solid Waste Management Plan. This plan outlines procedures to minimize waste generation and landfill disposal, and was written in conjunction with the following regulations:

- OPNAVINST 5090.1C CH-1, Environmental and Natural Resources Program Manual;
- The California Integrated Waste Management Act (Assembly Bill 939);
- The California Beverage Container Recycling Act (Assembly Bill 2020).

NAWS-CL's recycling program is an integral part of the Pollution Prevention Program. Recycling is the reuse or reclamation of previously used materials that would become wastes and require disposal if not recycled. In addition to recycling, the Pollution Prevention Program also incorporates such efforts as source reduction and waste treatment; many of these actions are implemented in conjunction with the City of Ridgecrest (Navy 2004a).

The Ridgecrest sanitary landfill annually receives 63,000 short tons (57,153 metric tons) of trash. NAWS-CL produces approximately 2.5 short tons (2.26 metric tons) of non-hazardous waste annually.

2.3.11.4 Steam Distribution

Two major steam-generating plants operate on NAWS-CL, each of which contains two or more boilers. Steam Plant #2 is at Mainsite and Steam Plant #4 is in the Salt Wells Propulsion Laboratory area. Steam Plant #1 and #3 are no longer in operation. Each plant serves a large area through a distribution system that supplies steam to several

buildings. Some buildings are not connected to the steam distribution system, but instead have individual boilers. Boilers are used for space, process, and hot water heating, and, in some cases, provide power for absorption chillers and for humidifiers in some laboratories. The steam distribution lines on Mainsite and Armitage Airfield are installed underground; the distribution lines in the Salt Wells area are mostly above ground (Navy 2004a).

The steam plants are in relatively good condition, but the distribution piping is in generally poor condition because of age. The steam system is gradually being downsized due to the high cost of upgrading. Certain facilities are being refitted with individual boilers or are being refitted with individual heating and cooling units, both of which are fueled by natural gas. Operation and maintenance of the steam distribution system is managed by NAWS-CL (Navy 2004a).

2.3.12 Airfield Operations

The primary aircraft types operating at NAWS-CL, the type and number of operations conducted by these aircraft, and the runways and flight routes used to conduct routine operations are summarized below (Navy 2007b).

Annual aircraft operations at Armitage Airfield are predominantly conducted by four primary aircraft types: F/A-18C/D, F/A-18E/F, EA-6B, and AV-8B aircraft. Other propeller, helicopter, general aviation, and heavy aircraft also use the airfield on a recurring basis, but such aircraft represent a much smaller proportion of total annual operations and do not contribute significantly to the airfield noise environment (Navy 2007b).

As presented and analyzed in the 2004 EIS, the baseline operational conditions at Armitage Airfield comprise approximately 27,000 airfield operations conducted during an average of 305 days per year. These operations are expected to increase by up to 25% in the near future as described in the EIS/Legislative EIS (Navy 2013). Approximately 76% of these operations are flown by the four primary aircraft types described above. The remaining aircraft types that use Armitage Airfield do not contribute significantly to the noise environment analyzed in the Air Installation Compatible Use Zones (Wyle Laboratories 1998). The four primary aircraft types conduct an average of 68.14 flight operations on an average busy day under baseline conditions, approximately 90% of which occur during daytime (Navy 2008).

2.3.12.1 Military Flight Routes and Air Space

NAWS-CL has about 20,000 mi^2 of restricted-use airspace. While use of airspace has fewer impacts on natural resources management at NAWS-CL than do ground-oriented military missions, military flight routes are presented here because they can affect natural resources management concerns of agency and non-agency partners in natural resource conservation. They are important because they are integral to the scope of operations undertaken at the Station.

The Airspace Management Office is responsible for the preservation and enhancement of the airspace asset at NAWS-CL. In accordance with the Federal Aviation Act of 1958, the Federal Aviation Authority has total management authority and responsibility for all U.S. airspace. The Station has four (R-2505, R2524, R-2506, and R-2508) assigned restricted air space designations. R-2508 is shared with four other military stations in the region.

A designated flight route is the intended flight path of an aircraft during a particular type of flight operation. The actual flight path followed by aviators will vary depending on mission requirements, wind velocity and direction, air density caused by ambient temperature, airspeed, mission load (fuel, ordnance, external configuration, etc.), runway availability individual pilot performance and other factors. This potential variability in actual flight paths, which results in the creation of a "flight corridor" centered on each established flight route, is taken into

consideration in the definition of Air Installation Compatible Use Zones planning areas and the discussion of land use compatibility (Navy 2007b).

Military airspace in the vicinity of NAWS-CL includes three separate components: Military Operations Areas (MOAs), Restricted Areas (RAs), and Air Traffic Control Assigned Airspace (ATCAA). The complex of military airspace is collectively referred to as the R-2508 Complex (Map 2-5). The R-2508 Complex covers approximately 20,000 square miles and includes all airspace and associated land currently owned by DoD stations in the Upper Mojave Desert region (Navy 2007b).

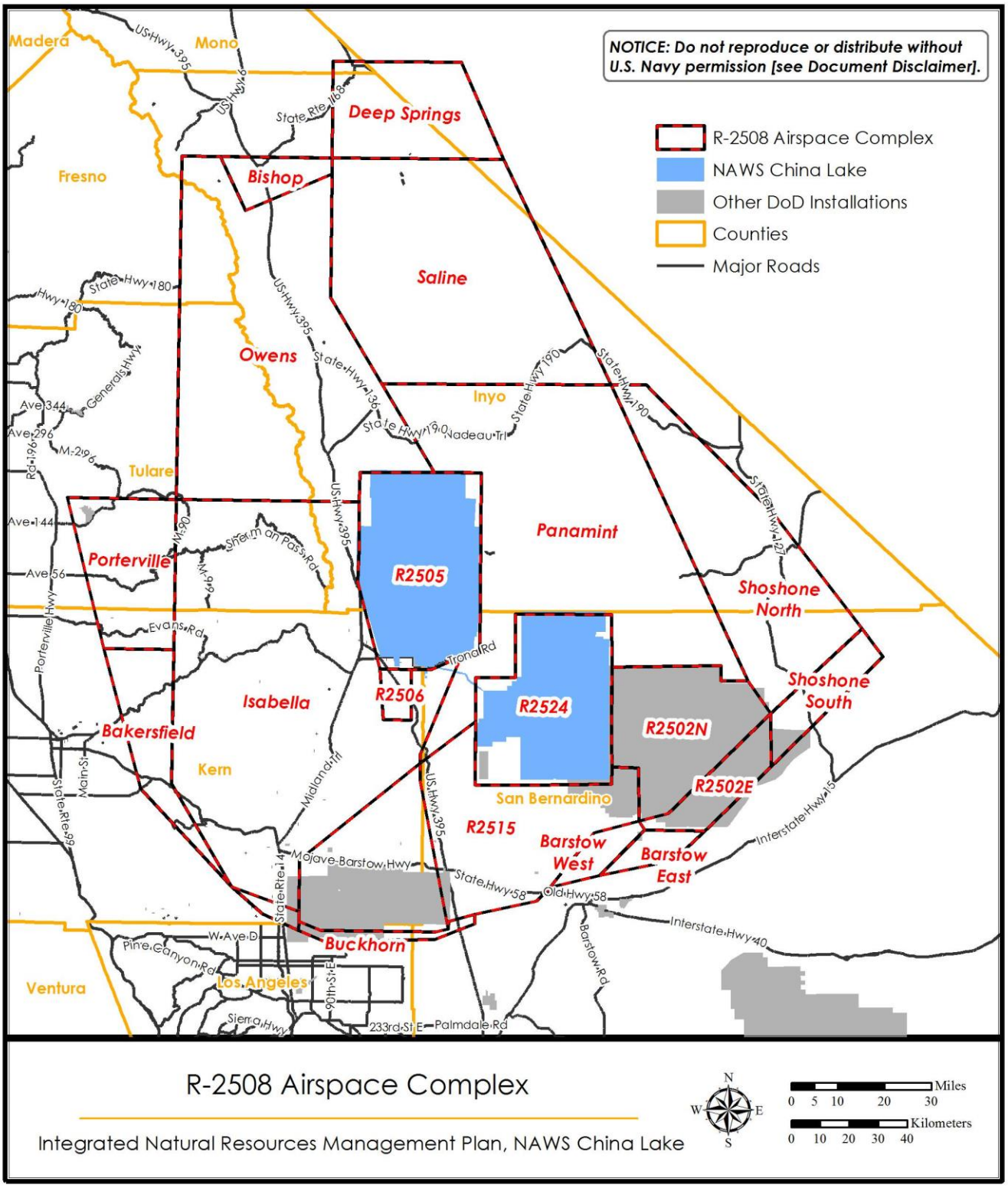
The R-2508 Complex is managed by the R-2508 Joint Policy and Planning Board, which consists of the commander of the NAWCWD, the Air Force Flight Test Center at Edwards Air Force Base, and NTC Fort Irwin. The responsibilities of the Board include overall operational policy and joint management and control of military activities within the Complex (Navy 2007b).

MOAs are areas of airspace used to conduct non-hazardous aviation training activities and RDAT&E of weapon systems technology. Low altitude navigation training, aerial refueling, formation and tactics training, air combat maneuvering, air-to-air intercepts, simulated close air support, and forward air controller training are representative of the type of activities typically conducted in MOA airspace. MOAs may be used by aircraft as staging areas for test or training activities before entering restricted airspace on approach to ground targets. There are five MOAs located within the R-2508 Complex, and six MOAs located on the periphery. The five MOAs located within R-2508 are Saline, Panamint, Isabella, Owens, and Bishop. MOAs on the periphery of the Complex include Shoshone, Barstow, Buckhorn, Bakersfield, Porterville, and Deep Springs. The floor of the MOAs in the R-2508 Complex is 200 feet above ground level and the ceiling is at 18,000 feet above mean sea level (Navy 2007b).

RAs are three-dimensional areas of airspace established by the Federal Aviation Administration to support special aircraft flight activities. Typically, RAs support such activities as military aviation training and other military-related operations, including air-to-ground and ground-to-ground ordnance training. RAs separate and segregate these activities from other, non-participating aircraft. RAs are used only by permitted military aircraft, during scheduled hours. Other military air traffic, along with civilian air traffic, is not authorized to enter the RA when it is in use.

There are seven RAs within the Complex, including the shared-use R-2508 (Navy 2007b). Armitage Airfield is located in R-2505, one of the seven restricted airspace areas in the R-2508 Complex. In addition to the airfield, R-2505 contains aerial bombing ranges, a guided missile range, and several ground ranges and other specialized areas. R-2505 airspace is scheduled through the NAWCWD Land Range Test Planning Office. All aircraft utilizing R-2505 are required to coordinate with the NAWCWD Airspace Surveillance Center. The Center informs the aircraft to contact the appropriate test conductor and continues to monitor the frequency and radar (Navy 2007b).

ATCAA is the airspace between the top of the MOAs and the base of the R-2508 Complex. ATCAAs are also located above most of the peripheral MOAs to allow additional areas for segregation of military operations from Instrument Flight Rule traffic. Isabella and Panamint ATCAAs are set up within the boundaries of several RAs to be used as an air traffic control aid when the RAs are not active (Navy 2007b).



Map 2-5. The R-2508 Airspace Complex at Naval Air Weapons Stations China Lake.

2.3.12.2 Civilian Airspace

In addition to military uses, civilian airports and commercial jet routes are located within the vicinity of the R-2508 Complex. Commercial and general aviation aircraft operate under Visual Flight Rule conditions in the Complex's MOAs, while remaining clear of RAs. Certain operators (such as Inyokern Airport) operate within the Complex on a non-interference basis. Other air carriers and civilian aircraft, flying under Instrument Flight Rule conditions, normally operate on structured routes on all sides of the R-2508 Complex. These routes include the main east-west high altitude structure entering the Los Angeles basin south of the Complex and a major north-south structure to the west. Real time coordination of the various airspace users allows daily use of the airspace without impacting NAWS-CL mission requirements (Navy 2007b).

Twenty-five civilian airports are located either within or in the vicinity of the R-2508 Complex. Inyokern and Trona airports are located nearest Armitage Airfield. The Inyokern Airport provides commercial service and has three paved runways, the longest of which is approximately 7,100 feet. The airport is located within the Isabella MOA, just to the west of R-2505 and R-2506. The Trona Airport is a general aviation airport that has a single paved runway, approximately 4,300 feet long; it is located in the Panamint MOA between R-2505 and R-2524. There are no active operational agreements between NAWS-CL and the Inyokern or Trona Airports (Navy 2007b).

2.4 Other Land Uses

The Navy may accommodate nonmilitary land use that does not adversely affect military operations or create safety, security, fiscal, or regulatory concerns. These considerations apply to all nonmilitary use currently or potentially accommodated on NAWS-CL lands. At the discretion of the Commanding Officer, nonmilitary use will continue to be accommodated on a case-by-case basis when practicable. Because of safety and security concerns, public access will continue to be limited to certain areas and will be a privilege granted by the Commanding Officer. The NAWS-CL Public Access Policy outlines the procedures, restrictions, and conditions for public access to the Station lands (Navy 2005).

2.4.1 Military Family Housing Areas

The Family Housing Office maintains 192 units, including Sagebrush Canyon (also known as Capehart A), which consists of 172 single-family homes, and the 20 units of Senior Officers Quarters, including one flag unit designated for generals or admirals. The Senior Officers Quarters buildings have been recommended eligible as a historic district (Navy 2004a).

2.4.2 Landscaping

Developed grounds at Mainsite are usually landscaped. The vegetation species used for horticultural purposes on these developed grounds must be included on an approved plant list and comply with specific conditions of use. The approved plant list is current as of 20 January 2008 and is included in Appendix G as a reference. The conditions for using species on the plant list for landscaping include:

- For each project, California native species from the approved plant list shall constitute a minimum of 60% of the number of plants within each stratum (herb, shrub, and tree). Other drought tolerant species from this list shall constitute the remainder of the plant material (a maximum of 40% in each stratum of herb, shrub, and tree) for each project. A higher proportion of natives may be required for projects within or adjacent to natural areas. The Navy will make the determination of whether cultivars are considered native or exotic on a project-by-project basis.

- It is vital that coordination with the Navy occur early in the planning process to determine site-specific needs and constraints. Please note that not all species on this list are appropriate for all settings. For example, in some areas trees may not be approved due to Bird/Animal Aircraft Strike Hazard risks and/or the presence of federally listed species.
- Additional native and non-native drought-tolerant species may be included in the landscape design (and potentially added to the approved plant list) contingent upon the approval of the Navy. Additional species must be identified early in the planning stages of the project design.
- All plants shall be verified for availability in size and quantities needed for each project prior to specifying on plans or scopes of work.
- All plants on the current California Invasive Plant Council Invasive Plant Inventory (California Invasive Plant Council 2006) and all non-native grasses (except those used for turf/lawns or those included in the approved plant list) are unacceptable.
- To protect wildlife and possible nesting habitats and to avoid violations of the Migratory Bird Treaty Act, existing mature trees shall not be removed without prior consultation and approval from the installation biologist.

2.4.3 Real Estate Outgrants

The encumbrances and outgrants on NAWS-CL lands can be characterized as either easements, leases, permits, licenses, Memoranda of Understanding, or Letters of Understanding. An outline of outgrant arrangements and land assets for the NAWS-CL Station can be found in Section 1.3. Easements are considered on a case-by-case basis. They are processed according to established Station procedures among NAWS-CL, the proponent, and the BLM, as appropriate.

Easements are described in Section 1.3. The following presents two of the major or commonly occurring commercial activities accommodated at NAWS-CL.

Geothermal Production. Development of the geothermal power-generating potential of 3,000 acres within the 72,640-acre Coso KGRA by California Energy Co., under contract with the Navy, began with the siting of four wells in early 1981. Geothermal production within the Coso KGRA continues, as authorized by the CDPA and in accordance with the Navy Private/Public Venture Contract and the Memorandum of Agreement between the Navy and the BLM. The Coso KGRA currently supports a commercially developed geothermal field producing over 250 MW of electricity. NAWS-CL will continue to administer and manage this major geothermal resource, located within Station boundaries on the western boundary of the North Range.

Commercial Filming. Commercial filming activities on the North and South Ranges are considered on a case-by-case basis, provided these activities do not conflict with mission requirements or sensitive biological and cultural resources. All access complies with the NAWS-CL Public Access Policy (see Appendix B).

2.4.4 Installation Restoration Sites

In 1980, the DoD initiated the Installation Restoration Program (IRP) to identify, investigate, and clean up or control the release of hazardous substances from past waste disposal operations and hazardous material spills at military facilities. Concurrent with formation of the IRP, Congress passed the Comprehensive Environmental Response, Compensation, and Liability Act in December 1980, which directed the U.S. Environmental Protection Agency to develop and implement a comprehensive national program to manage past disposal sites on private property. The Superfund Amendments and Reauthorization Act expanded the Comprehensive Environmental Response,

Compensation, and Liability Act to cover federal facilities under the Defense Environmental Restoration Program (DERP). This provides funding and management structures for the IRP, building demolition, and hazardous waste minimization. In September 2001, the DoD added the Military Munitions Response Program (MMRP) to the DERP in order to manage environmental responses to unexploded ordnance, discarded military munitions, and munitions constituents. The DERP provides for compliance with Comprehensive Environmental Response, Compensation, and Liability Act requirements, as amended by the Superfund Amendments and Reauthorization Act, as well as regulations issued under these acts or by state law. The DERP also complies with applicable, or relevant and appropriate, regulations under other federal, state, and local environmental laws. OPNAVINST 5090.1C CH-1 provides Navy policy for identifying, investigating, and restoring contaminated sites (Navy 2004a).

NAWS-CL is assessing and remediating areas of past contamination on its ranges through the IRP. As a result of two installation-wide Preliminary Assessments, 80 IRP sites have been identified and investigated (Appendix H). One site, known as IRP Site 80, Area of Concern (AOC), encompasses more than 200 small locations throughout NAWS-CL. Of the 80 IRP sites, Site Closeout has been reached at five sites, Response Complete at ten sites and Remedy in Place at 22 sites. The investigations are at various stages, from preparation of work plans, through fieldwork (including soil and groundwater sampling), to completion of technical memoranda documenting the results. Feasibility studies may be conducted if the investigation concludes that the contamination requires remediation (Navy 2004a).

Smaller areas of potential contamination are investigated as AOCs under IRP Site 80. As of fiscal year 2011, all 61 AOCs have undergone preliminary investigations and the sites have been ranked for prioritization for further assessment, as needed. These AOC sites are generally considered low priority and, at present, none have been elevated to formal IRP sites. It is anticipated that limited response actions would be necessary for these sites to facilitate closure. AOC sites that are co-located within IRP site footprints are addressed as part of the larger IRP response actions.

Five MMRP sites have been identified at NAWS-CL. MMRP sites can only be located in areas designated as "other than operational ranges," so the majority of NAWS-CL is excluded from the MMRP. The five sites are located in the Armitage Airfield land use management unit. Preliminary Assessments and Site Inspections have been completed for all five sites. One site has reached the Response Complete stage; the other four sites will require further action.

2.4.5 Recreation

Station employees and dependents can enjoy recreational opportunities associated with the housing area, such as a full-service gymnasium, several swimming pools, baseball fields, parks, tennis courts, horse stables and horseback riding on adjacent trails, a bowling alley, bike paths, etc. A radio controlled airplane flying facility is also located on NAWS-CL. These activities are privately sponsored in areas open to the public, such as the stables, and Mirror Lake and Satellite Lake playas. The Sierra Desert Gun Club and the Trap and Skeet Club use a facility south of Armitage Airfield.

A former overnight campsite at Bircham Springs was burned in a fire and could be re-opened if rehabilitated.

Hunting Program. Chukar (*Alectoris chukar*) hunting is open to the public and occurs during the regular Chukar hunting season established by the state of California, typically running from the third Saturday in October through the last Saturday in January. The hunting program is operated in cooperation with the California Department of Fish and Wildlife. Hunting operates on-Station in accordance with California Upland Game Bird regulations. The use of hunting dogs is permitted during the hunt as long as dogs are under control at all times. Parking is allowed only in designated areas around the periphery of the hunting area.

An Environmental Assessment was prepared to establish a Chukar hunting program on the North Range of NAWS-CL in 2005. Consistent with the use of military stations to ensure the preparedness of the Armed Forces, the Sikes Act (as amended) (16 USC Sections 670a et seq.) requires the development and implementation of a natural resources program for the Station and specifically requires that it provide for "sustainable multipurpose use of resources, which shall include hunting, fishing, trapping, and non-consumptive uses." Accordingly, the Navy allows no more than 24 hunters per hunt aboard the Station to hunt on 12,718 acres (2% of NAWS-CL land) for up to eight hunt days total.

Prior to the 2005 hunting season, hunting on-Station had not occurred since 1988. This hunting program has been determined to be appropriate and compatible with current land use practices and does not interfere with the overall military purpose. On-site monitors are present and briefings are required regarding environmental protection and safety measures in order to minimize any potential impacts to biological and other resources.

Bird Watching. Members of the Kerncrest Chapter of the Audubon Society are sponsored by the Environmental Management Division and allowed access to the Wastewater Treatment Facility ponds, Mainsite, and G-1 Seep for birding. The ponds provide nesting and foraging resources for large numbers of waterfowl and shorebirds. The Kerncrest Chapter conducts annual Christmas bird counts and Spring Bird-a-thons, during which members document all avian species observed. This information, along with bird species lists for the IWV, is provided to Environmental Management Division personnel in annual or post event reports.

Hiking. Hiking is permitted on existing roads and is generally performed by personnel with authorized access to the North Range areas. Hiking on the established dirt trails at B Mountain is allowed for Station employees with proper area access.

Equestrian Use. Equestrian use of the G-Corridor is permitted on established dirt roads and trails for informal use and during formal public events scheduled by the BLM, provided such use does not conflict with mission requirements. A working horse stable is present. The area currently used for equestrian activities has been extensively disturbed by housing and other developments previously located in this area. While the area is near low-density Mohave Desert Tortoise (*Gopherus agassizii*) habitat (i.e. 0 to 20 tortoise per square mile), it is also adjacent to rural housing areas. The existing trail, which is on unimproved dirt roadways, is not considered viable tortoise habitat. While the likelihood of a tortoise on the trail is fairly remote, equestrians can easily avoid tortoise by traversing the trail. To date no tortoise encounters have been reported to, nor observed by, NAWS-CL staff (Navy 2004a).

Off-Road Vehicle Use. Off-road vehicle (ORV) use is restricted to two locations on-Station: Mirror Lake (for land-sailing vehicles) and a small section of the existing roadway to the South Range, the Randsburg Wash Access Road, for off-road motorcyclists. This is an approved crossing of the China Lake Road for ORV use of nearby BLM lands. Authorized off-road motorcycle activities are restricted to a limited area of previously disturbed portions of the Randsburg access road. Habitat in the area that crosses the Randsburg Road is highly disturbed and is a part of the BLM open area where ORV activities are authorized. Only BLM-sponsored events are authorized to access this portion of NAWS-CL lands. This area is an established roadway and a designated BLM ORV use area (Navy 2004a).

Photography. Requests for photographic activities are considered by the Station on a case-by-case basis. Participants in authorized photographic activities are given the NAWS-CL environmental briefing, and activities are limited to existing roadways and disturbed areas (Navy 2004a).

2.4.6 Public Access

The Sikes Act (as amended) and guidance documents state that the public may be allowed access to DoD lands. DoD Instruction 4715.03 Environmental Conservation Program states that Integrated Natural Resources Management Plans shall describe areas and conditions appropriate for public access. These include:

1. Federal or state conservation officials shall be given access to DoD-controlled natural resources to conduct official business pursuant to applicable requirements of laws and regulations [e.g., section 1531 of the Sikes Act (as amended)] and a station's operational, security, and safety policies and procedures.
2. Military stations shall ensure, where practicable and when not in conflict with mission objectives or the Integrated Natural Resources Management Plan, that active and retired military service members and disabled veterans have access to its lands and waters for hunting, fishing, and non-consumptive use of wildlife.
3. Members of Native American tribes, bands, nations, pueblos, villages, or communities may have access to DoD sites and resources that are of religious importance, or that are important to the continuance of their cultures consistent with the military mission, Executive Order 13007, appropriate laws and regulations, and subject to safety and security. Members of federally recognized Indian tribes and organizations shall also have access to stations for the purposes of non-commercial gathering of botanical and mineral resources for traditional cultural use.
4. DoD stations shall be available to the public for hunting where such programs exist and when not in conflict with mission or environmental and natural resources conservation program goals.
5. Opportunities for public access shall be equitably and impartially allocated.

Hunting Program. Public use restrictions at NAWS-CL are primarily based on security and safety requirements and the capability of resources to withstand user impacts.

Scientific Research. The NAWS-CL policy is to allow access for certain areas of scientific research that benefit the Station. Such access is contingent on non-interference with operations commitments and is subject to cancellation without advanced notice due to operational or weather conditions.

Recreation. Access to Station areas for recreational purposes is allowed on a case-by-case basis, which normally are associated with Command-sanctioned events sponsored by local agencies and organizations. Although opportunities for outdoor recreation exist on the ranges, the following factors influence the amount and type of recreational activities:

- The NAWS-CL requirement for physical and information security due to its RDAT&E mission. In many areas visitors must either have permanent or interim security clearance or be under continuous escort by Station personnel.
- The physical safety of visitors. Much of NAWS-CL has been used for over 50 years for testing Navy weapons including ordnance.
- The protection of sensitive biological resources, such as federally listed species and unique habitats, and cultural resources such as petroglyphs and historic structures.

Little Petroglyph Canyon Tours. Petroglyph tours are conducted in the Little Petroglyph Canyon area of the Coso Range, in accordance with established procedures and supervised by guides trained and certified by NAWS-CL personnel. The number of visitors is controlled, limited to existing roads and trails, and collecting or damaging vegetation or harming wildlife is not allowed. Petroglyph tours provide visitors opportunities to witness

the extraordinary cultural resources of the Station. The only place unrestricted photography is allowed is in Little Petroglyph Canyon.

2.5 Future Land Use Patterns and Plans

The purpose of this section is to facilitate preparation of proactive conservation strategies for upcoming land uses. These projects or planning efforts may contribute to natural resource cumulative impacts in the future.

Of the six on-Station Military Construction projects discussed in the Comprehensive Land Use Management Plan EIS, two have been completed (P-407, Facility Upgrades at Weapons Survivability Lab and Junction Ranch; and P-455, Construction of Propellants and Explosives Laboratory); two were never implemented and canceled (P-515, construction of Base Operating Support Facility; and P-521, Runway, Taxiway and Parking Apron Repair); and two have not received funding and remain in a potentially pending status (P-529, Construction of Bachelor Quarters; and P-513, Construction of Electronic Combat Range Threat Dispersion Facility).

Table 2-6 lists Military Construction projects programmed for NAWS-CL as of May 2011. Table 2-7 lists some of the projects on the NNAWS-CL Operations and Maintenance "Integrated Project List" as of May 2011.

While NAWS-CL accommodates a wide range of Navy, DoD, and other customer test and training needs, some uses are not compatible with NAWS-CL operations (Navy 2004a).

Potentially cumulative projects and/or potentially relevant planning efforts off-station include the Desert Renewable Energy Conservation Plan, West Mojave Coordinated Management Plan, the Northern and Eastern Mojave Planning Efforts, the Timbisha Shoshone Land Study, highway projects, the expansion of NTC Fort Irwin, the Western Mojave Land Tenure Adjustment Project, and the Expansion of the Ridgecrest Wastewater Treatment Plant.

Table 2-6. Military construction projects programmed for Naval Air Weapons Station China Lake as of May 2011.

Projected Year	Project ID	Project Title	Capability Area	Provider Enterprise Component	Project Description
2018	P359	Air Traffic Control Tower	Airfield Operations	CNIC	Constructs a permanent (4,970 square feet [ft^2]), eight-story, free standing air traffic control tower and demolishes Building Numbers 20117 and 20162 for total demolition (demo) of 2,338 ft^2.
2021	P135	Unmanned Combat Air Vehicle Shelters	RDAT&E	Navy Acquisition Executive	Constructs four pre-engineered, insulated aircraft shelters, a support vehicle area, and taxiway/parking apron for Unmanned Combat Air Vehicles.
2024	P513	Electronic Combat Range	RDAT&E	CNIC	Constructs a research lab operation/storage facility and Threat Emitter Pads.
2027	P002	Explosive Ordnance Disposal Training and Evaluation Unite ONE Tactical Training Facility	Expeditionary Operations	CNIC	Builds new 24,402 ft^2 tactical training building, a 4,290 ft^2 vehicle maintenance building, and an 18,000 ft^2 operational trainer building.
2035	P008	Airfield Fire/Rescue Facility	Base Support	CNIC	Constructs new Fire Rescue Station at airfield.
2035	P805	Replace Main Site Fire Station	Base Support	CNIC	Replaces Fire Station at Mainsite.

Projected Year	Project ID	Project Title	Capability Area	Provider Enterprise Component	Project Description
2035	P005	Aircraft Systems/ Weapons Integration Lab	RDAT&E	CNIC	Constructs facility to meet existing/future needs of VX-9 and demolishes Building Numbers 20003, 20043, 20227, 20246.
2038	P529	Bachelors Quarters	Sailor & Family Readiness	CNIC	Constructs 93,775 ft^2, single story complex Bachelor Enlisted Quarters facilities to DoD Market-Style standards and demolishes old Bachelors Quarters Building Numbers 01394, 01395 and 01396 (70,080 ft^2 total).
2029	P356	Child Development Center	Sailor & Family Readiness	CNIC	Constructs a new one-story (20,255 ft^2) Child Development Center and demolishes Bldg. No. 02688, the current modular Child Development Center (total demo of 19,080 ft^2).
2040	P006	Rotary/Fixed Wind Aircraft Parking Aprons	RDAT&E	CNIC	Constructs aircraft parking aprons for both rotary and fixed wing aircraft.
2041	P527	Missile Magazines	Ordnance/ Weapons Operations	CNIC	Constructs two "Type E" magazines (5,414 ft^2) and demolishes four magazines: Building Numbers 31021, 31022, 31023 and 31024 (1,421 ft^2 total).
2044	P010	Unmanned Aerial System (UAS), System Integration & Weaponization Support Facility	RDAT&E	Navy Acquisition Executive	Constructs 85,928 ft2 Life Cycle Support, Systems Integration and Weaponization Research, Development, Test and Evaluation laboratories and hangar in support of UAS programs. The facility houses maintenance operations and administrative spaces for various air vehicles: Broad Area Maritime Surveillance Acquisition Category 1; Vertical Takeoff UAS Acquisition Category 1; Small Tactical UAS Acquisition Category 3 and associated support equipment; Weapons and Systems Integration laboratories; UAS Family of Systems Life Cycle Support functions; Tactical Control System Development and Life Cycle Support; Advanced Systems Development and Support; and UAS RDAT&E. Construction includes taxiway, aircraft parking apron, line shelter, and command and control antenna platform.
2044	P004	Security Enhancements to Entry Control Facilities	Base Support	CNIC	Configures to meet anti-terrorism/force protection standards.
2047	P809	Consolidated Warehouse	Base Support	CNIC	Consolidates aging supply warehouses and builds new, modern, and more efficient warehouse spaces.

Table 2-7. Some of the projects on the Naval Air Weapons Station China Lake Operations and Maintenance "Integrated Project List" as of May 2011. Projects that appeared related to building interiors, to the exteriors of structures, or to repairs in the same footprint as the targeted repair are not listed.

Project Number	Program	Project Title		Project Number	Program	Project Title
RM034-05 2/11	Air Operations	Repair Airfield Lighting Power Distribution		RM043-08 3/11	Public Safety	Replace Darwin Gate and Fence
ST012-06 2/11	Air Operations	Reconstruct Runway 21 Approach, Taxiway & Aircraft High Power Check Facility		RM044-08 3/11	Public Safety	Repair/Construct Fence at South Range Boundary
ST10-7492 2/11	Air Operations	Asphalt Repairs, Runway 14-32		RM005-07 3/11	Facilities	Repair by Reconstruction, Bowen Road
ST10-8105 2/11	Air Operations	Asphalt Overlay, Runway 3-21		Updated 3/11	Facilities	Repair Aviation and Neptune Roads
ST10-8103 2/11	Air Operations	Asphalt Overlay, RW 8-26		Updated 3/11	Facilities	Repair Skyhawk, Intruder Roads & Hazardous Waste Facility Asphalt
RM013-06 2/11	Air Operations	Reconstruct Runway 26 Approach & Taxiway		Updated 3/11	Facilities	Demolish Excess Storage Facilities, Public Works Compound
RM007-06 2/11	Air Operations	Repair Aircraft Parking Apron Pavements		Updated 3/11	Public Safety	Provide Power at Small Arms Range
RM10-7494 3/11	Facilities	Alteration to Intersection Bullard & Inyokern Roads		Updated 3/11	Air Operations	Repair Runway Light Fixtures
ST017-07 3/11	Facilities	Repair Nimitz & Poleline Roads, Airfield		Updated 4/11	Weapons	Replace Hoist
ST10-5224 5/11	Facilities	Repair Richmon Road		Updated 3/11	Logistics	Install Fencing West Side
ST018-07 5/11	Facilities	Repair Sandquist & Water Roads		Updated 5/11	Air Operations	Precision Approach Path Indicator for Runways 14 & 32
RM11-9463 5/11	Public Safety	Construct Apparatus Bay for Heavy Rescue Vehicle, Bldg. No. 00878		Updated 5/11	Air Operations	Airfield Operational Concrete Spall Repair
RM11-9463 5/11	Weapons	Repair Asphalt, Bldg. No. 31044		Updated 5/11	Air Operations	Re-Grade Dirt Overrun, Runway 26
RM11-4222 5/11	Public Safety	Main Gate Barrier Enhancement		Updated 5/11	Air Operations	Construct (2) Gates
SP#? 5/11	Public Safety	Modifications to Pass/Decal Office		Updated 4/11	Facilities	Repair AF Roads (Storm Damage)
NF09-0958 3/11	Air Operations	Construct Aircraft Parking Apron Between Hangars 1 & 2		Updated 3/11	Facilities	Demolish Bldg. 15991
SP#? 3/11	Public Safety	Sandquist Gate/Road Enhancements		Updated 5/11	Facilities	Repair Monterey Road
DE09-0214 5/11	Facilities	Demolish Various Buildings, China Lake Propulsion Laboratory		Updated 5/11	Facilities	Repair Gold Canyon Road
DE024-07 5/11	Facilities	Demolish Station Theatre		Updated 3/11	Logistics	Install Fencing West Side
DE09-0028 5/11	Facilities	Demolish Various World War II Structures		Updated 3/11	Air Operations	Provide Bird Netting
TBD 3/11	Public Safety	Combined K-9 Dog Kennel/Vet Treatment and Training Yard, Joint ASF/IS# EDD		Updated 5/11	Public Safety	Engineering Study to Develop Barrier Layouts
TBD 3/11	Public Safety	New Indoor Shooting Range		Updated 12/10	Public Safety	Study to Repair Water System Vulnerability

Project Number	Program	Project Title		Project Number	Program	Project Title
TBD 3/11	Public Safety	New Training Classroom		Updated 12/10	Logistics	Hazardous Material (Hazmat) Storage Space
TBD 3/11	Communications Support	Repairs and Upgrades, Schoeffel Field		Updated 12/10	Facilities	Move NMOI
TBD 3/11	Communications Support	New Running Trail		Updated 4/11	Communications Support	Construct Mini-Water Park at Oasis Pool
TBD 3/11	Logistics	Construct Asphalt, Recycling Yard		Updated 2/10	Public Safety	Construct AC Parking Lot, Public Safety, Bldg. 02653
SP? 5/11	Facilities	Repair Darwin Road		Updated 10/08	Command	Stormwater Engineering Study, Main Gate Area
DE10-9113 3/11	Facilities	Demolish Various Buildings, Airfield		Updated 1/10	Public Safety	New Bike Path
DE10-9569 3/11	Facilities	Demolish Various Buildings, Airfield		Updated 6/07	Communications Support	Construct Skate Park Next To Castle X
DE10-9570 3/11	Facilities	Demolish Various Buildings, Airfield		Updated 3/10	Weapons	Construct Ready Service Magazine, Airfield

2.6 Overview of Government Regulatory Context of Natural Resources Management

Appendix B includes a detailed listing of the government regulatory context of natural resources management. A detailed discussion of regulations and Navy instructions dealing with the Sikes Act (Sikes Act, Public Law 86-797 [16 USC §§ 670 - 670f], DoD Instruction 4715.03, OPNAVINST 5090.1C CH-1 [30 October 2007], NAVFAC P-73, Volume II) are discussed in this section. Additionally, please refer to this section for a detailed discussion of laws/regulations dealing with natural and cultural resources, including but not limited to: Endangered Species Act, Migratory Bird Treaty Act, DoD Migratory Bird Rule and Guidance, National Environmental Policy Act of 1969, Public Law 91-190 (42 USC §§ 4321-4370D), and National Historic Preservation Act.

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3.0 Status of Natural Resources, Their Current Management and Management Issues

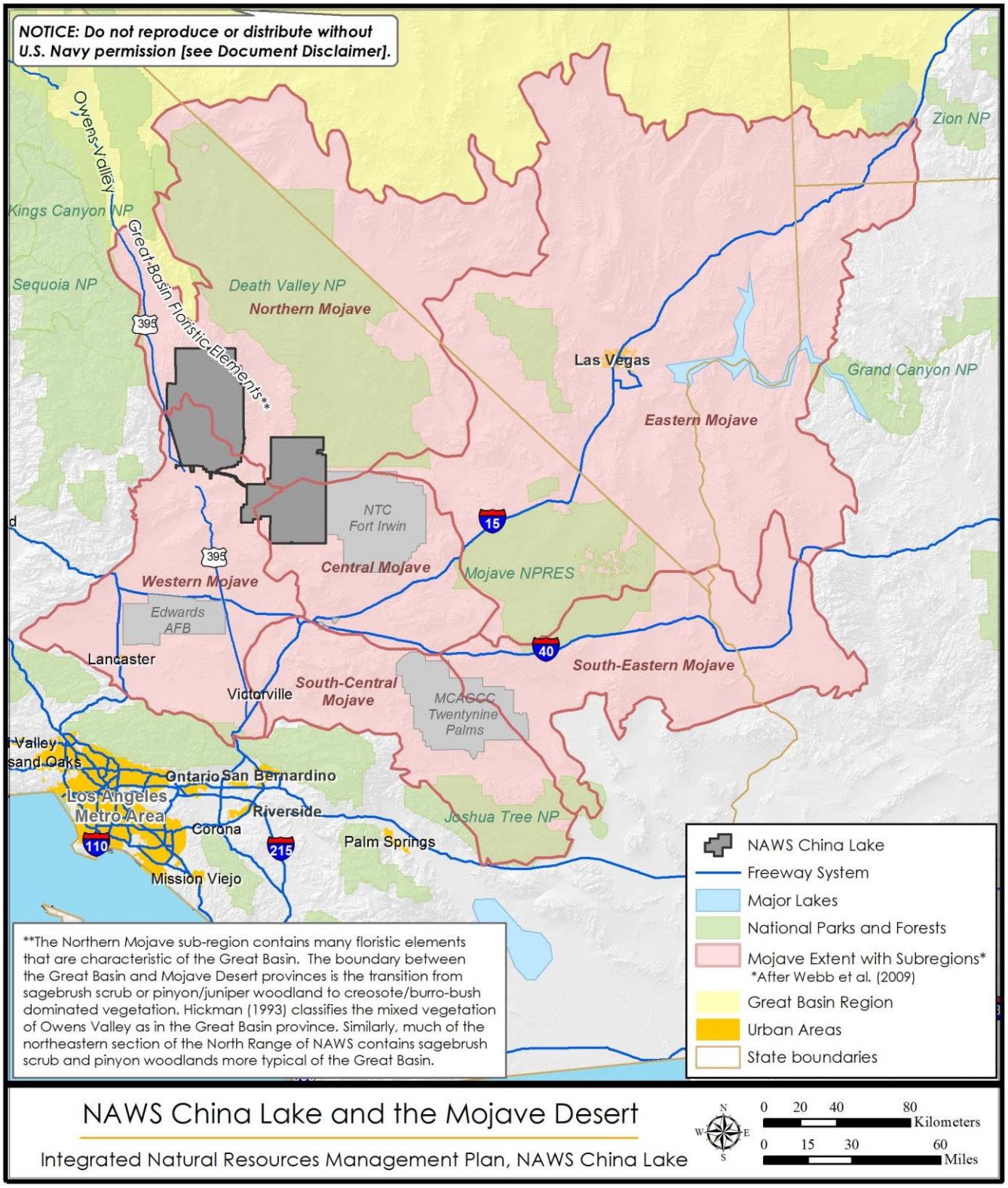
This chapter describes the natural resources of Naval Air Weapons Station China Lake and the status and condition of these resources. It also describes their current management context. Future management strategies are described in chapters to follow.

3.1 Ecoregional Setting

Naval Air Weapons Station China Lake's (NAWS-CL) ranges extend over 1.1 million acres, mostly located within the Mojave Desert ecoregion. The northernmost portion lies within the Great Basin Desert province and is generally colder and receives a greater proportion of annual precipitation as snow (Schoenherr 1992). The ranges encompass a transition zone in which the habitats and plant communities of the two deserts form a patchy ecotone, which is most distinct when elevation gradients are strong. The Mojave Desert is further divided into six subregions depending on the topography and the amount of rainfall received each season (Webb et al. 2009a). NAWS-CL lies in portions of three of these subregions: the northern Mojave, the central Mojave, and the western Mojave (see Map 3-1).

This ecoregion experiences hot, dry summers and cool winters. It receives most of its precipitation during the winter, primarily as rain, though the higher elevations experience regular snowfall (see Section 3.2). The majority of the Mojave Desert does not receive more than 6 inches of rain annually (MacMahon 1985) with the mean rainfall in the China Lake area of 3 to 4.5 inches; however, high elevations may receive up to 31 inches annually. China Lake's rainfall level follows this same pattern with lower elevations receiving relatively little rain and mountains receiving substantially more.

The diversity of animals and plants is much greater in the Mojave Desert than in the larger Great Basin Desert, most likely due to a longer growing season in the Mojave Desert (MacMahon 1985). In some areas, over 80% of spring and summer blooming annuals are species that are endemic to the Mojave Desert (MacMahon 1985). Areas near water sources, such as springs and washes, typically contain a greater diversity of plants and animals. The Mojave Desert is relatively young. It supported lusher flora and contained numerous large lakes and meandering rivers as recently as 8,000 years ago (Rowlands 1995). Consequently, mountains have become isolated refuges for many plants and animals as the climate of the region became warmer and drier. This will potentially continue because of climate change.



Map 3-1. Subregion boundaries within the Mojave Desert, including national park and military reserve boundaries. The subregion boundaries are based on Bailey (1995) and Wiken (1986).

The landscape of NAWS-CL is most visibly characterized by geologic expanses of peaks, lava flows, canyons, dry washes, sand dunes, and gently sloping bajadas terminating in playas. Variations in elevation and latitude, soil composition and different orientations to the wind and sun, along with desert springs and moist seeps, provide isolated microclimates and specialized habitats within this arid matrix. The diverse landscape has allowed the evolution of specially adapted species of plants and wildlife. A key ecosystem value of the NAWS-CL landscape is its sheer size, allowing an unparalleled capacity for military testing and research, as well as intact wildlife habitat and plant community existence. Clean air, secure and contiguous boundaries with adequate buffers, relatively low levels of human settlement and recreational pressure contribute to the military and natural resources values. NAWS-CL also has a very strong link to its human cultural context, including protection of world-class examples of petroglyphs and other archaeological assets.

In the following descriptions, the nomenclature used for wildlife species may not be consistent with the sources identified, due to the need for consistency with resource agency nomenclature. Amphibian and reptile nomenclature is from the San Diego Natural History Museum Field Guide and based on Crother (2000). All avian nomenclature is based on the American Ornithologists Union Checklist of North American Birds, except that bird names are not capitalized. Mammal nomenclature is based on the Smithsonian Institution's Mammal Species of the World (Wilson and Reeder 1993).

NAWS-CL is home to several species of endemic beetles and butterflies, Mohave tui chub (*Siphateles bicolor mohavensis*), Golden Eagle (*Aquila chrysaetos*), Inyo California Towhee (*Pipilo crissalis eremophilus*), a variety of waterbirds, Mohave Desert Tortoise (*Gopherus agassizii*), Rosy Boa (*Lichanura trivirgata*), Desert Horned Lizard (*Phrynosoma platyrhinos*), Eastern Collared Lizard (*Crotaphytus collaris*), Long-nosed Leopard Lizard (*Gambelia wislizenii*), bats, Mohave ground squirrel (*Spermophilus mohavensis*), kangaroo rats (*Dipodomys* spp.), voles (*Microtus spp*.), bobcat (*Lynx rufus*), kit fox (*Vulpes macrotis*), mule deer *(Odocoileus hemionus*), feral horse (*Equus caballus*), mountain lion (*Puma concolor*), and bighorn sheep (*Ovis canadensis*). Both groundwater-dependent vegetation and species support biodiversity immediately at the water source and influence a wide area. There are likely species yet to be discovered around the 120 springs and seeps on the Station (see Appendix F). A complete list of species known to occur on NAWS-CL can be found in Appendix I.

Current Management with an Ecosystem Approach

The NAWS-CL natural resources program has adopted many elements of an ecosystem approach. The Comprehensive Land Use Management Plan (CLUMP) began a process of examining land use on a Station-wide basis. This included improved habitat understanding and wildlife habitat conservation and protection through the use of avoidance measures and education.

In the 2000 Integrated Natural Resources Management Plan (INRMP), NAWS-CL adopted a system for identifying sensitive habitats, as well as wildlife and plant species to consider in land-use planning. The habitats identified are as follows:

- Aquatic and riparian areas and surrounding habitat, such as canyon slopes near Mill, Moscow, Wilson, and Margaret Ann springs
- Areas of dense Joshua Tree Woodland, such as Upper Mountain Springs Canyon and southwest China Garden Spring
- Dense perennial grass associations, such as in Grass Valley, big galleta grass (*Hilaria rigida*) near Goldstone, *Poa* stands, deer grass (*Muhlenbergia rigens*), Parish's needlegrass (*Stipa parishii* var. *parishii*), and James galleta grass (*Hilaria jamesii*)

- High elevation dry lakes, pools, and lacustrine basins, such as Carricut Lake, El Conejo Gate, and lava flow pools
- Juniper areas, such as southwest of Coso Peak and Mariposa Mine
- Concentrations of cactus, such as west of Argus Sterling Mine
- High elevation lava flow mesas, such as Birchum Mesa, the Coso Peak area, and low sage formations with mariposa lilies (*Calochortus* spp.)
- Desert pavements
- Sand fields and dunes
- Dolomite/marble formations
- Cinder formations
- Felsic outcrops, dikes and ridges
- High elevation caliche formations

Other ongoing ecosystem approach elements include:

- Habitat protection through fencing of riparian areas
- Feral horse and burro (*Equus asinus*) removal
- Invasive species irradication measures
- Routine monitoring of federally listed, protected, and sensitive species and their habitats (see Appendix J)
- Participation in regional groundwater monitoring
- Interagency partnerships and partnerships with local organizations to manage and monitor natural resources

Management Issues for Implementing the Ecosystem Approach

Ecosystem management became a national initiative in the 1990s as a reaction to deficiencies of species-based and agency-by-agency approaches. An inter-agency Memorandum of Understanding (MOU) (1995) was signed by the U.S. Department of Defense (DoD), along with 14 other agencies, in an attempt to create a more consistent approach to ecosystem management among federal agencies, enhance coordination, and to encourage more regional ecosystem initiatives (Council on Environmental Quality et al. 1995).

The INRMP complies with federal guidelines regarding adoption of an ecosystem approach to land management. The Sikes Act (as amended) states that INRMP goals "shall be to maintain or develop an ecosystem-based conservation program..." The U.S. Department of the Navy (Navy) is required to ensure that ecosystem management is the basis for all management of DoD lands and waters (Office of the Under Secretary of Defense Memorandum of 08 August 1994, Implementation of Ecosystem Management in the Department of Defense). In addition, DoD Instruction (DoDI) 4715.03 defines ecosystem management as "a goal-driven approach to managing natural and cultural resources that supports present and future mission requirements; preserves ecosystem integrity; is at a scale compatible with natural processes; is cognizant of nature's timeframes; recognizes social and economic viability within functioning ecosystems; is adaptable to complex and changing requirements; and is realized through effective partnerships among private, local, State, tribal, and Federal interests. Ecosystem-based 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 a part of the whole."

The ten guiding principles of ecosystem management, as identified in DoD guidance (MOU on Fostering an Ecosystem Approach [1995]), include improving the sustainability of ecosystems; using ecological units and

timeframes; supporting sustainable uses; managing for ecosystem health; setting priorities and reconciling conflicts; coordinating with partner agencies; using best available science and data sources; using benchmarks to assess outcomes; adaptive management; and integration with multiple installation plans and programs. Additionally, the Navy adds that ecosystem-based management shall include a shift from single species to multiple species conservation (Naval Operations Instruction [OPNAVINST] 5090.1C CH-1).

Ecosystem integrity can be defined as a system wholeness that includes the presence of native species, populations, communities, occurrences of ecological processes at appropriate rates and scales, and the environmental conditions that support the species and ecological processes (Dale and Beyeler 2001). This requires maintaining, for example, ecological processes such as nutrient cycling in soil, disturbance regimes, and hydrological processes, within specific parameters (Lindenmayer et al. 2000).

To this end, DoD land managers are asked "whenever practicable" to: 1) Maintain or restore remaining native ecosystem types across their natural range of variation; 2) Maintain or reestablish viable populations of native species on an installation; 3) Maintain ecological processes; and 4) Manage and monitor resources over sufficiently long time periods to allow for adaptive management and assessment of changing ecosystem dynamics (i.e. incorporate a monitoring component to management plans) (DoDI 4715.03).

Furthermore, DoD land managers shall use Natural Resources Conservation Metrics to assess and report to the Deputy Undersecretary of the Defense for Installations and the Environment on INRMP implementation and measure conservation efforts with regard to ecosystem integrity by answering the following questions each year with its agency partners (U.S. Fish and Wildlife Service [USFWS] and California Department of Fish and Wildlife [CDFW][1]): 1) To what extent are the installation's native ecological systems currently intact? 2) In what ways are an installation's various habitats susceptible to change or damage from different stressors? 3) What stressors affect each habitat type?

DoD land managers shall use Natural Resources Conservation Metrics to assess and report to Deputy Undersecretary of the Defense for Installations and the Environment on INRMP implementation, and measure conservation efforts with regard to ecosystem integrity by answering the following questions each year with its agency partners (USFWS and CDFW): 1) To what extent are the installation's native ecological systems currently intact? 2) In what ways are an installation's various habitats susceptible to change or damage from different stressors? 3) What stressors affect each habitat type? (DoDI 4715.03).

Ecosystem processes in deserts are driven by water availability from highly variable annual precipitation as well as retained soil moisture. Mojave species tend to respond in a burst of activity after heavy rains, and then quickly return to a resting state (seed in annual plants, dormancy in perennials). The most critical soil resources for plants-water and nitrogen-are available in short, high-intensity bursts rather than continuously through the growing season (Loik et al. 2004).

While most management is focused upon high-profile species that require monitoring, such as federal and state listed species, they are often poor indicator species for several reasons. Populations at abnormally low levels may respond to environmental changes quite differently than if they were at higher population levels. Also, the species may not be widespread enough to experience the full range of environmental changes potentially experienced by a more widespread species. Indicator species should have healthy populations and sufficiently widespread and accessible to allow managers to detect changes in ecosystem processes, as well as the indicator species population.

The criteria for selecting an indicator species are (adapted from Noss 1990; Noss and Cooperrider 1994; Poiani et al. 2000; Carignan and Villard 2002; Sanderson et al. 2002):

- Species is indigenous or endemic.

[1] The California Department of Fish and Game changed their name January 1, 2013 to the California Department of Fish and Wildlife. For any citations/references of documents published before January 1, 2013, California Department of Fish and Game or CDFG, is used.

- Species is sensitive to management activities in the local or regional vicinity.
- Species is a year-long resident of the vicinity (non-migratory).
- Species is considered a keystone species or habitat specialist.
- Species is found in similar habitats across most or all of the planning area.
- It is biologically and economically feasible to monitor populations and habitat at a similar spatial scale.
- Populations have sufficient size or density to be reasonably detected and monitored.
- Population trend information is available or in the collection process.

Specific Management Issues

- NAWS-CL is too large to manage as a single unit for natural resources.
- Threats and vulnerabilities that can result in ecosystem-level degradation.
  - The fragmentation of land by human settlement or recreation activity beyond the borders of NAWS-CL can cause habitats or species at NAWS-CL to have heightened sensitivity at a regional conservation perspective.
  - Uncontrolled wildland fire and altered wildland fire cycles may degrade resource values.
  - Invasive species threaten wetlands and other areas and may alter the fire regime in a manner that causes habitat conversion, particularly in upland areas.
  - Climate change is expected to alter the distribution of species at the edges of their ranges, depending on the narrowness of the niche each species occupies.
  - Many desert species, such as land birds, have small breeding ranges, which makes them more vulnerable to habitat loss or degradation, such as Mountain Quail (*Oreortyx pictus*), LeConte's Thrasher (*Toxostoma lecontei*), and Inyo California Towhee.
- Monitoring is expensive and is a trade-off with other necessary natural resources work, such as fencing off springs to protect the water source from damage by feral ungulates.

3.2 Climate

3.2.1 Precipitation

The Mojave Desert is considered a cool or winter desert because most of its annual precipitation typically falls from November through March, with additional precipitation in October or April in some locations (Redmond 2009). Most remaining rain falls during the southwest monsoon from July through September. The Great Basin Desert, which is considered a cold desert, often receives measurable precipitation in each season, including some winter precipitation from the fronts that produce the Mojave Desert pattern, some summer rains from the Gulf of California, and some at other times from the storm fronts that provide precipitation to the Intermontane Region (Rundel and Gibson 1996).

In central and southern California, most water content of the air is lost over the western slopes of the Sierra Nevada or Transverse Ranges. Compressional heating of air descending into the desert basins further reduces relative humidity. Occasionally, a storm or rapid succession of storms sweeps into the Mojave Desert and brings light to moderate autumnal and winter precipitation for one to several days. Gusty winds and cool temperatures usually accompany such storms, and in the coolest areas precipitation may occur as snow (Rundel and Gibson 1996).

Infrequent summer precipitation occurs when the subtropical high is weakened, resulting in the monsoonal influx of moist air from either the Gulf of Mexico or the Gulf of California, bringing air flow from the south and east into the eastern Mojave Desert. Thermal heating of these humid air masses produces strong convectional storms, which can be enhanced by convergence or topography. Such convectional storms can bring brief but intense precipitation bouts to local areas.

Annual weather data from nine weather stations in the vicinity of NAWS-CL (Table 3-1; Map 3-2) show that rainfall varies greatly by elevation and among years (Figure 3-1). Precipitation averages about four inches at lower elevations (<3,000 feet), 6.2 inches at middle elevations (3,000-4,500 feet), and up to 9.3 inches at higher elevations (6,800 feet). Measurable precipitation occurs about 20-22 days per year. It snows an average of two to three days per year at the lower elevations (data are not available for higher elevations). Most rain falls in the winter and early spring (Figure 3-2) with thunderstorms occurring primarily during August and September.

3.2.2 Temperature

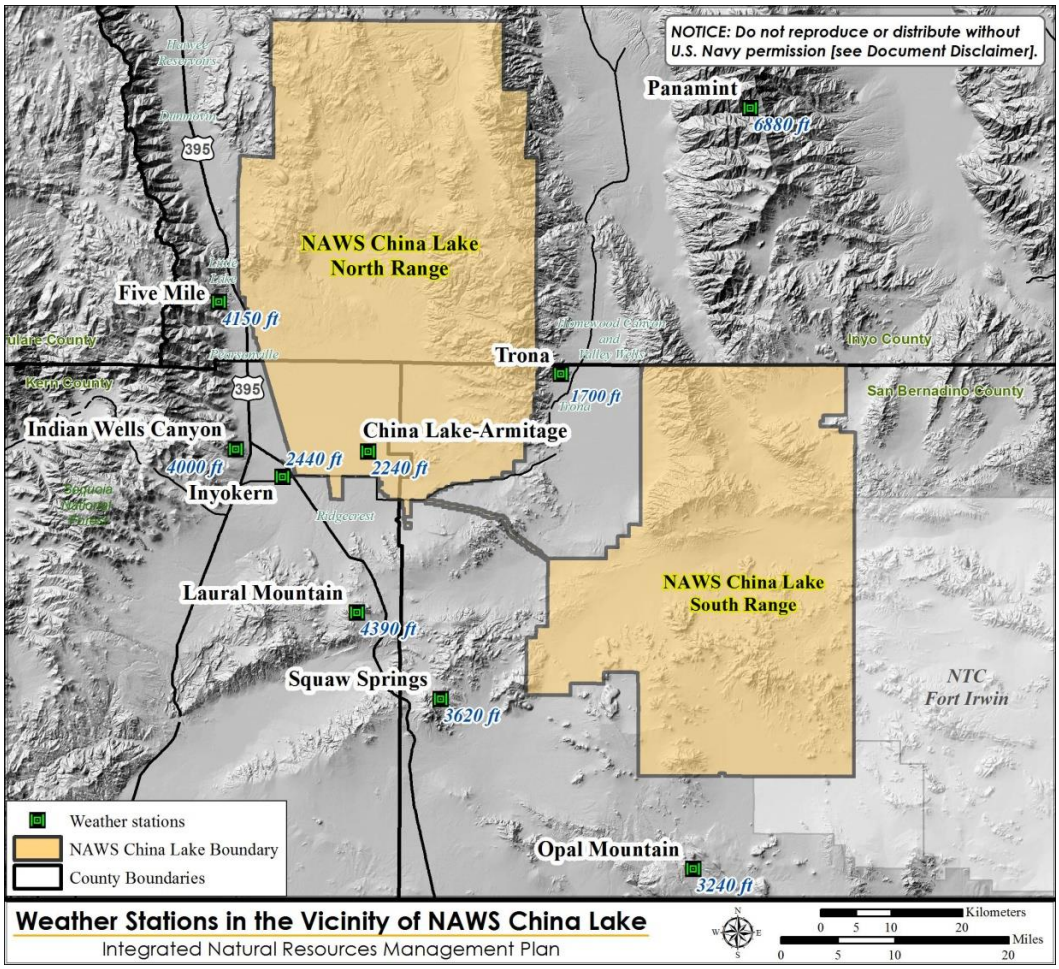
Figure 3-3 lists data from monthly climatic summaries from 1960-1993 specific to NAWS-CL. Summer daytime temperatures often exceed 100 degrees Fahrenheit (°F) (38 degrees Celsius [°C]), while summer nighttime temperatures drop into the 60s. Winter daytime temperatures average in the 50s, with winter nighttime temperatures in the 30s.

3.2.3 Wind Patterns

The topography of the Mojave Desert exerts a considerable influence on wind speed and direction. Winds flow through low mountain passes and gaps in the mountain ranges that surround NAWS-CL with the strongest winds occurring in late winter and early spring (Figure 3-4 and Figure 3-5).

*Table 3-1. Weather stations in the vicinity of Naval Air Weapons Station China Lake listed in order of increasing elevation. (*Metadata for these stations provide the precise lat-long coordinates in degrees and minutes.)*

Station Name	Data Source	Latitude	Longitude	Elevation (ft)	Period of Operation
Low Elevation (<3000 feet)					
Trona*	WRCC	35° 47	-117° 23’	1,700	Jan. 1920 - present
China Lake-Armitage*	WRCC	35° 41	-117° 41’	2,240	Jul. 1978 - Apr. 2009
Inyokern*	WRCC	35° 39	-117° 49’	2,440	Dec. 1940 - Jun. 2010
Mid-Elevation (3240 - 4390 feet)					
Opal Mtn.	RAWS	35° 09’ 15	-117° 10’ 32	3,240	Sep. 1991 - present
Squaw Springs	RAWS	35° 22’ 12	-117° 34’ 06	3,620	Sep. 1991 - present
Indian Wells Cyn.	RAWS	35° 41’ 06	-117° 53’ 22	4,000	Jan. 1996 - present
Five Mile	RAWS	35° 42’ 18	-117° 55’ 06	4,150	Jun. 1998 - present
Laural Mtn.	RAWS	35° 28’ 42	-117° 41’ 56	4,390	Jan. 1996 - present
High Elevation (6880 feet)					
Panamint	RAWS	36° 07’13	-117° 05’ 16	“6,880	Mar. 1988 - present
Data Sources: WRCC = Western Regional Climate Data Center, http://www.wrcc.dri.edu, accessed January 2011. RAWS = Remote Automated Weather Stations, http://www.raws.dri.edu (also accessible through WRCC), accessed January 2011.					



Map 3-2. Weather stations in the vicinity of Naval Air Weapons Station China Lake.

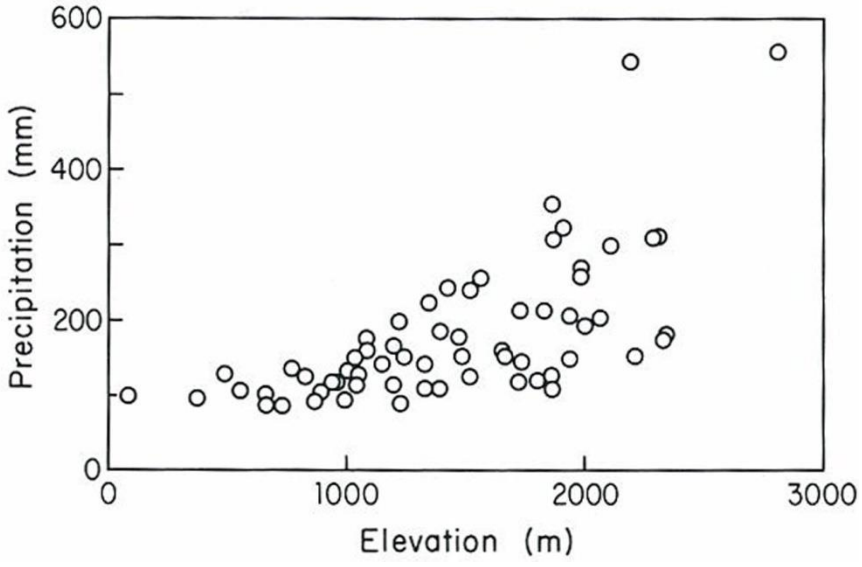


Figure 3-1. Precipitation by elevation in the region of Naval Air Weapons Station China Lake.

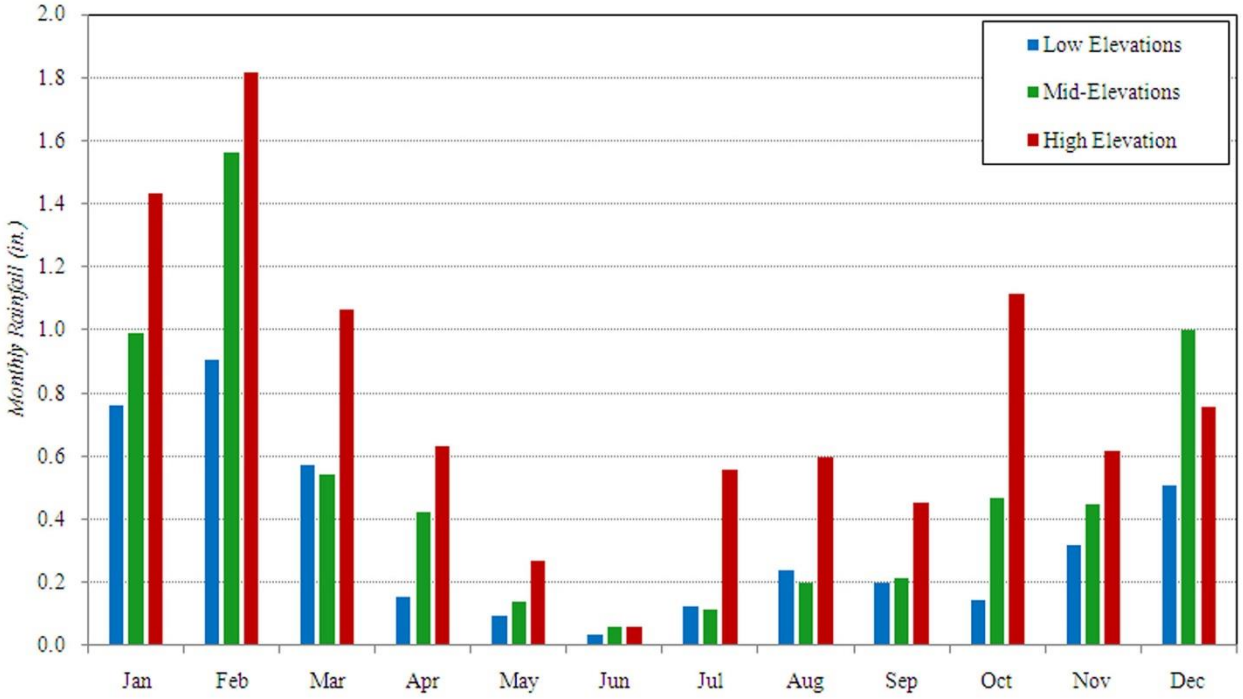


Figure 3-2. Monthly rainfall patterns at weather stations in the vicinity of China Lake (Data Sources: see Table 3-1).

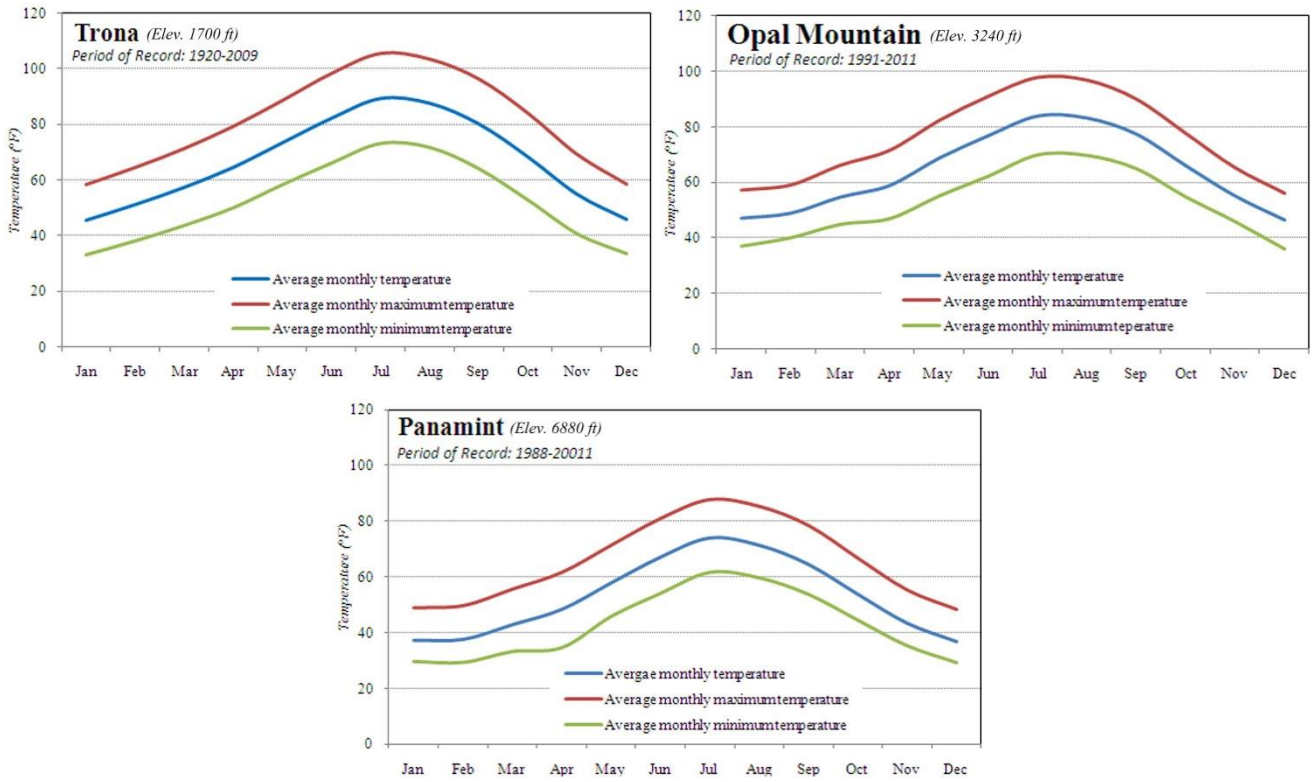


Figure 3-3. Average monthly temperature regimes at three weather stations in the vicinity of China Lake (Data Sources: see Table 3-1).

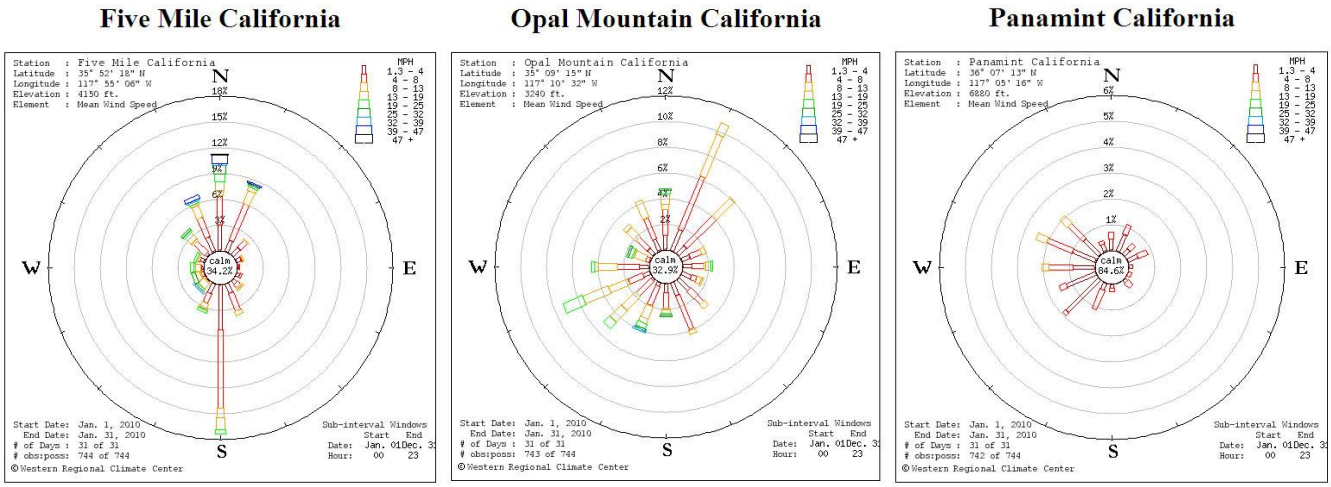


Figure 3-4. Representative wind rose charts, showing prevailing winter (January 2010) wind speeds and directions at three weather stations in the vicinity of Naval Air Weapons Station China Lake Spring (Data Sources: see Table 3-1).

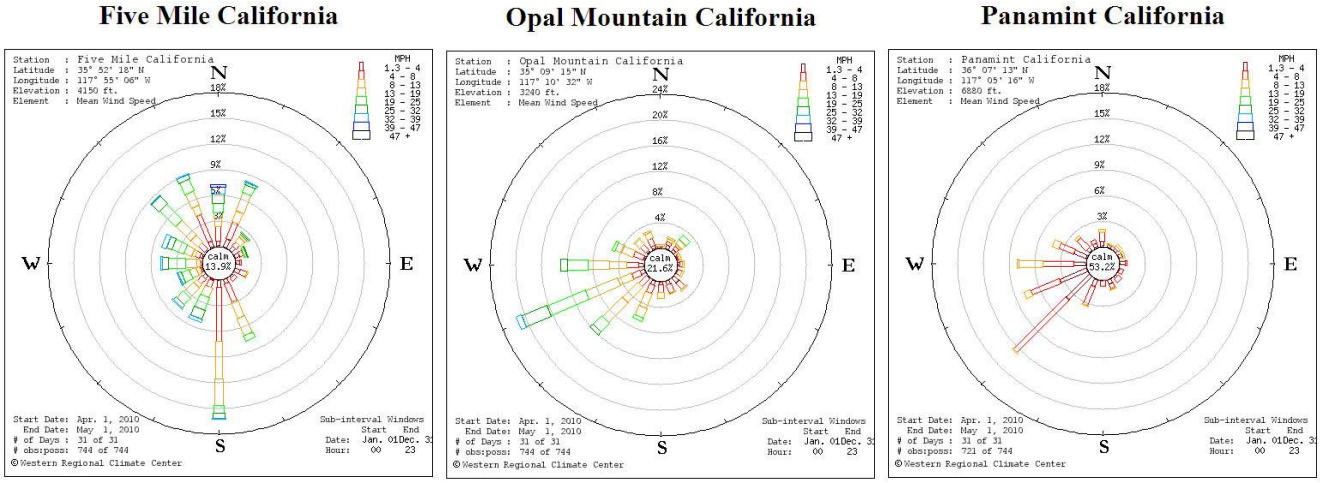


Figure 3-5. Representative wind rose charts, showing prevailing spring (April 2010) wind speeds and directions at three weather stations in the vicinity of Naval Air Weapons Station China Lake Spring (Data Sources: see Table 3-1).

3.2.4 Climate Change in the Mojave

The degree to which the Mojave Desert's climate changes within the next century will undoubtedly play a role both in the structuring of its communities, and influencing the ways in which they function. Research on these questions continues to develop. Key determinants of these changes will likely be the effects of decreased rainfall, increased temperature, increases in the soil and atmospheric concentrations of nitrogen and carbon dioxide (respectively), changes in the wildfire regime, and altered weather patterns.

3.2.4.1 Effects of Climate Change on Temperature

Changes in temperature due to climate change have been modeled using a diversity of approaches and scenarios. While best science today cannot predict an exact outcome for various factors of future climate due to climate change over the next 100 years, it is informative to look at the range of outcomes under various scenario factors and models. Two models about which there is widespread agreement are the Parallel Climate Model (PCM) and the National Oceanic and Atmospheric Administration's Geophysical Fluid Dynamics Laboratory (GFDL) model (refer to Cayan et al. 2008 for detailed discussion). When two human-caused greenhouse gas (GHG) emissions scenarios are applied to each model (B1—significant decreases in greenhouse gas emissions; A2—no significant decrease in GHG emissions), four outcomes may be examined. Cayan et al. (2008) illustrated the following outcomes of mean temperature change compared with mean historical temperature data from 1961-1990. Note that the PCM model does not deliver the expected difference between the low emissions model [B1] and the higher emissions model [A2]:

- From present to 2034, annual mean temperature increases from 0.5°C-0.6°C (PCM, A2 and B1 respectively) to 1.3°C (GFDL, B1 and A2)
- Mean summer temperature (June-August) increases from 0.4°C- 0.5°C (PCM, A2 and B1 respectively) to 1.6°C-1.7°C (GFDL, B1 and A2 respectively)
- Mean winter temperature (December-February) increases from 0.2°C-0.7°C (PCM, A2 and B1 respectively) to 1.0°C (GFDL, B1 and A2)

By the last 30 years of the century (2070-2099), the differences between the two GHG emissions scenarios sharpen, as illustrated by the following outcomes:

- Annual mean temperature increases from 1.6°C-2.5°C (PCM, B1 and A2 respectively) to 2.7°C-4.4°C (GFDL, B1 and A2 respectively)
- Mean summer temperature (June-August) increases from 1.5°C-2.6°C (PCM, B1 and A2 respectively) to 3.2°C-5.3°C (GFDL, B1 and A2 respectively)
- Mean winter temperature (December-February) increases from 1.6°C-2.4°C (PCM, B1 and A2 respectively) to 2.0°C-3.3°C (GFDL, B1 and A2 respectively)

Projected temperature increases according to these models indicate a slightly greater increase of summer temperatures over winter temperatures. However, these mean increases are likely to occur in summer as increases in historically extreme events. Loss of cool days in summer and increase in heat events become normal. Daily extreme temperature occurrences (number of days with mean temperatures > 99.9 percentile of mean summer temperature 1961-1990) from present to 2034 increase from 4 (1961-1990) to 7-13 (PCM, B1 and A2 respectively) and 10-13 (GFDL, A2 and B1 respectively). By the end of the century (2070-2099), historically extreme mean temperature occurrences rapidly accelerate to 24-59 (PCM, B1 and A2 respectively) and 52-228 (GFDL, B1 and A2 respectively). Mean winter temperatures follow a similar pattern. Under both GFDL model runs, the lower tertial (third) of historical mean winter temperatures drops away in the present period. Under the PCM runs, the B1 GHG emission scenario indicates a highly significant reduction (>66%) in the number of days in the lower tertial, and a pattern of increasing number of intervening years between clusters of years with a low number of coolest days. These may reflect projected Pacific Decadal Oscillation (PDO) behavior in the North Pacific Ocean currents. Under GFDL model runs with the A1 GHG emission scenario, the coolest historical tertial of winter mean temperatures drops to single occurrences in the present period and return as a small cluster of consecutive years with single occurrences only once in the mid-century period. This indicates that the number of frost days in the Mojave may be reduced to rare occurrences and disappear entirely by late century.

3.2.4.2 Effects of Climate Change on Precipitation

Climate change models are in general agreement that changes in precipitation patterns may be modest at most, and the general Mediterranean pattern of precipitation occurring primarily in winter (December-February) will remain intact (Cayan et al. 2008; Mastrandrea et al. 2011). Annual changes from present to 2034, under the GFDL model and both emissions scenarios, indicate a slight drop in percent annual precipitation from 2% to 6%. For the same period under the PCM, percent annual precipitation increases 7% to 18%. Patterns for the mid-century period (2035-2064) indicate a drop of 2–11% under the GFDL model. For the same period under the PCM, percent annual precipitation ranges from an increase of 7% to a drop of 2%. Patterns for the late century period (2070-2099) indicate a drop of 22–26% under the GFDL model. For the same period under the PCM, percent annual precipitation increases 7–8%. These projections are obviously not in agreement, and the broader range of climate change models follows a similar discordant pattern with regard to changes in precipitation patterns.

Winter precipitation will continue to be driven by the arrival of Pacific storms (Cayan et al. 2008). These in turn are influenced by two oceanic water temperature phenomena: The El Niño Southern Oscillation (ENSO) and the PDO. ENSO events occur when eastern Pacific warm equatorial waters are transported north along the western coast of Central and North America over one to several years (Northwest Fisheries Science Center [NFSC] 2013). PDO describes a longer term phenomenon in the north eastern Pacific, which may be linked to ENSO events. When the PDO is in a positive phase, the ocean surface waters are warmer than average over a period of a decade or more. A negative phase indicates ocean surface waters are cooler than average (NFSC 2013). When ENSO and the PDO warm cycle events occur concurrently, heavier to much heavier precipitation is highly likely to occur in the Mojave and throughout California. During the one to several years between ENSO events, an opposing phenomenon occurs in the equatorial waters of the eastern Pacific referred to as La Niña, resulting in cooler than average surface water temperatures off the western coast of North America. La Niña, especially when combined with a PDO negative phase, results in drier than average conditions in California. Historically, these two oceanic water temperature phenomena result in anomalous precipitation patterns and great variation in annual rainfall in relation to mean, multi-decadal characterization of precipitation. The NFSC has recently published an account of the current breakdown of the PDO pattern observed in the 20th century (NFSC 2013). During the first 12 years of the 21st century, the PDO has reversed itself three times. It is unclear what this might mean for future precipitation patterns in the Mojave.

When rising winter mean temperatures are considered, there is strong indication that precipitation as snowfall in the mid-upper elevation zones of the NAWS-CL installation will become rainfall. Snowfall above 1,000 meters will melt more quickly than under historical conditions, and any water storage capacity from snowfall at higher elevations will likely cease to exist by mid-century.

3.2.4.3 Ecological Effects of Climate Change

While mean temperatures are projected to rise in the Mojave Desert throughout the century at an accelerating pace, analysis of temperature trends over the past century indicate nighttime minima are already rising more than daytime maxima (Karl et al. 1995; Easterling et al. 1997). Projections for the Mojave Desert region are for significant reductions in freeze events. Freezing stress establishes the northern distributional limit of many species of subtropical origin at the Sonoran-Mojave ecotone (Turnage and Hinckley 1938 as cited in Smith et al. 2009), and many warm-desert species such as creosote bush (*Larrea tridentata*) at the Mojave-Great Basin ecotone (Beatley 1974; Pockman and Sperry 2000). Nocturnal warming could, therefore, relax these biogeographical constraints and result in the northern migration of many species, as has been observed in numerous regions of the globe (Walther 2003).

As the climate changes in the Mojave Desert, potential decreases in summer rainfall could occur primarily via a decrease in large (eastern Mojave/Chihuahua/Sonora deserts) or small (west and central Mojave) rainfall events. Long periods of drought could dramatically decrease plant cover and productivity and favor the recruitment of fast-growing invasive species (McAuliffe and Hamerlynck 2010; Hereford et al. 2006).

Precipitation means and intra-annual rainfall patterns are not expected to change significantly (Cayan et al. 2008). However, based on multi-year precipitation patterns of the recent past, multiple consecutive drought years of 60 months duration were seen to cause highly significant mortality among smaller shrub, subshrub, and perennial species (McAuliffe and Hamerlynck 2010; Hereford et al. 2006). Consecutive severe drought years have also impacted Joshua Tree (*Yucca brevifolia*) Woodlands, where decline and death have been observed in several locations (Sawyer et al. 2009).

It is currently not clear how climate change will impact precipitation patterns over the next century, but the expectation is for drought to increase, especially toward the latter part of the century. Under these conditions, ephemeral streambeds may act as refugia for shrub, subshrub, and perennial species. Small shrubs species, such as burrobush (*Ambrosia dumosa*), act as nurse plants for larger growing species, offering protection against herbivory by rabbits (McAuliffe and Hamerlynck 2010). Ephemeral streambeds may act as an important landscape feature for the conservation of a number of plant species, much as they do in the present. Some have predicted that rainfall events will decrease in occurrence but will increase in intensity (Archer and Predick 2008). The extensive effect this will have on desert systems is difficult to determine. However, extreme downpour events in the present can lead to flash flooding and scouring effects at ephemeral drainage sites. If these events increase in the future, conservation of a number of plant species may be further compromised. Projected mean temperature increases will result in greater evapotranspiration rates, which will have adverse effects on riparian systems, especially tree species, and aquatic habitats associated with desert springs.

See Table 3-2 (taken from Smith et al. 2009) for a summary of potential ecological effects of global climate change in the Mojave Desert.

Table 3-2. Potential ecological effects of global change in the Mojave Desert (Smith et al. 2009).

Climate Variable	Functional Response	Potential New Regime
Elevated CO^2	Greater plant production Increased plant invasion	More productive desert Increased fire frequency
Higher temperature	Species range shift	Community disequilibrium
Altered precipitation ▪ Wetter winter ▪ Wetter summer ▪ Drier	 ▪ Greater production of exotics ▪ Greater production of bunchgrasses ▪ Increased mortality	 ▪ Increased fire frequency ▪ Semiarid desert ecosystem ▪ Species poor system
Increased Nitrogen deposition	Reduced Nitrogen fixation Greater plant production	Loss of Nitrogen-fixing species More productive desert

3.3 Physical Conditions

3.3.1 Landforms and Geomorphic Features

Map 3-3 and Map 3-4 show the topography and dominant geographic features at NAWS-CL, which are the vast expanse of fairly flat desert topography dissected by ephemeral washes and terminal playa lakebeds, along with volcanic tablelands and mountains. Elevations range from less than 2,000 feet above mean sea level on the South Range, to over 8,800 feet above mean sea level at Maturango Peak in the Argus Mountains of the North Range.

The Coso Range has an average elevation of 6,500 feet above mean sea level, the Slate Range averages 4,500 feet above mean sea level with Straw Peak the highest at 5,578 feet. Eagle Crags lies at 5,512 feet above mean sea level. Table 3-3 lists key landforms of the North and South Ranges.

Indian Wells Valley (IWV) dominates the low elevations of the North Range. It is bordered on the north by the Coso Range; on the east by the Argus Range and Salt Wells Valley; on the south (off the Station) by the Rademacher Hills, El Paso Mountains, and Spangler Hills; and on the west by the steep escarpment of the southern Sierra Nevada.

Table 3-3. Key landforms of the North and South ranges at Naval Air Weapons Station China Lake.

North Range	
Volcanic Tablelands and Mountains	Coso Range (includes Coso Peak, Sugarloaf Mountain, Cactus Peak), Argus Ranges (includes Maturango Peak)
Valleys	Northern IWV, Etcheron Valley, portion of Salt Wells Valley
Basins and playas	Vast expanse of fairly flat desert topography dissected by ephemeral washes and terminal playa lakebeds. China Lake, Mirror Lake, Satellite Lake, Paxton Ranch Playa, Airport Lake, Coso Basin, numerous other unnamed playas
Washes and canyons	Darwin Wash, Petroglyph Canyon, Renegade Canyon, Mountain Spring Canyon, Wilson Canyon, Burro Canyon
Flats	Coles Flat, Cactus Flats
South Range	
Mountains	Slate Range, Panamint Range, Brown Mountain, Quail Mountains, Granite Mountains, Black Mountain, Robbers Mountain, Black Hills, Slocum Mountain, Eagle Crags, Lava Mountains
Valleys and playa	Panamint Valley, Pilot Knob Valley, Superior Valley, Long Valley, Searles Valley, Movie Dry Lake
Wash	Wingate Wash

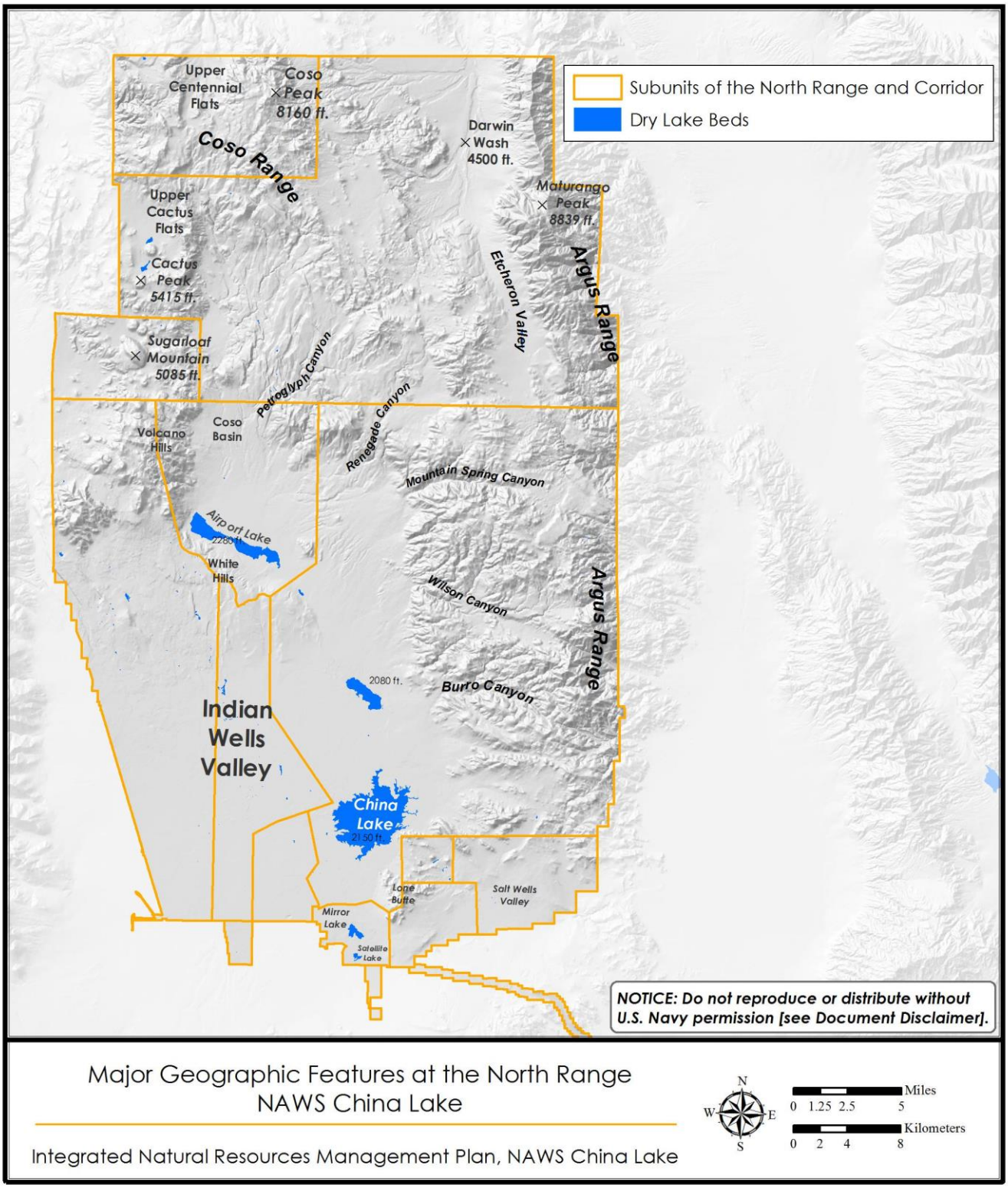
Pilot Knob Valley and Superior Valley are the dominant basins of the South Range. Pilot Knob Valley bisects the South Range; it is bordered on the north by the Slate Range and Quail Mountains; Granite Mountains to the east; on the south by Black Mountain, Robbers Mountain, Black Hills, and Eagle Crags; and to the west the Lava Mountains. Superior Valley is bounded on the north/northwest by Slocum Mountain, Pilot Knob, and Eagle Crags; on the east by Lane Mountain; and on the south by Opal Mountain.

Other unmapped geomorphic features occurring at NAWS-CL include bajadas, dunes, and pavement, described below.

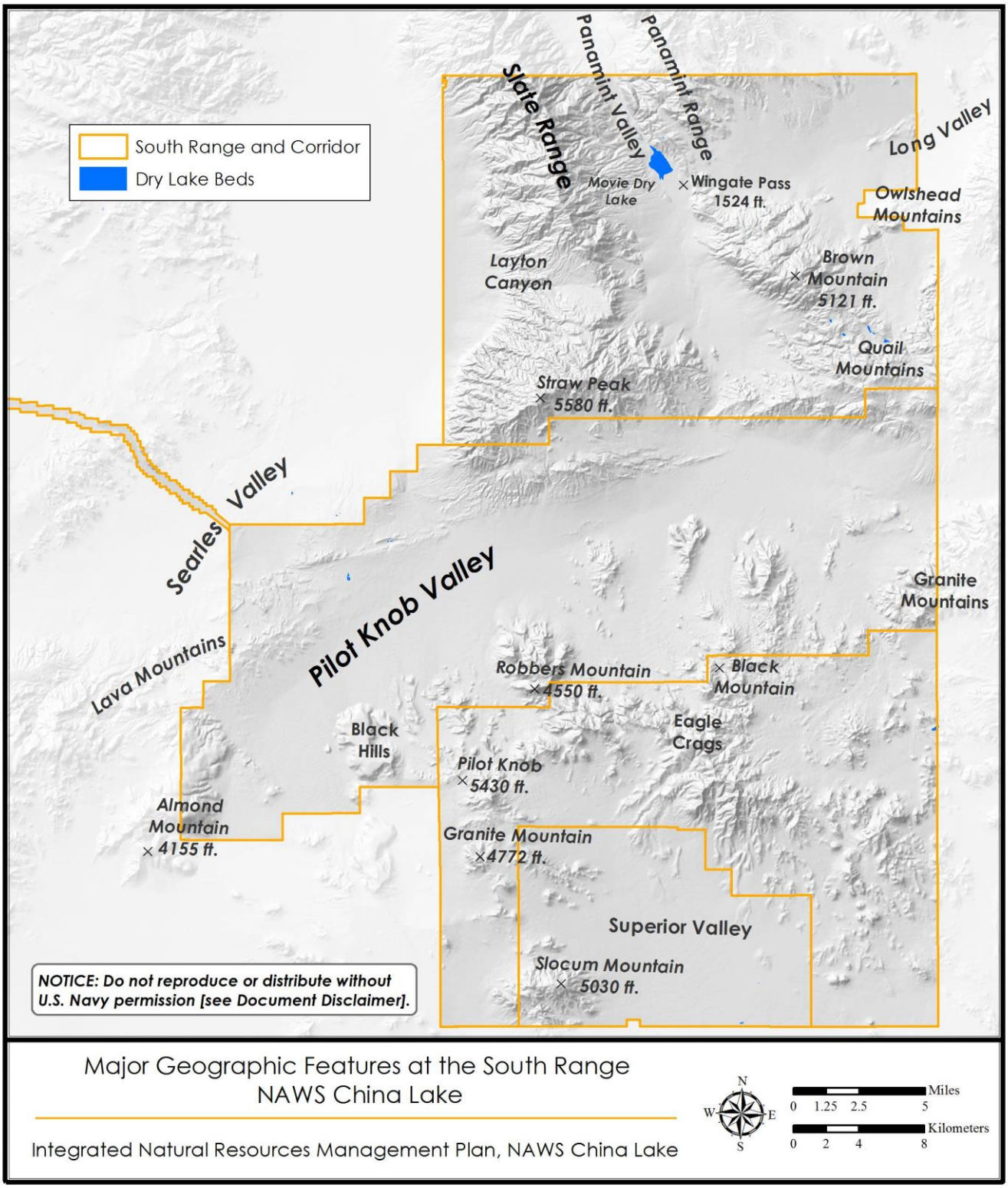
Bajadas. Alluvial fans commonly spread out at their lower borders, and the edges of adjacent alluvial fans overlap. This part of a slope, where alluvial fans coalesce below the foot of the mountain, is known as the bajada. The bajada is composed of gravels and sand, and particle size becomes smaller toward the center of the valley (Blair and McPherson 1994). If the center of the basin is clay, it remains relatively free of vegetation and is known as a playa.

Dunes. There are a few areas of dunes on both the North and South Ranges. Dunes are collections of windblown sand downwind of sand supplies from washes and playas that do not have chemical or biological soil crusting (Miller et al. 2009).

Desert Pavement. A gravelly surface referred to as "desert pavement" is common. This surface is stable and resistant to erosion, until broken through. Windblown silt and sand collect immediately below a gravel pavement, forming the vesicular horizon (McFadden et al. 1987, 1998; McDonald et al. 1995 as cited in Miller et al. 2009). A darkening of the rock surfaces, known as desert varnish or rock varnish, is due to oxidation of minerals such as iron and manganese. The degree of varnish accumulation and soil development are the two most diagnostic features for assessing the age of a site (McFadden et al. 1987, 1998; McDonald et al. 1995; Bull 1991).



Map 3-3. Dominant geographic features at North Range, Naval Air Weapons Station China Lake.



Map 3-4. Dominant geographic features at North Range, Naval Air Weapons Station China Lake.

3.3.2 Geology

Desert surface geology strongly influences the ability of vegetation and soil to recover from disturbance.

Geologic deposit types harbor distinct plant communities in many cases, so that vegetation maps of the desert utilize geomorphic criteria to describe plant communities (e.g., Thomas et al. 2004 as cited in Miller et al. 2009). Vegetation monitoring studies will be improved by integrating surface geology into the study design. Studies exploring the links between geology and desert ecology have demonstrated that the geology of surface deposits can be useful for understanding soil moisture and plant dynamics (McAuliffe and McDonald 1995; Hamerlynck et al. 2002; Fenstermaker et al. 2009), and thus, wildlife habitat.

A site's geological setting also provides information on surface hydrology, which can be used to predict flooding and soil moisture. Geomorphic traits are useful in understanding susceptibility to wind erosion (Gillette 1978; Logie 1982) and predicting habitat for organisms dependent on physical niches.

Surface geology at NAWS-CL is depicted on Map 3-5.

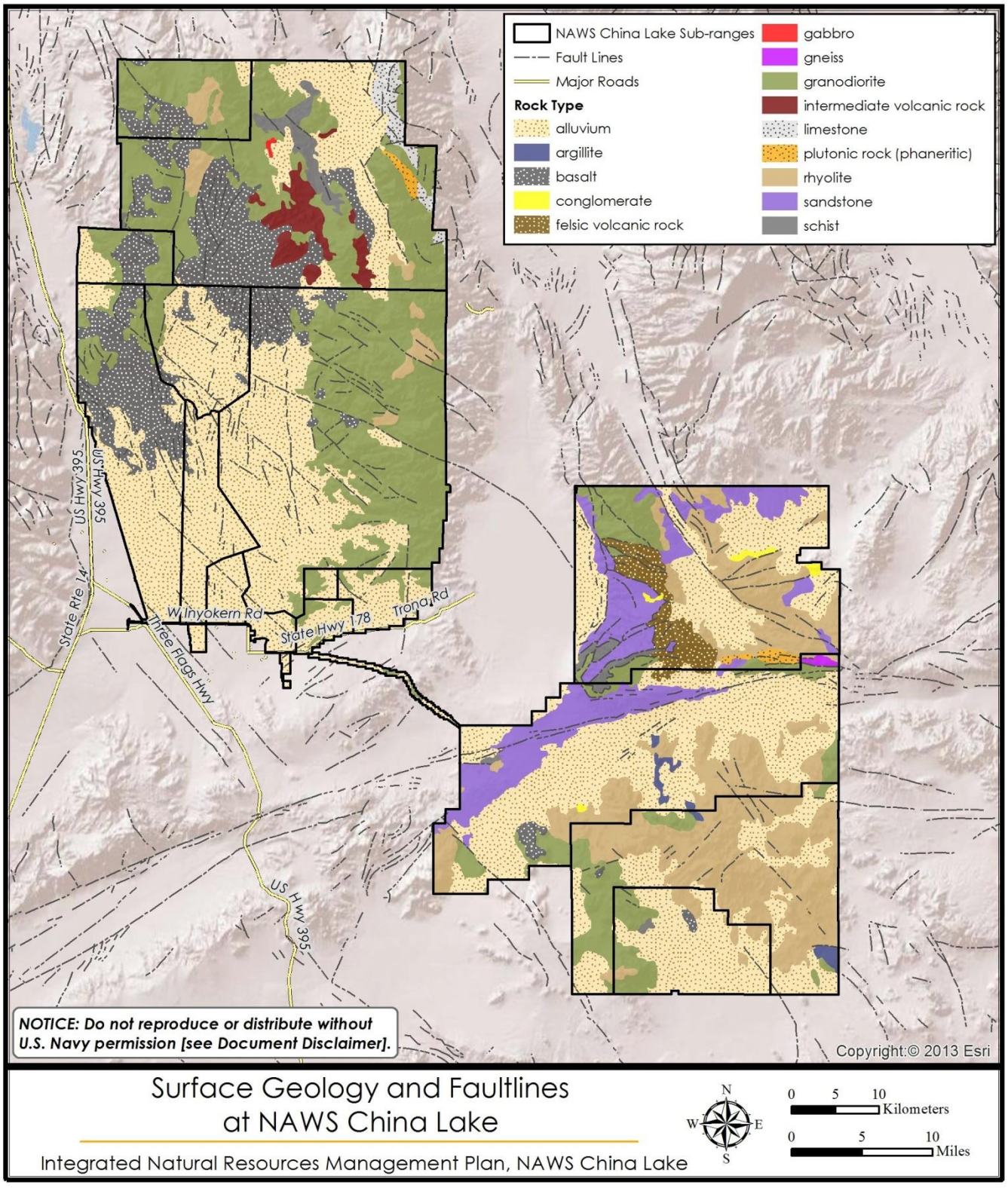
3.3.3 Soils and Soil Condition

Understanding soil capability and soil health is fundamental to land use management. Soil properties affect construction, water retention, flood potential, moisture and nutrient availability, the distribution and productivity of many plant communities and their resilience to disturbance (Ehleringer 1985; Smith et al. 1995; Hamerlynck et al. 2002).

Soil texture is a major factor determining the susceptibility of the soil to compaction (Webb 1982, 1983). Sandy loam and loamy sand are highly susceptible to compaction from human trampling and off-road motor vehicles (Webb 1983). Arid soils, which often have abundant rock in the profile, and a gravel, cobble or stone cover, will not compact as easily (Webb 1982, 1983). These soil types are present on bajadas and alluvial fans, which occupy a great portion of the Mojave Desert (Webb 1983).

Soil types define many plant communities, usually through soil water retention capacity. For example, creosote shrubs are larger and denser in areas with well-drained gravelly soils. Soils lacking strong horizons, and those with high gravel content, allow water to infiltrate to deep moisture zones. Because water stored at depth in gravelly soils is under less tension and is less likely to evaporate, water is more available for deep-rooted vegetation, such as creosote. In contrast, older soils with wind-deposited horizons at the surface have substantially lower infiltration rates than younger soils lacking such a horizon (Bedford et al. 2009), resulting in lower plant production. Subsurface soil development, notably calcic horizon formation, restricts root expansion (Shreve and Mallery 1933 as cited in Schwinning and Hooten 2009), thereby reducing the above-ground biomass of perennial species, including creosote bush (Stevenson et al. 2009).

Finally, soils are living systems that cycle nutrients supporting native plants and wildlife. Many areas at NAWS-CL have cryptogrammic, or macrobiotic crusts that are small patches of primitive surface algae and fungi that increase the ability of the soil to retain soil moisture and the soil surface to resist erosion. These crusts significantly increase nitrogen cycling in the soil environment and are important contributors to the nutrient cycling in desert ecosystems. They are also very fragile and easily destroyed by foot or vehicle traffic.



Map 3-5. Surface geology at Naval Air Weapons Station China Lake.

The presence of desert pavement, mychorrhizal relationships, and cryptogrammic crusts contributes to the fragile nature of the desert's soil surface. The sparse vegetation, often intense rainfall, large proportion of sand, and low proportion of organic matter contribute to the desert soils' erodibility.

3.3.3.1 General Soil Characteristics

In general, desert soils found on slopes are coarse textured, light in color, and well drained. Clay soils that form in playas are fine-textured, darker in color, and poorly drained. Soil structure is poor due to the lack of organic matter; this usually reduces drainage when clay content is high. Often desert soils have chemical surface crusts caused by the lack of leaching in low rainfall areas. The buildup of calcium compounds often results in an impervious subsurface caliche layer. Some soils also develop hydrophobic properties, making them slow to wet.

Topography and parent material are the primary factors in desert soil composition. Most parent material within the area is granitic. Granite is made up of several minerals, including quartz, feldspar, and ferromagnesian minerals. These generally break down into decomposed granite and finally form a coarse-textured, well-drained soil. Other, finer-grained parent materials occur in the area, including limestone (carbonates) of the Argus Range, tuff, rhyolite, and basalt. Soils formed from these parent materials have significantly different properties than granitic soils. These materials are transported and mixed by water and wind, forming a variety of soil types that transition gradually or abruptly.

3.3.3.2 Soil Classification and Mapping

Soils are mapped to the association level at NAWS-CL (Map 3-6; Table 3-4). Each polygon on the soils map represents several soil series, but the actual boundaries have not been determined. The standard soil map for the area is the 1993 Natural Resources Conservation Service State Soil Geographic Database (STATSGO) Geographic Information System data layer. California, Nevada, and Arizona State Soil Conservation Service offices provided descriptions of each soil series. The STATSGO soils map contains 39 series or landform mapping units for NAWS-CL, grouped into 14 different associations or mapped polygons of non-soil units, such as riverwash, rubble, rock outcrops, and sand dunes.

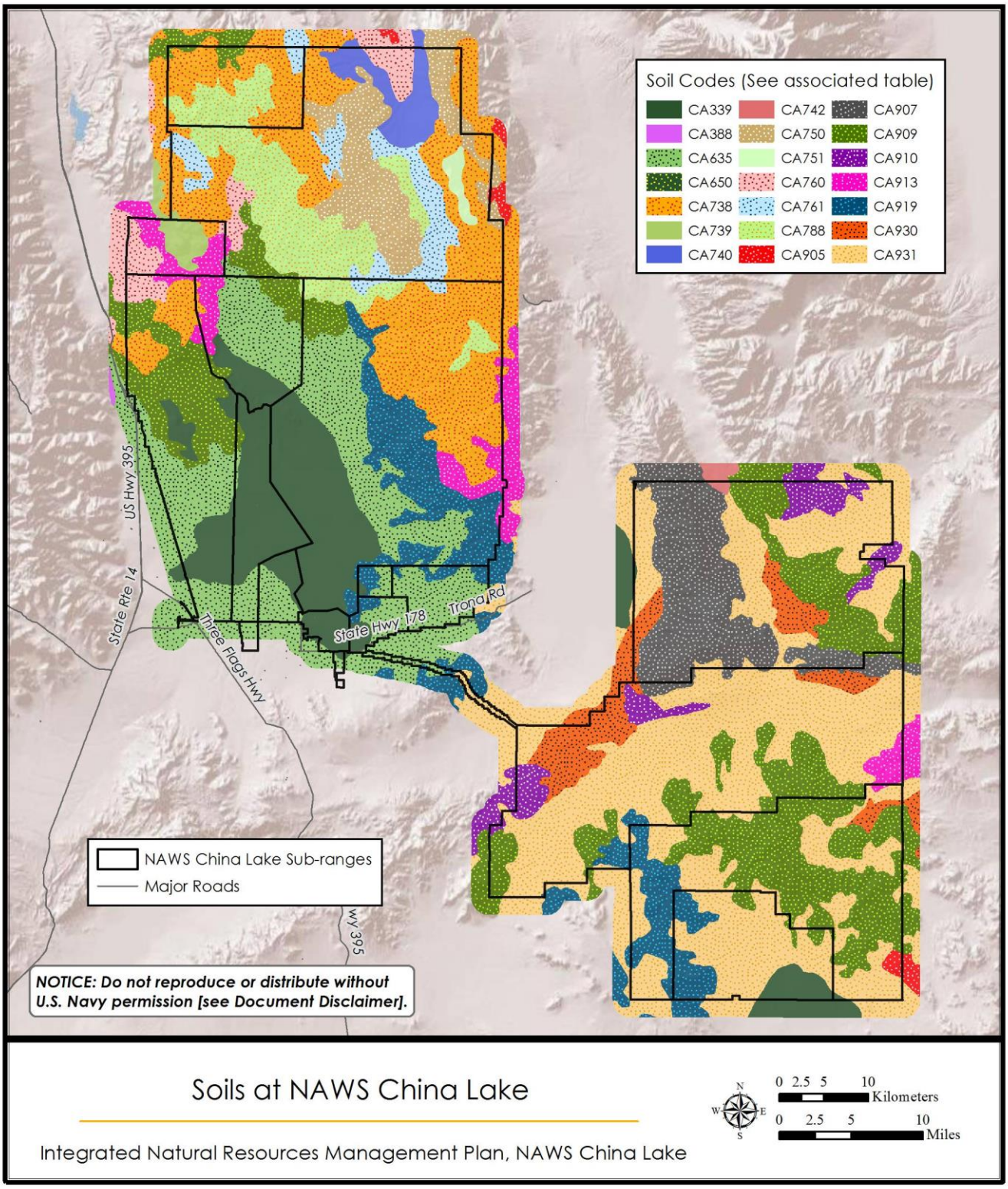
Within the North Range, the predominant soil unit identified is Rosamond-Rosamond Variant-Playas, found on basin floors and playas. This soil association also occurs on the South Range in Superior Valley and Searles Valley.

Further up the slope from the playa areas are soils formed on alluvial plains. These soils have a sandy surface layer in most areas, but the underlying soil varies widely in clay content and layering. Some of these soils contain cemented layers that are referred to as "caliche" or "hardpan" (U.S. Soil Conservation Service 1989). The STATSGO database map unit corresponding to this environment within the North Range is Cajon-Wasco-Rosamond, found on alluvial plains.

Soils in the Coso Range typically have a clay accumulation below the surface layer. Loamy or clayey subsoils with a layer of clay accumulation occur on volcanic flows. Mountain valley fan terraces contain deep alluvial soils with sandy surface textures and sandy or loamy subsoils.

Soils in the IWV are mostly sandy with some areas exhibiting stratified soils with variations in clay content. Silica or carbonate cemented soils also occur, representing caliche deposits. Near playas, soils are predominantly silts and clays, exhibiting very low dry densities and high moisture content. Soils in playas range from sand to clays with high salt concentrations.

Brief descriptions of the technical characteristics of the soils may be found in Appendix K.



Map 3-6. Soils at Naval Air Weapons Station China Lake. See Table 3-4 for a description of soil codes.

Table 3-4. Selected soil characteristics (from Environmental Impact Statement (EIS) for Proposed Military Operational Increases and Implementation of Associated Comprehensive Land Use and Integrated Natural Resources Management Plans, Naval Air Weapons Station China Lake and Bureau of Land Management 2004).

ID Number	STATSGO Name and Location
CA339	Rosamond, Rosamond Variant, Playas. Found on basin floors and playas in the North and South Ranges.
CA635	Cajon, Wasco, Rosamond. Found on alluvial plains in the North Range.
CA738	Mexispring, Rock Outcrop, Ferroburro. Found associated with granitic outcrops in the North Range.
CA739	Upspring, Blacktop, Rock Outcrop. Found on the northeast side of Rose Valley on the North Range.
CA740	Arizo, Yellowrock, Riverwash. Found in Darwin Wash on the North Range.
CA742	Bunkerhill, Salt Flats, Dune Land. Found in Panamint Valley, near the northern boundary of the South Range.
CA750	Theriot, Rock Outcrop, Uhaldi. Found in upland areas of both the North and South Ranges.
CA751	Rubble Land, Clanalpine Family, Bregar. Found only in the Maturango Peak area of the North Range.
CA760	Cartago, Yermo, Tinemaha. Found in upland flats and low hills in the North Range, including Darwin Hills, the west side of Rose Valley, and canyons northeast of Coso Hot Springs.
CA761	Ulymeyer, Rovana, Bairs. Found in Etcheron Valley and Upper Cactus Flat on the North Range.
CA788	Blacktop, Downeyville, Rock Outcrop. Found along central granitic ridges of the Coso Range in the North Range.
CA905	Rock Outcrop, St. Thomas, Tecopa. Found in small region near Goldstone Lake in the southeast corner of the South Range.
CA907	Rock Outcrop, Tecopa, Lithic Torriorthents. Found over most of Slate Range in the northern portion of the South Range.
CA909	Rock Outcrop, Upspring, Sparkhule. Found over most of the tertiary volcanic peaks in the South Range.
CA910	Badland, Bitterwater, Cajon. Found on south margin of Straw Peak, north margin of Lava Mountains, and the southeast foothills of Panamint Range, all within the South Range.
CA913	Rock Outcrop, Lithic Torriorthents, Calvista. Found on the southwest slope of the Argus Range, in Rose Valley on the North Range, and on the western slope of the Granite Mountains in the South Range.
CA919	Calvista, Rock Outcrop, Trigger. Found on the margins of Salt Wells Valley in the North Range and on the western margin of Superior Valley in the South Range.
CA930	Nickel, Arizo, Bitter. Found on southeastern margin of Searles Valley and on scattered locations in the South Range.
CA931	Cajon, Arizo, Victorville Variant. Found on the South Range.

Current Management of Soil Resources

Impacts to soils are managed through best practices and the NAWS-CL Site Approval Process, whereby avoidance and minimization measures are considered under the National Environmental Policy Act. Any project that may disturb the soil (such as digging, grading, stockpiling, dumping, staging, or establishing a laydown area) must go through a screening process with the Project Review Board to receive a site approval. Best management practices are required to minimize soil erosion by wind and water.

The U.S. Soil Conservation Service (now the Natural Resources Conservation Service) surveyed a few limited soil plots in the late 1980s at NAWS-CL (M. Stoner, pers. com. 2010). Site-specific soil information is generated by contracting engineers at NAWS-CL construction sites.

Management Issues for Soil Resources

Soil conservation includes surface stabilization, protection of nutrient cycling and other ecosystem functions that soils provide, and maximization of opportunities for soils to self-recover after disturbance. Conventional methods of land management, such as rest-rotation with follow-on habitat restoration, are of limited use in the Mojave Desert ecosystem. Native vegetation may recover on the site, but it will not return to its original species composition for decades in many cases. Sustainable soil management prevents damage that eliminates an area from use for the foreseeable future, or for which restoration or mitigation is excessively costly.

Some specific management considerations are:

- Land use and conservation decisions could be enhanced through improved availability of information on which soils recover from disturbance better than others. Soils data related to site resiliency to disturbance, inherent erodibility, flood potential, stability, and productivity, help managers effectively plan for impact avoidance and minimization for projects and military mission activities.
- Soil maps and a soil and vegetation-monitoring program would allow ecosite health assessment similar to other federal land management agencies.
- The role of biological crusts in site recovery should be considered. Soil crusts affect recovery rates post-disturbance.
- Soils can be key indicators of habitat value for herptiles and other species that are tied to soil type, such as the Mohave Desert Tortoise.
- Soil compaction resulting from roads and off-road use can lead to direct wildlife mortality, invasive species movement along the road corridors, fire and long-term soil impairment on certain soils. Soil compaction promotes non-native species that have dispersed root systems, such as Mediterranean grass (*Schismus barbatus*) (Adams et al. 1982), as opposed to deep root systems that use water more efficiently and hold soil more effectively.

3.3.4 Water Resources

Groundwater use, water use efficiency for all uses of water at NAWS-CL, and surface waters developed for use at NAWS-CL are addressed in Chapters 2 and 5. Water as a natural resource, including groundwater that comes to the surface at seeps and springs, is addressed here and in Chapter 4 (see Appendix F for a summary of documentation on individual springs).

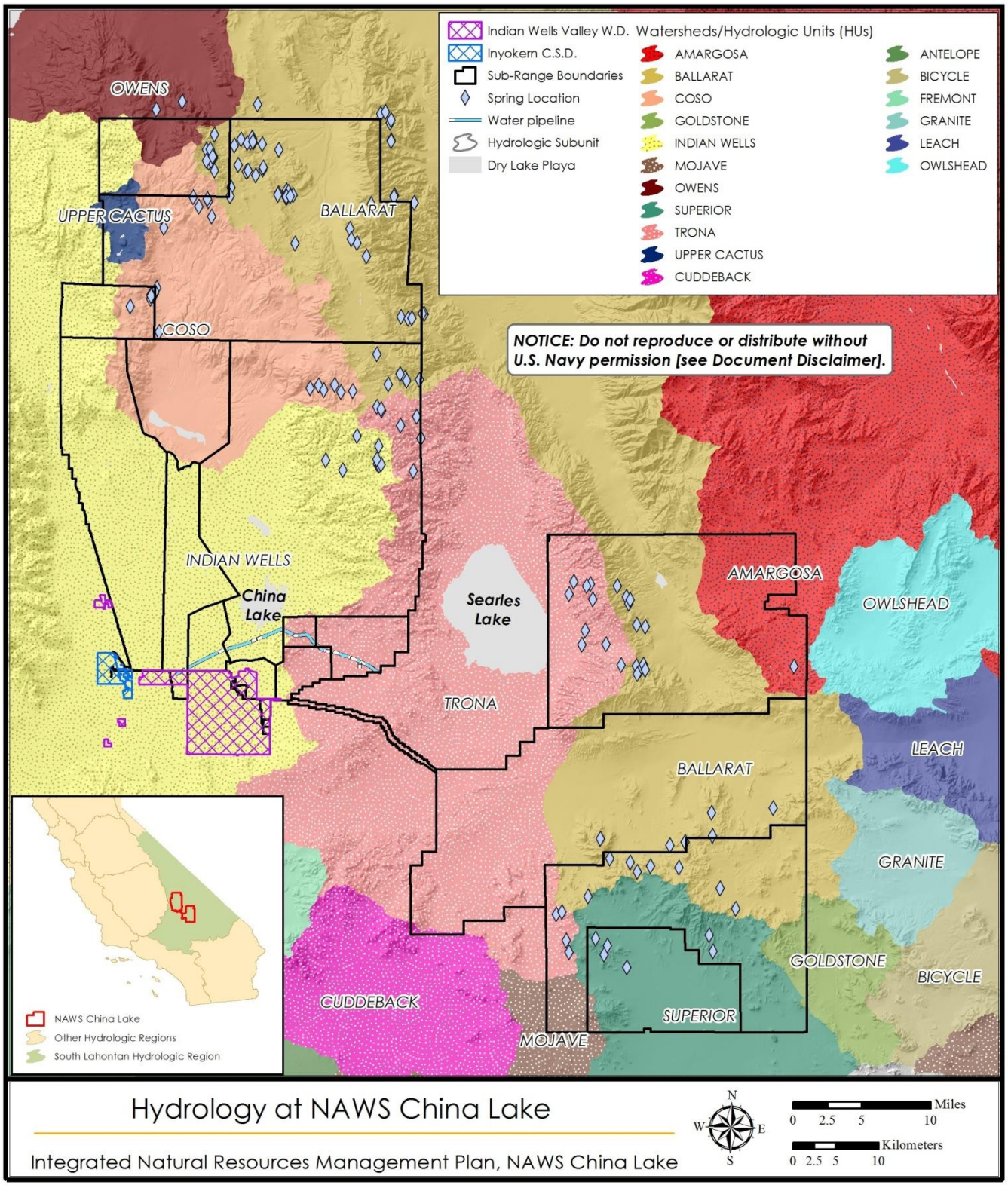
3.3.4.1 Watersheds and Surface Water

NAWS-CL lies within the South Lahontan Basin management area. This area falls under the State Water Resources Control Board Regional Water Quality Control Board Basin Plan (2005). Ten hydrologic units are mapped with portions on the property, but none are completely contained within the boundaries of NAWS-CL (see Map 3-7 and Table 3-5). Within the South Lahontan Basin, surface runoff generally results from rainfall, snowpack melt, or natural springs.

NAWS-CL shall use a watershed-based approach to manage operations, activities, and lands to avoid or minimize impacts to wetlands, ground water, and surface waters on or adjacent to the installation in accordance with the guidelines and goals established in the Unified Federal Policy for a Watershed Approach to Federal Land and Resource Management (see pages 62565 through 62572 of Volume 65, Federal Register).

At NAWS-CL, there are several types of water sources including natural perennial waters, such as springs and seeps that support natural riparian vegetation; natural ephemeral water, such as lake beds (playas), tenajas, and washes; and man-made waters, such as the Waste Water Treatment Facility evaporation ponds and the Lark Seep System. Major playas on the Station are China, Mirror, Satellite, and Airport lakes, all within the North Range, and Movie Lake in the South Range. In addition, there are as many as 80 smaller playas ranging from less than an acre to hundreds of acres in size.

In the IWV in the North Range, the most significant surface flows originate in the El Paso Mountains and southern Sierra Nevada, including the Coso, Argus, and Spangler ranges, as well as the Rademacher Hills (see Map 3-7). These ephemeral flows are then conveyed to the dry basins through local washes. Most runoff in the IWV comes from four major ephemeral streams: the El Paso, Little Dixie, Ridgecrest, and Bowman Washes, as well as other, smaller, ephemeral washes that discharge into China, Satellite, and Mirror Lakes. Runoff channels and arroyos transport surface water flow laterally, but infiltration also takes place.



Map 3-7. Watersheds and hydrologic subbasins at Naval Air Weapons Station China Lake. Naval Air Weapons Station China Lake is in the South Lahontan Hydrologic Area for the State Water Resources Control Board.

Table 3-5. Watersheds within portions of Naval Air Weapons Station China Lake.

Watershed Name (Hydrologic Unit)	Total Watershed Acres	Acres on NAWS-CL	% of Total Watershed on Station	Watershed Description (hydrologic unit number, named topographic features, and any developed areas)
Amargosa (9609.) Inyo San Bernardino	3,992,017	40,537	1.02	**Death Valley 9609.1** ▪ Developed Areas: Harrisburg, Skidoo, Leadfield, Chloride City, Beatty Junction, Park Village, Furnace Creek, Badwater, Ashford Junction, and Sperry ▪ Streams: Amargosa River, Wingate Wash, Hanaupah Canyon Creek, Salt Creek, Wet Fk Blackwater Wash, Blackwater Wash, Tucki Wash, Emigrant Wash, Death Valley Wash, Little Grapevine Creek, Cottonwood Creek, Furnace Creek Wash, Willow Creek, Bradbury Wash, Confidence Wash, Ibex Wash and Buckwheat Wash
Ballarat (9620.) Inyo San Bernardino	1,046,369	349,438	33	**Darwin 9620.5** ▪ Developed Areas: Darwin and Junction Ranch ▪ Streams: Lucky Jim Wash, Indian Gardens Wash, Domingo Wash, China Gardens Wash, Darwin Wash and Junction Wash **Panamint Valley 9620.6** ▪ Developed Areas: Millspaugh, Junction Ranch, Panamint Springs, Panamint and Ballarat ▪ Streams: Darwin Wash and Wildrose Wash **Brown 9620.7** **Wingate Pass 9620.1** **Robbers 9620.8** ▪ Developed Areas: Mars. **Santa Rosa Wash 9620.4** ▪ Stream: Santa Rosa Wash
Coso (9622.) Inyo	160,284.69	160,171.88	99.93	**Airport 9622.2** ▪ Stream: Coso Wash **Wild Horse 9622.1**
Cuddeback (9627.0) San Bernardino	132,453	856	0.65	▪ Developed Areas: Atolia
Goldstone (9617.0) San Bernardino	44,685	7,684	17.2	▪ Developed Areas: Apollo, Goldstone and Mojave Base
Indian Wells (9624.) Kern Inyo San Bernardino	728,219	256,844	35.3	**Rose 9624.1** ▪ Developed Areas: Haiwee, Dunmovin, Coso Junction, Coso, and Little Lake ▪ Streams: Summit Creek, Hogback Creek and Second Los Angeles Aqueduct **China Lake 9624.2** ▪ Developed Areas: Pearsonville, Brown, Bradys, Indian Wells, Inyokern, China Lake Acres, Armistead, Harts Place, China Lake, Ridgecrest and Linnie ▪ Streams: Little Dixie Wash
Mojave (9628.) San Bernardino	2,852,592	8,683	0.30	**Lockhart 9628.4** ▪ Developed Areas: Kramer, Kramer Junction, Jimgrey, Kramer Hills, Lockhart and Hinkley
Owens (9603.) Inyo	1,430,730	8,513	0.60	**Centennial 9603.4** **Lower Owens 9603.3** ▪ Developed Areas: Aberdeen, Blackrock, Independence, Kearsarge, Manzanar, Reward, Owenyo, Lone Pine, Alabama Hills, Alico, Dolomite, Bartlett, Swansea, Keeler, Cartago, Olancha and Grant ▪ Streams: Owens River, Olancha Creek, Cottonwood Creek, Lone Pine Creek, Shepherd Creek, Pinyon Creek, Sawmill Creek, Taboose Creek, Aberdeen Ditch, Blackrock Dm, Division Creek, Thibaut Creek, N.Fk Oak Creek, Oak Creek, S.Fk Oak Creek, Independence Creek, Moiver Canal, Stevens Canal, Blairs Creek, George Creek, Inyo Creek, Tuttle Creek, Cottonwood Creek, Los Angeles Aqueduct, S.Fk Ash Creek, Braley Creek, Ash Creek and Walker Creek
Superior (9619.0) San Bernardino	184,099	91,209	50.0	▪ Developed Areas: Copper City
Trona (9621.) Inyo San Bernardino	457,533	175,152	38	**Salt Wells 9621.2** ▪ Developed Areas: Skytop **Pilot Knob 9621.3** **Searles Valley 9621.1** ▪ Towns: Trona, Argus, Borosolvay, South Trona, Searles Valley, Pioneer Point, Valley Wells, Searles and Spangler ▪ Streams: Teagle Wash
Upper Cactus (9623.0) Inyo	10,385	9,492	91	

3.3.4.2 Springs and Seeps

A summary of information collected from springs and seeps at NAWS-CL is in Appendix F.

Springs

In the North Range, there are over 80 mapped springs, primarily in the Argus and Coso Ranges. The mapped springs include small areas of moist soil, pools, intermittently flowing streams with riparian vegetation, and an artesian well at Paxton Ranch. Many springs were developed by miners and ranchers, prior to the Navy assuming management of the lands. A few springs are maintained by the Navy for remote facility use or for firefighting. Flow rates at many of the springs and seeps are dependent on annual rainfall.

In the South Range, there are 42 mapped springs or seeps. There are no naturally occurring ponds or standing water other than ephemeral pools or playas on the South Range, which receives drainage from the Slate Range, Panamint Range, Quail Mountains, Eagle Crags, Brown Mountain, Pilot Knob, Slocum Mountain, Robbers Mountain, and Granite Mountain. A few of the springs may disappear in dry years.

Coso Hot Springs is a series of geothermal-fed springs of hot, non-potable mineral water (see Appendix F). The Navy does not believe groundwater pumping impacts the springs as there is no known hydrological connection.

Seeps

NAWS-CL has two interconnected seeps. Located near the southern end of the North Range, the Lark Seep System is a series of channels diverting water away from Lark Seep and out to the China Lake Playa to G-1 Seep. Both seeps are brackish marshes formed on the edge of the China Lake Playa.

The Lark Seep System is characterized by naturally high groundwater conditions. The creation of the Waste Water Treatment Facility in 1945 and resulting percolation of water from its evaporation ponds has forced groundwater movement in this area to the north, where it surfaces near Lark Seep, helping to augment the existing seep's habitat (M. Stoner, pers. com. 2010).

During building construction at NAWS-CL in the 1950s for test/range support, a series of channels was constructed to intercept the elevated groundwater and divert it to the G-1 area (away from building sites). The Lark Seep System was created to divert water into Lark Seep and G1 Seep via George, North, and G1 channels. Approximately five miles of channels continue to carry water out to the G-1 Seep.

Both seep systems include areas of open water and have provided habitat for the introduced and federally endangered Mohave tui chub population. Recently, the G-1 Seep suffered severe drying and the USFWS and CDFW relocated its 1,400 chub population to North Channel.

Dominant vegetation types in these seeps include cattail marsh, tule marsh, and alkali meadow (Glenn Lukos Associates 1998). Runoff from the golf course and the NAWS-CL housing areas also contributes a small amount of water to these seeps.

3.3.4.3 Floodplains and Flooding

Although precipitation in the South Lahontan Basin is low, on average, intense cloudbursts may result in occasional flooding. A 1983 flood caused significant damage at Main Site, especially in and around the Michelson Laboratory area, so channels were constructed to prevent flooding at Main Site by re-directing surface water to the playa lakes (M. Stoner, pers. com. 2010).

Outlying range areas and the South Range have also been affected by flooding from seasonal runoff, but floods in these areas have caused less damage.

3.3.5 Jurisdictional Waters of the U.S. and Wetlands

All wetlands occurring on federal land are protected under Executive Order 11990 Protection of Wetlands (24 May 1977, as amended). Federal agencies are directed to avoid, to the extent possible, the long- and short-term adverse impacts associated with the destruction or modification of wetlands, and to avoid direct or indirect support of new construction in wetlands, wherever there is a practicable alternative. "Each agency shall provide leadership and shall take action to minimize the destruction, loss or degradation of wetlands, and to preserve and enhance the natural and beneficial values of wetlands in carrying out the agency's responsibilities." In addition, the White House Office on Environmental Policy, Protecting America's Wetlands: A Fair, Flexible, and Effective Approach (24 August 1993) promotes "no overall net loss of the Nation's remaining wetlands" and "the restoration of damaged wetland areas through voluntary, non-regulatory programs." This is regardless of whether or not these wetlands are considered jurisdictional Waters of the U.S. under the Clean Water Act. On the Station, some areas such as springs and seeps that function as wetlands ecologically, but exhibit only one or two of the three characteristics (hydrology, soil, or wetland plants) under U.S. Army Corps of Engineers guidelines, do not currently qualify as Clean Water Act jurisdictional wetlands or waters of the U.S.

Recent court decisions have likely eliminated most NAWS-CL drainages and playas from jurisdiction under Section 404 of the Clean Water Act and the need for a 401 Certification. The 33 Code of Federal Regulation § 328.3(a) provides a variety of definitions of "water of the U.S." Specifically, waters are evaluated that potentially meet the definitions provided in subdivisions (a)(2) (interstate waters or waters that cross state lines), (a)(3) ("waters... the use, degradation or destruction of which could affect interstate or foreign commerce"), and (a)(5) (tributaries to (a)(1) through (a)(4) waters.

NAWS-CL shall ensure no net loss of size, function, and value of wetlands, and will preserve the natural and beneficial values of wetlands in carrying out activities in accordance with EO 11990 and the White House Office on Environmental Policy.

No areas within NAWS-CL have the necessary characteristics of jurisdictional waters or wetlands: none are navigable, none cross state lines, and none are or have been used for interstate commerce.

The sole exceptions that need to be examined more closely are portions of drainages that flow into off-Station drainages that have been identified by the U.S. Army Corps of Engineers as jurisdictional waters of the U.S. due to the interstate commerce connection: the Owens River and the Mojave River. In addition, the Amargosa River crosses the California-Nevada state line.

Recent court decisions have likely eliminated all NAWS-CL drainages and playas from jurisdiction under Section 404 and the need for a 401 Certification. However, there are three exceptions that need to be examined.

Management Issues for Jurisdictional Waters

No formal determination has been made for the jurisdictional status of waters and wetlands of NAWS-CL. In particular, watersheds with surface connection to the Mojave River, Owens River, and Amargosa River require further evaluation.

3.3.6 Water Quality

Groundwater in the shallow aquifer is typically poor quality. Unlike recharge to the deep aquifer, most of which comes from infiltration of runoff along the range fronts, recharge to the shallow aquifer includes direct infiltration from washes and playas, irrigation, leaking sewer or water distribution lines, and wastewater treatment ponds.

Because it is nearer to the China Lake Playa, shallow groundwater reflects the concentration of salts in shallow sediments in this area.

In general, the deep groundwater aquifer shows good quality down to 2,000 feet in some areas of the Valley (M. Stoner, pers. com. 2010). However, in the portion of the basin nearest China Lake Playa, total dissolved solids exceed 1,000 parts per million (ppm). Wells near Lark Seep, north of the wastewater ponds, contain total dissolved solids concentrations of up to 6,800 ppm, and total dissolved solids concentrations in water on the playa itself have been reported up to 72,000 ppm (Leedshill 1983). Arsenic concentrations of up to 1,199 ppm have been reported in wells near Lark Seep (Feldmeth et al. 1989).

3.3.7 Geothermal Water

Development of the geothermal power-generating potential of 3,000 acres within the 72,640-acre Coso Known Geothermal Resource Area by California Energy Co., under contract with the Navy, began with the siting of four wells in 1981.

Temperature profiles indicate geothermal sources deep beneath IWV (Bureau of Reclamation 1993). Fournier and Thompson (1980) studied the sources of the water in geothermal wells by comparing isotopic ratios. They concluded that the recharge to the Coso Geothermal area is predominantly from precipitation that falls on the Sierra Nevada, and speculated that the recharge may enter east-dipping faults. The water is heated at depth and migrates upward in a convection pattern. Convection is a slow, vertical pattern of circulation caused by the upward movement of water that becomes heated by contact with hot rock at depth and the downward movement of cold water as it percolates from lakes and streams at the earth's surface. The convective flow pattern may be influenced by the orientation of faults beneath the Coso Known Geothermal Resource Area.

3.4 Vegetation Communities and Wildlife Habitat

3.4.1 Regional Floristic Provinces

The NAWS-CL landscape encompasses portions of two floristic provinces: the Mojave Desert (represented by the entire South Range and portions of North Range; Map 3-1), and the Great Basin (northern portions of the North Range). While dominated by Mojave Desert flora, it has floristic affinities with the Sierra Nevada and White-Inyo Range. These subregions vary in temperature extremes and the seasonality of precipitation (Baldwin and Martens 2002; Thomas et al. 2004). Precipitation increases with elevation. Temperature extremes tend to be greater in the Mojave subregion and precipitation there has a strong seasonal component. While creosote is practically ubiquitous in the Mojave Desert flora, a large majority of vegetation alliances, as identified in the Mojave Desert Ecosystem Program (MDEP) study, occupy a relatively small portion of the environmental gradient (Keeler-Wolf 2007). Most of these are strongly correlated with high summer and winter precipitation, and higher elevations. Alliances with creosote as a dominant occupy two-thirds of the Mojave transects sampled in that study. It is replaced by sagebrush in the Great Basin flora.

A comparison of the various floristic influences evident at NAWS-CL, including subcategories of Mojave Desert, Great Basin Desert, and Sierra Nevada floras, is offered in Table 3-6. The approximate location of these influences at NAWS-CL, characteristic species and vegetation, and predominant climate comparisons are also described.

Table 3-6. Floristic influences of China Lake vegetation communities. (Adapted from: Schoenherr 1992; Baldwin and Martens 2002; Hickman 1993; Silverman 1997.)

Name	Defining Physical Characteristic	Characteristic Flora / Species at NAWS	General Location at NAWS-CL
Major Provinces			
Mojave Desert	Winter precipitation, some snow; winter/spring growing season; hot, dry summers and cool winters	Creosote Bush-Burrobush Scrub, Joshua Tree Woodland, Blackbrush Scrub, Shadscale Scrub, and Alkali Sink	Wide areas of bajadas and basins between mountain ranges, most lower elevations of North Range and all of South Range.
Great Basin	Winter precipitation, longer periods of freezing temperatures, snow often, and spring/summer growing season	Big Sagebrush Scrub, Shadscale Scrub, and Alkali Sink	Northeast portion of the North Range and lower elevation distributions of big sagebrush (*Artemisia tridentata*), bitterbrush (*Purshia tridentata* var. *glandulosa*), yellow rabbitbrush (*Chrysothamnus viscidiflorus*), and Mormon tea (*Ephedra viridis*). This boundary occurs at about 4,500-5,000 feet mean sea level from northwest Coso Range east of Haiwee Reservoir, southeast to Louisiana Butte, upper Mountain Springs Canyon, and ending near Moscow Springs and Argus Peak.
Floristic Subregions and Minor Influences			
Northern Mojave Desert /Death Valley (not recognized by Hickman [1993])	Numerous unique and highly adapted, low-growing, perennial species, many endemic to carbonate formations	Yerba desierto (*Fendlerella utahensis*), caespitose evening primrose (*Oenothera caespitosa* subsp. *crinita*), pagoda buckwheat (*Eriogonum rixfordii*), large-headed rock daisy (*Perityle megalocephala*), Panamint springparsley (*Cymopterus panamintensis*), Death Valley round-leaved phacelia (*Phacelia mustelina*), net veined viguiera (*Bahiopsis reticulata*), little-leaved mountain mahogany (*Cercocarpus intricatus*), Mexican cliffrose (*Purshia mexicana*), and Death Valley sand mat (*Chamaesyce parishii*)	Northeast regions of NAWS-CL: Panamint Mountains, southern Panamint Valley, northern Slate Range, and eastern Argus Range, usually where limestone is present. Lower elevations are Mojave-like while upper elevations are more characteristic of the Great Basin Province, especially the limestone ranges.
West Mojave Desert	Low summer rain and extreme ratio of abundant annuals to sparse perennials	Desert candle (*Caulanthus inflatus*), alkali goldfields (*Lasthenia californica*), leafy-stemmed coreopsis (*Coreopsis calliopseda*), angle-stemmed buckwheat (*Eriogonum angulosum*), chickpea lupine (*Lupinus microcarpus*), spineplant (*Chorizanthe watsonii*), and Mojave buckwheat (*Eriogonum mohavense*)	South Range, West Superior Valley to the Black Hills.
Central Mojave Desert	Summer rain more significant than western or northern Mojave Desert	Mohave indigo bush (*Psorothamnus arborescens* var. *arborescens*)	South Range.
Southern Sierra Nevada Subregion	Desert transition areas from Mojave to Little Lake	Charlotte's phacelia (*Phacelia nashiana*), Modoc gilia (*Gilia modocensis*), Coulter jewelflower (*Caulanthus coulteri*), bush mallow (*Malacothamnus fremontii*), bush penstemon (*Keckiella breviflora*), and xantus spineplant (*Chorizanthe xanti*)	Inyokern and western Coso Mountains, northwestern and higher elevations portions of the North Range such as at Haiwee Springs.
Eastern Sierra Nevada Subregion	Granitic-adapted conifer woodlands and Great Basin scrub, contiguous with Southern Sierra Nevada Subregion	Magnificent lupine (*Lupinus magnificus* var. *glarecola*), crowned muilla (*Muilla coronata*), DeDecker's clover (*Trifolium macilentum* var. *dedeckerae*), mono penstemon (*Penstemon monoensis*), and horkelliella (*Hoekelliella congdonis*)	Northern Coso Mountains.

Name	Defining Physical Characteristic	Characteristic Flora / Species at NAWS	General Location at NAWS-CL
Inyo-White Mountains	Greater snowfall than Mojave or Great Basin, cold and dry, and closer biologic ties to Great Basin than Sierra Nevada	Prince's plume (*Stanleya elata*), Owens Valley penstemon (*Penstemon patens*), showy penstemon (*Penstemon speciosus*), Inyo rock-cress (*Arabis inyoensis*), chocolate drops (*Caulanthus pilosus*), Kennedy buckwheat (*Eriogonus kennedyi* subsp. *purpusii*), bush penstemon (*Keckiella rothrockii*), Darwin milkvetch (*Astragalus atratus* var. *mensanus*), Case's milkvetch (*Astragalus casei*), Indian parsley (*Cymopterus aborigunum*), and Inyo hulsea (*Hulsea vestita* subsp. *inyoensis*)	North Coso Range, and somewhat the north Argus Range

In the northern Mojave, growing conditions vary dramatically in temperature extremes, rainfall totals, and potential evapotranspiration rates (Webb et al. 2009a). This results in higher plant species richness. Most of the rainfall occurs during winter months, which may also limit the establishment of warm season, non-native grasses that require summer rainfall. Broad valleys and moderate topography characterize the central Mojave ecoregion, which encompasses most of the South Range. It has the fewest vascular plants of all Mojave subregions, and lower ecological variability and biodiversity. The western Mojave subregion has only one rainfall season (97% in winter), compared to two seasons for the other regions.

Locally, the influence of soils becomes more important, causing distinctive mosaics of vegetation. Very little precipitation occurs during summer, and summer photo-periods are very long during the time of greatest drought stress.

3.4.2 Controlling Factors in Plant Distribution, Composition, and Productivity

Vegetation structure in the Mojave Desert is more closely tied to soil development and the ability of different plant species to efficiently use water than to other environmental variables, such as total precipitation and runoff. Data for creosote bush canopy volume, derived from surficial geology mapping and data collected over a broad part of the central Mojave Desert (Bedford et al. 2009), demonstrate that these relations hold regionally. Canopy volume for these shrubs varies with soil development (deposit age): creosote bush decreases in volume with deposit age (Bedford et al. 2009), whereas burrobush maintains a relatively constant canopy volume, but plant density increases with deposit age. This is explained by soil moisture patterns, indicating that young deposits receive deep infiltration accompanied by shallow drying during summers, whereas soil horizons of old deposits slow infiltration and store soil moisture at shallow depths for longer time periods.

The availability of water to plants is, in turn, governed as follows:

- Soil water availability: regulated by total rainfall and its variation, summer rainfall, annual fluctuations of temperature and evapotranspiration, soil age, and soil compaction as it affects water movement and storage through the soil.
- Nutrient concentrations and ratios: regulated by soil texture, parent material, soil microbes, exotic plant introduction, and possibly air pollution.
- Soil surface condition (stability): regulated by parent material, particle size and aggregation, and soil age.
- Alteration of the natural patterns of disturbance: flash floods, introduction of non-native grasses, disturbance, and transition to more competitive or weedy plants.

Finally, biological soil crusts are important because they stabilize desert surfaces, reducing wind and water erosion. They also contribute nitrogen and carbon to soils and soil food webs, increase the ability of the soil to retain soil moisture, and decrease the successful establishment of non-native species (Belnap and Lange 2003). Undisturbed crusts have a high biomass of late-successional species of cyanobacteria, lichens, and mosses. Most disturbances result in a greatly simplified crust community, which reduces the crusts' contribution to soil stability and fertility. In addition, the loss of these dark colored, late-successional species increases the albedo (reflective power) of the soil, which reduces soil temperatures.

No specific information is reported on the status of surface biological crusts at NAWS-CL.

3.4.3 Vegetation Communities at NAWS-CL

Vegetation communities are geographically depicted for both the North Range and the South Range, respectively, in Map 3-8 and Map 3-9. Table 3-7 shows the acreages of each on both ranges.

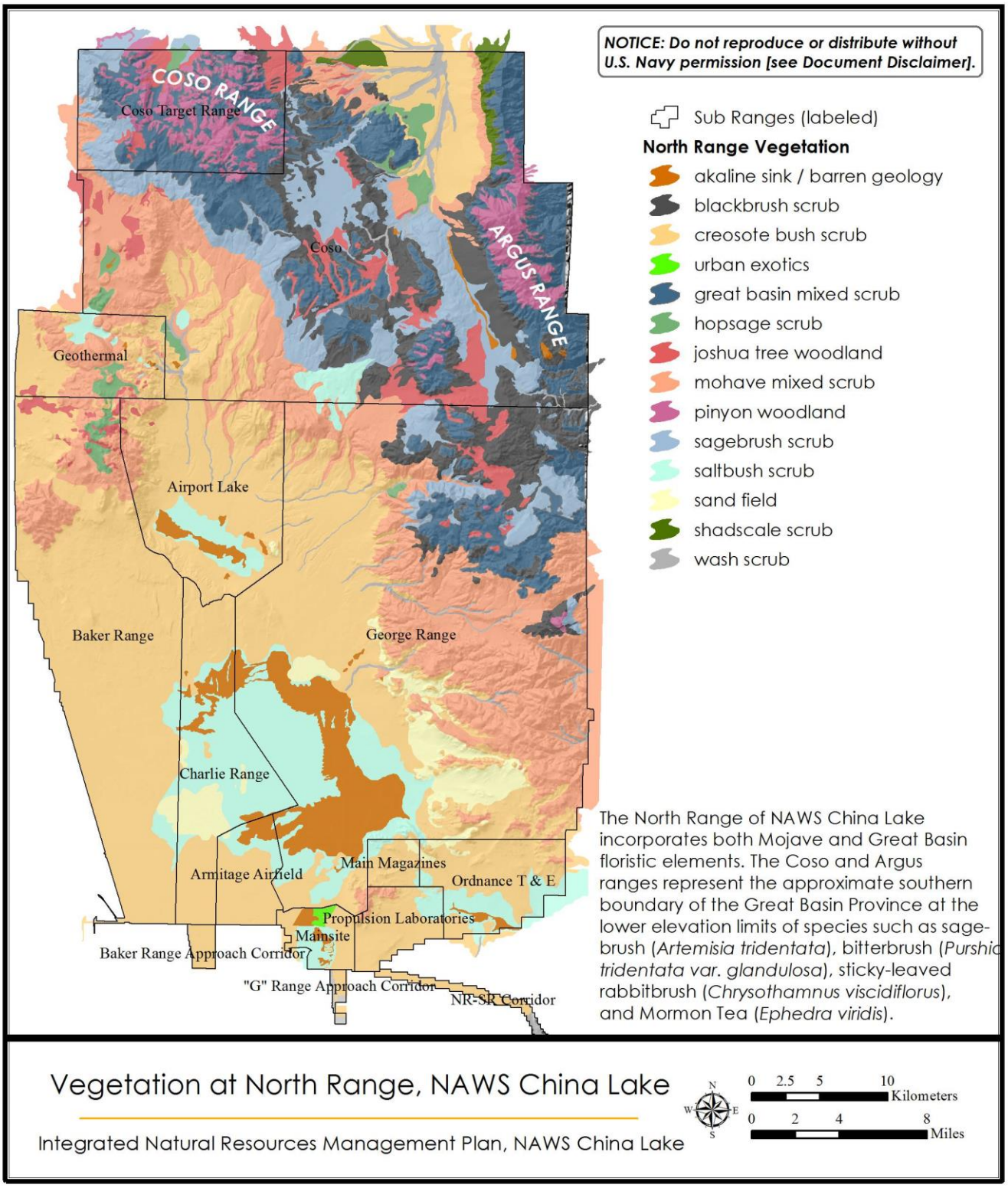
There are 18 different vegetation communities classified at NAWS-CL, of which 15 are mapped. The communities identified are as follows: Pinyon Woodland, Great Basin Mixed Scrub, Sagebrush Scrub, Blackbrush Scrub, Joshua Tree Woodland, Desert Transition Scrub, Mojave Mixed Scrub, Unique Zones of Mojave Mixed Scrub, Shadscale Scrub, Hop-Sage Scrub, Mojave Wash Scrub, Creosote Bush Scrub, Mojave Sand Field, Desert Holly Scrub, Saltbush Scrub, Alkaline Sink Scrub, Vernal Playa, and Disturbed/Successional.

Not mapped in the NAWS-CL Geographic Information System are Desert Transition Scrub, Vernal Playas, Disclimax (also referred to as Disturbed/Successional), and Riparian (includes springs, seeps, and open water).

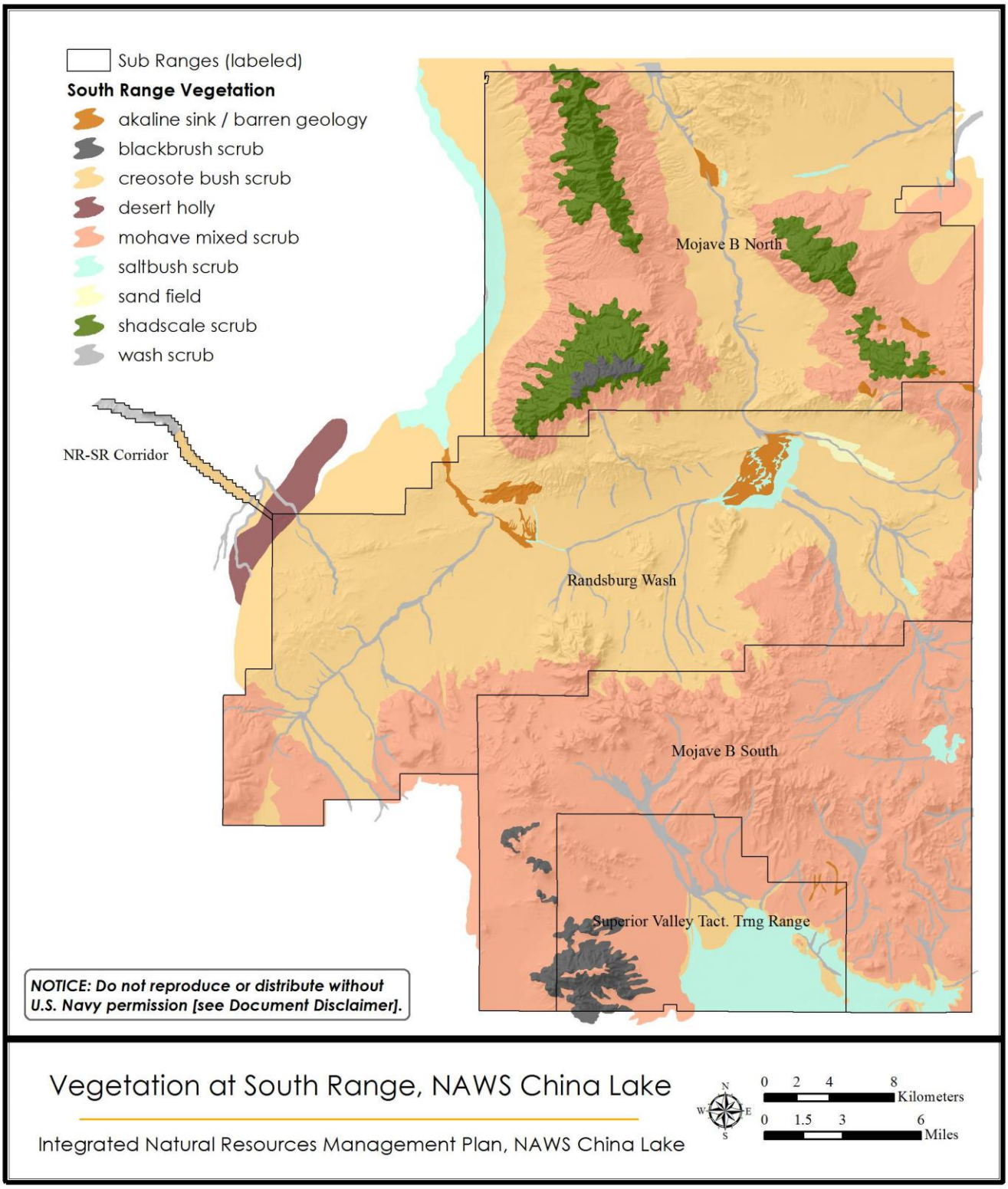
The classification system is cross-referenced to the following published classification systems in Appendix L: Brown 1982; Holland 1986; Munz and Keck 1968; Sawyer and Keeler-Wolf 1995; Rowlands 1995; Beatley 1976; NatureServe 2003; and Charlton 2003.

3.5 Plant, Fish and Wildlife Populations

The diversity of NAWS-CL flora and fauna is influenced by a number of factors including the number and location of water (natural waters such as seeps and springs, as well as the Waste Water Treatment Facility, Evaporation Ponds, and the Lark Seep System), the relatively undisturbed nature of the property (approximately 8% surface disturbance), the elevation range of 1,700 to 8,800 feet above sea level, and the location of the Installation at the confluence of the Great Basin and Mojave biomes. About 35 species of reptiles and amphibians (Navy 2000a), 322 species of birds (Blue and Moore 1998), 58 species of mammals (Navy 2000a) and 1,833 species of invertebrates (Navy 2000a) have been observed on NAWS-CL. Six federally listed species have been recorded at NAWS-CL. Detailed descriptions of these and their current management are found in Section 3.5.8. Sections 3.5.2 through Section 3.5.7 provide information on NAWS-CL plant and animal species. Included in these Sections are limited discussions of species considered NAWS Special Status Species (these species were designated NAWSCL Sensitive Species in the CLUMP and 2004 INRMP). More detailed discussion of these species is provided in Appendix J.



Map 3-8. North Range vegetation communities at Naval Air Weapons Station China Lake.



Map 3-9. South Range vegetation communities at Naval Air Weapons Station China Lake.

Table 3-7. Vegetation mapping unit acreages are based on a system developed for Naval Air Weapons Station China Lake natural resources management. There are 18 different types of vegetation units. Classes are series-based with simplified names. Community descriptions are based on field data, a review of past documents and a vegetation map from 1996-1997. The Naval Air Weapons Station China Lake vegetation Geographic Information Systems layer does not depict Vernal Playas, Disclimax (also referred to as Disturbed/Successional), riparian, or Desert Transition Scrub categories, although they are described in past reports.

Vegetation Type	North Range (acres)	South Range (acres)	Total Acres	Dominant, Frequent, or Characteristic Species
Pinyon Woodland	18,915	--	18,915	Single-leaf pinyon pine (*Pinus monophylla*), big sagebrush (*Artemisia tridentata*), Mormon tea (*Ephedra viridis*), bitterbrush (*Purshia* sp.), Utah juniper (*Juniperus osteosperma*), Joshua tree (*Yucca brevifolia*), western serviceberry (*Amelanchier utahensis*), Mohave ceanothus (*Ceanothus vestitus*), desert gooseberry (*Ribes velutinum*), and spineless horsebrush (*Tetradymia canescens*).
Great Basin Mixed Scrub	65,314	--	65,314	Bitterbrush (*Purshia* sp.) is co-dominant with big sagebrush (*Artemisia tridentata*) and Mormon tea (*Ephedra viridis*). Other characteristic shrubs are Joshua tree (*Yucca brevifolia*), purple sage (*Salvia dorrii*), sticky-leaved rabbitbrush (*Chrysothamnus viscidiflorus* subsp. *puberulus*), rubber rabbitbrush (*Ericameria nauseosus*), and fourwing saltbush (*Atriplex canescens*).
Sagebrush Scrub	40,999	--	40,999	Big sagebrush (*Artemisia tridentata*) is dominant or co-dominant. On high elevation basalt lava flows it is frequently associated with Mormon tea (*Ephedra viridis*), purple sage (*Salvia dorrii*), and threadleaf snakeweed (*Gutierrezia microcephala*), such as in central Argus Range, east of Birchum Springs, surrounding Water Canyon, and west of Junction Ranch.
Blackbrush Scrub	41,338	7,339	48,677	Blackbrush (*Coleogyne ramosissima*), Joshua tree (*Yucca brevifolia*), Mexican bladder sage (*Scutellaria mexicana*), various Mormon teas (*Ephedra* spp.), banana yucca/Spanish bayonet (*Yucca baccata*), and Mohave yucca (*Yucca schidigera*).
Joshua Tree Woodland	18,461	--	18,461	Joshua tree (*Yucca brevifolia*).
Mojave Mixed Scrub: Ecotonal plant community subcategories include Desert Transition Scrub, Joshua Tree Woodland, Shadscale Scrub, Hop-Sage Scrub, Mojave Wash Scrub, and Mojave Sand Field	108,254	221,305	329,559	Numerous localized series may be dominated by: Anderson thornbush (*Lycium andersonii*), burrobush (*Ambrosia salsola*), Cooper's goldenbush (*Ericameria cooperi*), green rabbitbrush (*Chrysothamnus viscidiflorus*), spineless horsebrush (*Tetradymia canescens*), chaffbush (*Amphipappus fremontii*), Johnson's indigo bush (*Psorothamnus arborescens* var. *minutifolius*), spiny menodora (*Menodora spinescens*), California buckwheat (*Eriogonum fasciculatum*), and Mexican bladder sage (*Scutellaria mexicana*). Other associates are goldenhead (*Acamptopappus sphaerocephalus*), Nevada joint-fir (*Ephedra nevadensis*), ratany (*Krameria erecta*), Mohave woodyaster (*Xylorhiza tortifolia*), desert alyssum (*Lepidium fremontii*), turpentine broom (*Thamnosma montana*), threadleaf snakeweed (*Gutierrezia microcephala*), winterfat (*Krascheninnikovia lanata*), wire lettuce (*Stephanomeria pauciflora*), golden cholla (*Cylindropuntia echinocarpa*), brittlebush (*Encelia actoni*), Johnson's indigo bush (*Psorothamnus arborescens* var. *minutifolius*), and spiny hopsage (*Grayia spinosa*).
Mojave Mixed Scrub–Upper Bajada Alluvial Scrub Subtype	10,825		10,825	Turpentine broom (*Thamnosma montana*), Cooper's goldenbush (*Ericameria cooperi*), spineless horsebrush (*Tetradymia canescens*), peach thorn (*Lycium cooperi*), spiny menodora (*Menodora spinescens*), winterfat (*Krascheninnikovia lanata*), burrobush (*Ambrosia salsola*), Mexican bladder sage (*Scutellaria mexicana*), Anderson thornbush (*Lycium andersonii*), Joshua trees (*Yucca brevifolia*), blackbrush (*Coleogyne ramosissima*), and spiny hopsage (*Grayia spinosa*) are common. In the Grass Valley and Slocum Mountain region of the South Range, desert needlegrass (*Stipa speciosa*) is a co-dominant cover species in this zone. This zone of Mojave Mixed Scrub has the highest diversity of annual species at NAWS-CL. Small fescue (*Festuca microstachys*), an annual grass species, is very characteristic.
Mojave Mixed Scrub–Rocky Slope and Cliff Scrub Subtype				Characterized by cliff goldenbush (*Ericameria cuneata*), green rabbitbrush (*Chrysothamnus viscidiflorus*), starry bedstraw (*Galium stellatum*), bushy bedstraw (*Galium matthewsii*), California spear-leaved brickellia (*Brickellia atractyloides* var. *arguta*), California buckwheat (*Eriogonum fasciculatum*), bushy cryptantha (*Cryptantha racemosa*), wire lettuce (*Stephanomeria pauciflora*), desert alyssum (*Lepidium fremontii*), Mexican bladder sage (*Scutellaria mexicana*), Mohave woodyaster (*Xylorhiza tortifolia* var. *tortifolia*), desert needlegrass (*Stipa speciosa*), desert lotus (*Acmispon rigidus*), rock-cress (*Arabis* sp.), Mohave thistle (*Cirsium mohavense*), and ferns (*Cheilanthes* and *Pityrogramma*).

Vegetation Type	North Range (acres)	South Range (acres)	Total Acres	Dominant, Frequent, or Characteristic Species
Mojave Mixed Scrub–Carbonate Adapted Scrub Subtype				Shadscale (*Atriplex confertifolia*) and creosote bush (*Larrea tridentata*) are the most characteristic. Blackbrush (*Coleogyne ramosissima*) and spiny hopsage (*Grayia spinosa*) are also common. Other characteristic shrubs are desert alyssum (*Lepidium fremontii*), winterfat (*Krascheninnikovia lanata*), spiny menodora (*Menodora spinescens*), Heermann's buckwheat (*Eriogonum heermannii*), Death Valley ephedra (*Ephedra funerea*), Anderson thornbush (*Lycium andersonii*), Mohave woodyaster (*Xylorhiza tortifolia*), turpentine broom (*Thamnosma montana*), net veined viguiera (*Bahiopsis reticulata*), brittlebush (*Encelia actoni*), prince's plume (*Stanleya pinnata*), and threadleaf snakeweed (*Gutierrezia microcephala*). Cacti are often locally abundant on south- and west-facing carbonate slopes. More closely associated with the carbonate zones of Mojave Mixed Scrub are species such as budsage (*Artemisia spinescens*), green molly (*Kochia americana*), spiny greasebush (*Glossopetalon spinescens* var. *aridum*), bush penstemon (*Keckiellla* sp.), and Utah butterflybush (*Buddleja utahensis*). Higher elevations in the carbonate zones of Mojave Mixed Scrub also include black sagebrush (*Artemisia nova*), Mexican cliffrose (*Purshia mexicana*), little-leaved mountain mahogany (*Cercocarpus intricatus*), and desert snowberry (*Symphoricarpos longiflorus*). Herbaceous perennials are probably the most highly adapted formation in carbonate zones of Mojave Mixed Scrub. Characteristic species include large-headed rock daisy (*Perityle megalocephala*), yellow cryptantha (*Cryptantha confertiflora*), Walker's suncup (*Camissonia walkeri*), caespitose evening primrose (*Oenothera caespitosa* subsp. *crinita*), Inyo blazing star (*Mentzelia inyoensis*), Mohave milkvetch (*Astragalus mohavensis*), Newberry's milkvetch (*Astragalus newberryi*), Panamint milkvetch (*Astragalus panamintensis*), Kings' sandwort (*Arenaria kingii*), and Panamint phacelia (*Phacelia perityloides*).
Mojave Mixed Scrub–Cinder and Talus Scrub Subtype				Cinder and talus zones within Mojave Mixed Scrub have very distinctive, highly adapted plant compositions. Shinyleaf sandpaper plant (*Petalonyx nitidus*), Mexican bladder sage (*Scutellaria mexicana*), bush lupine (*Lupinus* sp.), threadleaf ragwort (*Senecio flaccidus*), and pigmycedar (*Peucephyllum schottii*) frequent on loose slopes. Plants characteristic of wash zones are often able to colonize lower slopes of talus and cinder slopes, where extra moisture is likely present. Herbaceous perennials characteristic of these slopes include naked buckwheat (*Eriogonum nudum*), hoary buckwheat (*Eriogonum saxatile*), desert trumpet (*Eriogonum inflatum*), wishbone bush (*Mirabilis bigelovii*), Panamint springparsley (*Cymopterus panamintensis*), prickly poppy (*Argemone munita*), Mohave thistle (*Cirsium mohavense*), and desert thistle (*Cirsium neomexicanum*). More gentle slopes with more developed soils have flat-topped buckwheat (*Eriogonum deflexum*), spotted buckwheat (*Eriogonum maculatum*), birdnest buckwheat (*Eriogonum nidularium*), pagoda buckwheat (*Eriogonum rixfordii*), Bigelow's coreopsis (*Coreopsis bigelovii*), turtle plant (*Psathyrotes* spp.), limestone phacelia (*Phacelia cryptantha*), Charlotte's phacelia (*Phacelia nashiana*), specter phacelia (*Phacelia pedicellata*), sand blazing star (*Mentzelia involucrata*), green fiddleneck (*Amsinckia vernicosa*), scented cryptantha (*Cryptantha utahensis*), Booth's evening primrose (*Camissonia boothii* subsp. *boothii*), brown-eyed primrose (*Camissonia claviformis*), yellow cups (*Camissonia brevipes*), woolly stars (*Eriastrum* spp.), rock gilia (*Gilia scopulorum*), and chia (*Salvia columbariae*). There is great potential for undocumented species on cinder and talus slopes at NAWS-CL. This type of terrain is difficult to access. Past work in these areas has been minimal, yet very productive in locating noteworthy plant occurrences.

Vegetation Type	North Range (acres)	South Range (acres)	Total Acres	Dominant, Frequent, or Characteristic Species
Mojave Mixed Scrub–Canyon Bottom and Wash Scrub Subtype				Characteristic shrubs are fourwing saltbush (*Atriplex canescens*), rubber rabbitbrush (*Ericameria nauseosus*), bush lupine (*Lupinus* sp.), Mexican bladder sage (*Scutellaria mexicana*), burrobush (*Ambrosia salsola*), desert baccharis (*Baccharis sergiloides*), scalebroom (*Lepidospartum squamatum*), allscale (*Atriplex polycarpa*), little-leaved brickellia (*Brickellia microphylla*), longleaf brickellbush (*Brickellia longifolia* var. *multiflora*), peach thorn (*Lycium cooperi*), threadleaf snakeweed (*Gutierrezia microcephala*), common snakeweed (*Gutierrezia sarothrae*), Rothrock's keckiella (*Keckiella rothrockii* var. *rothrockii*), brittlebush (*Encelia actoni*), sweetbush (*Bebbia juncea*), and threadleaf ragwort (*Senecio flaccidus*). Subshrubs and herbaceous perennials of canyon bottoms include naked buckwheat (*Eriogonum nudum*), Wright's buckwheat (*Eriogonum wrightii*), desert lotus (*Acmispon rigidus*), small-flowered melica (*Melica imperfecta*), tall melica (*Melica frutescens*), prickly poppy (*Argemone munita*), purple threeawn (*Aristida purpurea*), desert milkweed (*Asclepias erosa*), rattlesnake weed (*Chamaesyce albomarginata*), desert rocknettle (*Eucnide urens*), yellow nightshade groundcherry (*Physalis crassifolia*), desert tobacco (*Nicotiana obtusifolia*), bushy bedstraw (*Galium matthewsii*), prince's plume (*Stanleya pinnata*), and thistles (*Cirsium* spp.). Shrubs characteristic of open wash zones of Mojave Mixed Scrub on the South Range outside the Slate Range include Mohave indigo bush (*Psorothamnus arborescens* var. *arborescens*), burrobush (*Ambrosia salsola*), peach thorn (*Lycium cooperi*), Anderson thornbush (*Lycium andersonii*), spiny hopsage (*Grayia spinosa*), desert senna (*Senna armata*), desert almond (*Prunus fasciculata*), bladderpod (*Peritoma arborea*), Mexican bladder sage (*Scutellaria mexicana*), allscale (*Atriplex polycarpa*), fourwing saltbush (*Atriplex canescens*), and Nevada joint-fir (*Ephedra nevadensis*). Fewer herbaceous perennials are associated with these zones. Some characteristic types include Cooper's dyssodia (*Adenophyllum cooperi*), rattlesnake weed (*Chamaesyce albomarginata*), Mohave stillingia (*Stillingia paucidentata*), hole-in-the-sand plant (*Nicolletia occidentalis*), and desert milkweed (*Asclepias erosa*). Annuals in open wash zones can be very abundant and diverse in years of ample rainfall. They are typical of other alluvial zones of Mojave Mixed Scrub.
Shadscale Scrub	2,675	20,456	23,131	Shadscale (*Atriplex confertifolia*) and spinescale saltbush (*Atriplex spinifera*).
Hop-Sage Scrub	6,702	--	6,702	Spiny hopsage (*Grayia spinosa*), spiny menodora (*Menodora spinescens*), Cooper's goldenbush (*Ericameria cooperi*), Anderson thornbush (*Lycium andersonii*), shadscale (*Atriplex confertifolia*), burrobush (*Ambrosia salsola*), blackbrush (*Coleogyne ramosissima*), creosote bush (*Larrea tridentata*), budsage (*Artemisia spinescens*), spinescale saltbush (*Atriplex spinifera*), winterfat (*Krascheninnikovia lanata*), and burrobush (*Ambrosia dumosa*).
Mojave Wash Scrub	7,850	18,680	26,530	Mohave rabbitbrush (*Ericameria paniculatus*), pigmycedar (*Peucephyllum schottii*), and allscale (*Atriplex polycarpa*).
Creosote Bush Scrub	212,120	203,492	415,612	Creosote bush (*Larrea tridentata*), allscale (*Atriplex polycarpa*), shadscale (*Atriplex confertifolia*), Johnson's indigo bush (*Psorothamnus arborescens* var. *minutifolius*), goldenhead (*Acamptopappus sphaerocephalus*), burrobush (*Ambrosia salsola*), desert senna (*Senna armata*), and Anderson thornbush (*Lycium andersonii*).
Mojave Sand Field	15,853	931	16,784	Characteristic perennials include sandpaper plant (*Petalonyx thurberi* subsp. *thurberi*), dapple pod locoweed (*Astragalus lentiginosus* var. *variablis*), sand grass (*Stipa hymenoides*), annual stillingia (*Stillingia spinulosa*), Mohave stillingia (*Stillingia paucidentata*), giant woolly star (*Eriastrum densifolium*), desert death camas (*Toxicoscordion brevibracteatum*), hole-in-the-sand plant (*Nicolletia occidentalis*), prickly poppy (*Argemone munita*), evening primrose (*Oenothera* spp.), and yucca buckwheat (*Eriogonum plumatella*). Annuals growing on dunes and sand fields are rich and robust. Some of the most characteristic include desert dandelion (*Malacothrix glabrata*), Bigelow's coreopsis (*Coreopsis bigelovii*), Mohave sand-verbena (*Abronia pogonantha*), desert sand-verbena (*Abronia villosa*), brown-eyed primrose (*Camissonia claviformis*), keysia (*Glyptopleura marginata*), two-color phacelia (*Phacelia bicolor*), desert twinbugs (*Dicoria canescens*), small wire lettuce (*Stephanomeria exigua*), various *Gilia* species, Arabian schismus (*Schismus arabicus*), Mediterranean schismus (*Schismus barbatus*), and desert chicory (*Rafinesquia neomexicana*).
Desert Holly Scrub	--	391	3,91	Desert holly (*Atriplex hymenelytra*), creosote bush (*Larrea tridentata*), and shadscale (*Atriplex confertifolia*).
Saltbush Scrub	48,048	19,300	67,348	Allscale (*Atriplex polycarpa*) and spinescale saltbush (*Atriplex spinifera*).

Vegetation Type	North Range (acres)	South Range (acres)	Total Acres	Dominant, Frequent, or Characteristic Species
Alkaline Sink Scrub	22,700	4,618	27,318	Characteristic species include bush seepweed (*Suaeda moquinii*), rusty molly (*Kochia californica*), Parry's saltbush (*Atriplex parryi*), iodine bush (*Allenrolfea occidentalis*), shrubby alkali aster (*Arida carnosa*), rubber rabbitbrush (*Ericameria nauseosus*), allscale (*Atriplex polycarpa*), shadscale (*Atriplex confertifolia*), desert alyssum (*Lepidium fremontii*), fourwing saltbush (*Atriplex canescens*), tamarisk (*Tamarix* spp.), Mohave indigo bush (*Psorothamnus arborescens* var. *arborescens*), Torrey saltbush (*Atriplex torreyi*), littleleaf horsebrush (*Tetradymia glabrata*), alkali goldenbush (*Isocoma acradenia*), prince's plume (*Stanleya pinnata*), and saltgrass (*Distichlis spicata*). The least alkaline and driest areas in the community are characterized by allscale (*Atriplex polycarpa*) and fourwing saltbush (*Atriplex canescens*). In the Mojave Desert, these saltbushes are often associated with honey mesquite (*Prosopis glandulosa*).
Seasonal Pools and Playas	Unmapped	Unmapped	Unmapped	Bluntleaf stinkweed (*Cleomella obtusifolia*), bristly fiddleneck (*Amsinckia tessellata*), tumbleweed-mustards (*Sisymbrium* spp.), valley mayweed (*Chamomilla occidentalis*), and Coville's orach (*Atriplex covillei*).
Riparian	Unmapped	Unmapped	Unmapped	Arroyo willow (*Salix lasiolepis*), narrowleaf willow (*Salix exigua*), red willow (*Salix laevigata*), desert olive (*Forestiera pubescens*), desert baccharis (*Baccharis sergiloides*), rush (*Juncus* spp.), Woods' rose (*Rosa woodsii*), monkeyflower (*Mimulus* spp.), goldenrod (*Solidago* spp.), beardless wild rye (*Elymus triticoides*), common reed (*Phragmites australis*), bulrush (*Scirpus* spp.), spikerush (*Eleocharis* spp.), annual beard-grass (*Polypogon monspeliensis*), tarragon (*Artemisia dracunculus*), white sagebrush (*Artemisia ludoviciana*), cattail (*Typha* spp.), and saltgrass (*Distichlis spicata*).
Disturbed Plant Associations	Unmapped	Unmapped	Unmapped	Tumbleweed (*Salsola* spp.), tamarisk (*Tamarix ramosissima*), saltbush (*Atriplex* spp.), rubber rabbitbrush (*Ericameria nauseosus*), buckwheat (*Eriogonum* spp.), lupine (*Lupinus* spp.), milkvetch (*Astragalus* spp.), burrobush (*Ambrosia salsola*), brome (*Bromus* spp.), *Brassica* spp., *Sisymbrium* spp., schismus (*Schismus* sp.), bristly fiddleneck (*Amsinckia tessellata*), redstem filaree (*Erodium cicutarium*), common red sage (*Kochia scoparia*), annual bursage (*Ambrosia acanthicarpa*), and saltgrass (*Distichlis spicata*).

NAWS-CL Special Status Species are defined as those species that are not protected under federal law, but are considered important components of the Installation's biotic system. They are categorized as special status species by various federal, state, and local resource agencies and organizations. A species may qualify as a NAWS-CL Special Status Species if it meets any of the following criteria.

- Listed as threatened or endangered by the Federal Government;
- Covered by the Migratory Bird Treaty Act;
- Listed as threatened or endangered by the State;
- Proposed for federal listing or a former USFWS Category 2 or 3 species;
- State, BLM, or other agencies/organizations have identified them as warranting special management consideration (based on other resource agencies or professionally recognized organizations or specialists);
- Listed in the California Natural Diversity Database (CNDDB);
- Of scientific interest;
- Rare or endemic;
- Range extension;
- Unknown taxonomy (i.e., specimens not confirmed as definitely matching a known rare species but similar enough to warrant tracking for further study); or
- Recognized by NAWS-CL technical staff as unique or of scientific interest.

The development of the NAWS Special Status Species list relied heavily on the species listed in the CNDDB (CDFG 1996) and various lists developed by state and federal agencies and conservation organizations. These agencies employ the best available science in developing their particular sensitive species lists and may consider factors such as the species rarity, state listing status, endemic status, scientific interest, or proposal for federal listing. Species not found in the CNDDB were added based on their inclusion on similar lists compiled by agencies including:

- CDFW
- California Native Plant Society (CNPS)
- USFWS (Birds of Conservation Concern List, other)
- Bureau of Land Management (BLM) (Special Status/Sensitive Species)
- U.S. Forest Service (USFS)
- National Park Service (NPS)
- National Audubon Society and American Bird Conservancy's (WatchList)

In addition, scientific experts assisted in the development of the list of species specifically applicable to lands managed by NAWS-CL. Some of these subject matter experts included:

- Dr. Kristin Berry (common chuckwalla [*Sauromalus ater*], reptiles and amphibians)
- Dr. Pat Brown-Berry (bats)
- Dr. Chris Conroy - UC Berkeley (mammals, voles)
- Dr. Dave Delehanty - University of Idaho (mountain quail)
- Dr. Robert Hershler - University of Florida (snails)
- Dr. Robert Lovich - Naval Facilities Engineering Command (NAVFAC) Southwest (reptiles and amphibians)

- The late Dr. David Morafka - California Academy of Sciences and California State University, Dominguez Hills (reptiles and amphibians, Panamint alligator lizard)
- Dr. Robert Murphy - Royal Ontario Museum (toads)
- Ted Papenfuss - UC Berkeley (Panamint alligator lizard [*Elgaria panamintina*], rubber boa [*Charina* sp.], other reptiles and amphibians)
- Dr. Gordon Pratt - UC Riverside, entomologist (invertebrates, some plants and mammals)
- Eric Simadal - University of Nevada, Reno (toads, other reptiles and amphibians)

NAWS-CL also considers those species exhibiting unique or rare features (such as creosote clones or Joshua tree spikes), and those occurring in a known sensitive habitat (Section 3.1) or in designated Critical Habitat as warranting either stewardship or protection. In accordance with the Sikes Act, protection, stewardship, and conservation of natural resources are conducted in a mission compatible manner.

There are several locations within NAWS-CL that have diverse and/or unique vegetation and several Special Status plant species. These include areas such as lava flows in the Coso Mountains, the Coso Known Geothermal Resource Area, dune systems of the southern Argus Range, and numerous springs and mines. There are also plants that are essential hosts to NAWS-CL wildlife, such as riparian vegetation, Parry saltbush, and creosote clonal rings. Dr. Frank Vasek, Professor Emeritus of University of California (UC) Riverside has observed that NAWS-CL is home to examples of large creosote rings, which may be among the oldest living plants.

Wetlands and riparian areas have the greatest diversity and density of fauna because they offer greater availability of food, water, and protective cover. Many of the 415 recorded vertebrates on NAWS-CL, including a high proportion of endemic and endangered species, are typically associated with wetlands or riparian habitats. These habitats also support migratory birds.

Shrub growth provides nesting areas to resident birds such as flycatchers, LeConte's thrashers, loggerhead shrikes (*Lanius ludovicianus*), and stopover areas for numerous species of migrants. Though there are no substantial areas of open water on the South Range, denser clumps of vegetation supported by seeps and subsurface flow are important to bird populations on the South Range. These areas also offer shade and protection for many reptile and amphibian species on NAWS-CL.

Joshua trees provide shade and attract animals, especially ungulates, to their bases. Nesting raptors and migratory songbirds depend heavily on Joshua Tree Woodlands.

The conservation of these species and natural resource features is a management goal of the INRMP, and they are provided management consideration during the land use planning process described in Installation's Site Approval process and in the CLUMP. The Sikes Act requires that an INRMP provide for "no net loss in the capability of the military Installation lands to support the military mission of the installation." The purpose of the INRMP is to accommodate current and evolving mission requirements while meeting natural resource compliance and stewardship responsibilities. Additional conservation benefits are also realized through the implementation of voluntary impact avoidance and minimization measures that activity proponents and NAWS natural resources staff conduct on a noninterference basis with mission requirements.

Should a NAWS-CL Special Status Species be identified in an area that may be affected by a proposed project or activity, efforts are made to avoid or minimize impacts to these resources whenever practicable in light of military mission requirements. NAWS-CL Special Status Species are not afforded the level of protection required for species listed under the federal ESA or other federal law. According to the 2000 INRMP, "recognition of these

species as sensitive and deserving consideration in the decision-making process, especially when approving new facilities or project sites, is part of the NAWS-CL long-range management strategy." The management and conservation of NAWS Special Status Species is also a CLUMP management goal that was approved by the Commanding Officer and State Director of the BLM. It remains a management goal of the current INRMP which was signed by the USFWS and the CDFW. In addition, OPNAVINST 5090.1C CH-1, Chapter 24 (Section 24-5) contains substantial language directing natural resource managers (and Commands) to recognize and balance environmental stewardship with mission readiness. Navy policy is to restore, improve, conserve, and properly use natural resources and to strive to protect and conserve natural resources throughout the land, sea, and air space areas in which the Navy operates. The Navy's goal is to protect and enhance ecosystem integrity, and to sustain both biological diversity and continued availability of those resources for military readiness.

In general, NAWS-CL manages natural resources by working closely with project proponents to accommodate military mission accomplishment while conserving species and habitats to the extent practicable. Species that are not federally listed or otherwise protected (the Golden Eagle and MBTA listed species), such as NAWS-CL Sensitive Species, are conserved primarily through impact avoidance or minimization procedures. These conservation efforts have been highly successful over the past few decades. They have been implemented in a mission compatible manner with little or no impact to project timelines or funding expenditures and have been widely acknowledged as a successful conservation practice by individuals, organizations and agencies.

A key component for successful implementation of avoidance and minimization procedures is the completion of pre-activity surveys and/or activity monitoring. Pre-project surveys provide useful planning information for all parties and are typically conducted at the time the activity proponent notifies the Environmental Management Division (EMD) of the project, typically weeks or months prior to the start the activity. Monitoring of surface disturbing activities is usually conducted immediately prior to or, at times, during the activity. These types of actions fulfill the requirements of Section 7 (a)(1) of the Endangered Species Act and comply with the Protective Measures required by the 2013 Biological Opinion for these types of activities. Implementation of these avoidance and minimization procedures and pre-project and final site clearance surveys also support the navy's protection and conservation policy for natural resources as required by OPNAVINST 5090.

As a result of these compliance and conservation measures NAWS-CL has been able to foster a good relationship with internal and external stakeholders; avoid potential additional federal listings (Mohave ground squirrel); and has facilitated proposed delisting of threatened species (Inyo California towhee). Funding is acquired for sensitive species through the Environmental Program Requirements process and is supported by Navy agreements including:

- MOU among the DoD, the USFWS, and the Association of Fish and Wildlife Agencies for a Cooperative Integrated Natural Resource Management Program on Military Installations (01-2006)
- MOU with Watchable Wildlife, Inc. (10-2002)
- MOU for Support of Cooperative Agreement between the DoD and The Nature Conservancy (04-2005)
- MOU for the Continuation of the Cooperative Ecosystem Studies Units Network (05-2005)
- MOU between the DoD and the National Biological Information Infrastructure (06-2005)
- MOU for Conservation of Migratory Birds (07-2006)
- MOU for Federal Native Plant Conservation (09-2006)
- MOU between the DoD and Bat Conservation International (10-2006)
- MOU between Natural Resources Conservation Service and DoD to Promote Cooperative Conservation (11-2006)

- MOU among Federal Agencies for Achieving Objectives of Partners in Amphibian and Reptile Conservation (03-2007)
- MOU among members of the North American Bird Conservation Initiative Committee (06-2007)

3.5.1 Flora

3.5.1.1 Plant Taxa

About 760 unique vascular plant taxa have been documented on NAWS-CL (Appendix I). Vascular plants include angiosperms (monocots and dicots), gymnosperms (conifers and ephedras), and pteridophytes (ferns and fern allies). Excluding cultivated plants, another 20+ plant taxa, mostly in the form of naturalized weeds, occur only in the NAWS-CL main complex.

The North and South Ranges have notable differences in plant and animal diversity with the North Range having greater plant diversity than the South Range. Ninety-six percent of NAWS-CL documented plant taxa can be found on the North Range, and 66% can be found on the South Range (Navy 2000a). Mesic microhabitats become more numerous with elevation and provide a niche for species uncharacteristic of desert regions. Such microhabitats are typically associated with springs, but also include canyon bottoms, cliffs, tree-shaded areas, and crevices in lava flows. Other features that contribute greatly to the North Range's floral diversity are plateaus, lava flows, and rolling terrain formed at the junction of the Coso and Argus mountain ranges. This topographical feature provides a more stable island than typical desert ranges for the survival of relictual species that were once more widespread (Betancourt et al. 1990) but have since retreated to higher elevations with the drying of the Mojave region in recent geologic time.

Several vascular plant families are well represented (see the list below). The genus *Eriogonum* (buckwheats) is the most diverse of vascular plant genera present at NAWS-CL with 35 species recorded. This genus is host to a diverse group of butterfly species (Pratt and Pierce 1995). Twenty-three taxa from the genus *Gilia* have been reported.

Genera with the most species at NAWS-CL are:

- *Eriogonum* (Buckwheats) - 40 taxa
- *Gilia* (Gilias) - 23 taxa
- *Phacelia* (Phacelias) - 20 taxa
- *Cryptantha* (Forget-me-nots) - 21 taxa
- *Camissonia* (Evening primroses) - 16 taxa
- *Lupinus* (Lupines) - 15 taxa
- *Astragalus* (Milkvetch) - 16 taxa

Appendix I presents the complete plant species list for NAWS-CL.

Non-vascular plants, such as lichens, mosses, liverworts, algae, and fungi, are important ecological components of the flora of NAWS-CL. The species diversity and ecology of non-vascular plants in native ecosystems at NAWS-CL is undocumented. The most important non-vascular plants in the ecology of NAWS-CL are mycorrhizal fungus, soil algae, and blue-green algae (*Cyanobacteria*), which help to form crusts, stabilize soils, and may be vital to repopulation and survival of many shrub species. Lichens, a symbiotic association of algae and fungus, are the most conspicuous forms of non-vascular plants at NAWS-CL, especially orange lichens (*Caloplaca*), which form radiating crusts on the north sides of boulders. Mosses and liverworts are found infrequently around springs

and shady microhabitats. Fungi are common at NAWS-CL; however, the only forms frequently observed are those with conspicuous fruiting bodies, such as the desert puffball mushrooms (*Podaxis*), wood-rotting fungi of pinyon pine, and rusts that affect shrubs. Red algae are sometimes conspicuous during favorable seasonal conditions, when playas become flooded. These playas and associated salt crusts turn bright red with algal blooms if temperatures and flooding are adequate.

3.5.1.2 Management of NAWS-CL Plants

Past surveys have documented a long list of rare plants, and this list continues to grow as incidental observations are made during other work (Munz 1974; DeDecker 1980; Kiva 1993; Pratt 1996; Silverman 1997). David Silverman has conducted surveys for the Lane Mountain milkvetch (*Astragalus jaegerianus*), and *Dudleya* sp. (a rare succulent reported near Pilot Knob). Voucher specimens are provided to UC Riverside, Rancho Santa Ana herbarium, or the Santa Barbara Botanical Garden.

Current management of special status plant species on NAWS-CL is accomplished primarily through the conservation of their habitats, fire management, and non-native plant control.

NAWS-CL has a general prohibition against unauthorized plant collection, and the CLUMP directs habitat protection as a first priority. Natural resources staff support avoidance and minimization measures, as these are consistent with the military mission. Trees, cacti, and unique large shrubs are often voluntarily avoided. Many minor roads avoid pines or large Joshua trees (especially spikes), creosote bush clones, and cactus, which are among the most valued plants at NAWS-CL.

Limited public access and the high level of protection already provided in some areas, due to cultural resources, endangered wildlife species, and wetlands, also provide incidental benefits for protecting sensitive flora. Protecting habitat will remain the primary management objective for many of these species, especially high-value (an area that has "rare, endemic, or unique flora or fauna or habitat that is limited in distribution at NAWS-CL") seeps and springs.

3.5.1.3 NAWS-CL Special Status Plant Species

Although there are no known federally or state listed plant species at NAWS-CL, there are numerous plants either known or with the potential to occur (based on available habitat and range) that are considered to be special status (see Table 3-8), based upon the following criteria:

- Proposed for federal listing or a former USFWS Category 2 or 3 species;
- Are unconfirmed taxonomically (i.e. specimens not confirmed as definitely matching a known rare species but similar enough to warrant tracking for further study);
- Are listed by the CNPS as rare or of limited distribution (CNPS status 1B);
- Are found on the BLM Sensitive Species list or USFS Significant Species list.

Maps 3-10 and 3-11 show the known locations of sensitive plant species at NAWS-CL and the immediate (five-mile radius) vicinity. With one exception, the Special Status Species listed in Table 3-8 have no federal or state legal implications to NAWS-CL, but are listed as rare by CNPS (Lane Mountain milkvetch is a federally endangered species that is currently not known to occur at NAWS-CL). 24 species in Table 3-8 are well known and documented at NAWS-CL, another five have probable records on-Station but need further verification. Ten species have suspect records and are probably reporting errors or nomenclature changes (Navy 2000a). Creosote bush clones are recognized by multiple agencies as ancient plant formations meriting conservation. Large

individuals of the Mohave fish-hook cactus (*Sclerocactus polyancistrus*) on NAWS-CL are regionally important plants due to their limited distribution.

Table 3-8. Special status plant species that occur or have potential to occur at Naval Air Weapons Station China Lake.

Species Common Name Scientific Name	North or South Complex	Associated Plant Community	Status
Species Presence Confirmed at NAWS-CL			
Great Basin onion *Allium atrorubens* var. *atrorubens*	North	Pinyon and Juniper Woodland, Great Basin Mixed Scrub	CNPS 2.3
Pinyon rock cress *Arabis dispar* (*Boechera d.*)	North	Pinyon Woodland, Great Basin Mixed Scrub, Sagebrush Scrub, Joshua Tree Woodland, Blackbush Scrub	CNPS 2.2, NAWS 2a
Darwin Mesa milkvetch *Astragalus atratus* var. *mensanus*	North	Pinyon Woodland, Great Basin Mixed Scrub, Sagebrush Scrub, Joshua Tree Woodland, Blackbush Scrub	CNPS 1B.1, BLM, NAWS 2a
Booth's camissonia *Camissonia boothii* subsp. *boothii*	North	Joshua Tree Woodland, Pinyon and Juniper Woodland	CNPS 2.2, NAWS 2b
Desert bird's-beak *Cordylanthus eremicus* subsp. *eremicus*	North	Pinyon Woodland, Great Basin Mixed Scrub, Sagebrush Scrub, Joshua Tree Woodland, Blackbush Scrub, Desert Transition Scrub	CNPS 4.3, NAWS 2a
Clokey's cryptantha *Cryptantha clokeyi*	South	Creosote Bush Scrub, Mojave Mixed Scrub	CNPS 1B.2
Desert cymopterus *Cymopterus deserticola*	South	Joshua Tree Woodland, Mojave Desert Scrub	CNPS 1B.2
Panamint dudleya *Dudleya saxosa* subsp. *saxosa*	South	Mojave Desert Scrub, Pinyon and Juniper Woodland	CNPS 1B.3, NAWS 2c
Pinyon Mesa buckwheat *Eriogonum mensicola*	North	Great Basin Scrub, Pinyon and Juniper Woodland, Upper Montane Coniferous Forest	CNPS 1B.3
Panamint Mountains buckwheat *Eriogonum microthecum* var. *panamintense*	North	Pinyon and Juniper Woodland, Subalpine Coniferous Forest	CNPS 1B.3
Yerba desierto *Fendlerella utahensis*	North	Pinyon Woodland, Great Basin Mixed Scrub, Desert Transition Scrub	CNPS 4.3, NAWS 2b
Inyo hulsea *Hulsea vestita* subsp. *inyoensis*	North	Chenipod Scrub, Great Basin Scrub, Pinyon and Juniper Woodland	CNPS 2.2, NAWS 2b
Creosote clones *Larrea tridentata*	North	Mojave Sand Field	Scientific Value (age)
Coso Mountains lupine *Lupinus magnificus* var. *glarecola*	North	Pinyon Woodland, Great Basin Mixed Scrub, Sagebrush Scrub, Joshua Tree Woodland, Blackbush Scrub	CNPS 4.3
Creamy blazing star *Mentzelia tridentata*	North	Mojave Desert Scrub	CNPS 1B.3
Crowned muilla *Muilla coronata*	North	Joshua Tree Woodland, Blackbush Scrub, Desert Transition Scrub, Mojave Mixed Scrub, Hopsage Scrub, Shadscale Scrub, Creosote Bush Scrub	CNPS 4.2, NAWS 2b
Oppressed muhly *Muhlenbergia appressa*	South	Coastal Scrub, Mojave Desert Scrub, Valley and Foothill Grassland	CNPS 2.2
Amargosa beardtongue *Penstemon fruticiformis* var. *amargosae*	North	Mojave Desert Scrub	CNPS 1B.3, BLM
Death Valley round-leaved phacelia *Phacelia mustelina*	South	Joshua Tree Woodland, Blackbush Scrub, Mojave Mixed Scrub	CNPS 1B.3, NAWS 2a
Charlotte's phacelia *Phacelia nashiana*	North	Joshua Tree Woodland, Mojave Mixed Scrub, Hopsage Scrub, Shadscale Scrub, Creosote Bush Scrub	CNPS 1B.2, BLM, NAWS 2a
Mohave indigo bush *Psorothamnus arborescens* var. *arborescens*	South	Joshua Tree Woodland, Blackbush Scrub, Mojave Mixed Scrub, Hopsage Scrub	CNPS 4.3, NAWS 2a
Mohave fish-hook cactus *Sclerocactus polyancistrus*	Both	Great Basin Mixed Scrub, Joshua Tree Woodland, Blackbush Scrub, Desert Transition Scrub, Mojave Mixed Scrub, Shadscale Scrub, Creosote Bush Scrub	CNPS 4.2, NAWS 2a

Species Common Name Scientific Name	North or South Complex	Associated Plant Community	Status
DeDecker's clover *Trifolium macilentum* var. *dedeckerae*	North	Pinyon Woodland	CNPS 1B.3, BLM, NAWS 2b
Species with Unconfirmed Records at NAWS-CL			
Shining milkvetch1 *Astragalus lentiginosus* var. *micans*	North	Creosote Bush Scrub, Saltbush Scrub, Alkaline Basin Scrub	CNPS 1B.2, NAWS 1b
Naked milkvetch *Astragalus serenoi* var. *shockleyi*	North	Sagebrush Scrub, Pinyon Pine	CNPS 2.2, NAWS 2b
Panamint mariposa lily *Calochortus panamintensis*	North	Pinyon Woodland, Great Basin Mixed Scrub, Sagebrush Scrub	CNPS 4.2, NAWS 2b
Winged cryptantha *Cryptantha holoptera*	Both	Mojave Desert Scrub, Sonoran Desert Scrub	CNPS 4.3
Caespitose evening-primrose *Oeonothera caespitosa* subsp. *crinita*	North	Mixed Desert Scrub, Pinyon Woodland, Bristlecone Pine Forest, Subalpine Coniferous Forest	CNPS 4.2, NAWS 2b
Mono County phacelia *Phacelia monoensis*	South	Pinyon and Juniper Woodland, Great Basin Mixed Scrub, Clay, Roadsides, Alkaline Meadows	CNPS 1B.3, NAWS 2a
Species with Suitable Habitat at NAWS-CL, but No Documented Occurrences			
Darwin rock cress *Arabis pulchra* var. *munciensis*	Both	Chenopod Scrub, Mojave Desert Scrub	CNPS 2.3, NAWS 2c
Lane Mountain milkvetch *Astragalus jaegerianus*	South	Creosote Bush Scrub, Joshua Tree Woodland	FE, CNPS 1B.1, NAWS 1a
Pygmy poppy *Canbya candida*	North	Joshua Tree Woodland, Mojave Desert Scrub, Pinyon and Juniper Woodland	CNPS 4.2, NAWS 2e
Barstow woolly sunflower *Eriophyllum mohavense*	South	Chenopod Scrub, Mojave Desert Scrub, Playas	CNPS 1B.2
Ripley's aliciella *Gilia ripleyi* (*Aliciella r.*)	South	Mojave Desert Scrub	CNPS 2.3

Status Codes:
FE = Federal Endangered
BLM = U.S. Bureau of Land Management Sensitive Plant
CNPS = California Native Plant Society; 1B = Rare, threatened, or endangered in California and elsewhere, 2 = Rare, threatened, or endangered in California, but more common elsewhere, 3 = We need more information about this plant (Review List), 4 = Limited distribution (Watch List).
NAWS = NAWS-CL Species of Concern; 1 = Status species, a = potential to occur at NAWS, b = possible occurrence at NAWS-CL but needing taxonomic study; 2 = Sensitive species, a = species known to occur at NAWS, b = possible occurrence at NAWS-CL but needing taxonomic study, c = species with suspect records at NAWS-CL requiring further review, e = potential sensitive species at NAWS.
1Shining milkvetch is locally common in the China Lake basin. However, further taxonomic determinations are necessary to verify the species.

3.5.2 Invasive Plants

Non-native plants at NAWS-CL can alter ecosystems through changes in nutrient cycling or water and fire regimes so that a return to the original state is not possible. Not only do non-natives colonize disturbed habitats, but they also create new disturbances on nearby ecosystems. The effects are usually widespread across many plant communities.

Navy installations shall identify, prioritize, monitor, and control invasive and noxious species and feral animals whenever feasible (DoDI 4715.03, OPNAVINST 5090.1C CH-1 (24-7[j]).

Navy installations are tasked with preventing the introduction of invasive species and provide for their control per DoDI 4150.07 (DoD Pest Management Program, 29 May 2008); Executive Order 13112 (Invasive Species, 03 February 1999, as amended); and the Plant Protection Act (§§ 7701-7772 of Title 4, U.S. Code). The Plant Protection Act provides for the control and eradication of noxious (pest) plants and weeds on land under the control of the federal government. Many invasive species have become established in the Mojave Desert. The origins of virtually all can be attributed to human activities. Federal and state agencies maintain lists of plants that are considered threats to the well-being of the state or the country.

California Invasive Plant Council (Cal-IPC) is an organization that monitors invasive plants, and their on-line database categorizes non-native invasive plants that threaten the state's wildlands. Several species are known to

occur at NAWS-CL (Table 3-9). The Cal-IPC inventory categorizes plants as High, Moderate, or Limited, reflecting the level of each species' negative ecological impact in California (Cal-IPC 2006).

Table 3-9. California Invasive Plant Council invasive plant species known to occur at Naval Air Weapons Station China Lake (adapted from California Invasive Plant Council Inventory, website accessed 31 January 2011).

Scientific Name	Common Name	Overall Rating	Ecological Impacts	Invasiveness
Agrostis stolonifera	creeping bentgrass	Limited	Limited	Moderate
Bromus madritensis subsp. *rubens*	red brome	High	Severe	Moderate
Centaurea solstitialis	yellow star thistle	High	Severe	Moderate
Cynodon dactylon	bermudagrass	Moderate	Moderate	Moderate
Descurainia sophia	flixweed, tansy mustard	Limited	Limited	Moderate
Erodium cicutarium	redstem filaree	Limited	Limited	Limited
Lupinus arboreus	yellow bush lupine	Native	Moderate	Moderate
Peganum harmala	African rue	Not Listed	Not Listed	Not Listed
Phragmites australis	common reed	Native	Moderate	Moderate
Salsola paulsenii	barbwire Russian-thistle	Limited	Limited	Limited
Tamarix aphylla	athel tamarisk	Limited	Limited	Moderate
Tamarix parviflora	smallflower tamarisk	High	Severe	Severe
Tamarix ramosissima	saltcedar, tamarisk	High	Severe	Severe

Cal-IPC Rating System:
High: severe ecological impacts on physical processes, plant and animal communities, and vegetation structure. Their reproductive biology and other attributes are conducive to moderate to high rates of dispersal and establishment. Most are widely distributed ecologically.
Moderate: substantial and apparent-but generally not severe-ecological impacts on physical processes, plant and animal communities, and vegetation structure. Their reproductive biology and other attributes are conducive to moderate to high rates of dispersal, though establishment is generally dependent upon ecological disturbance. Ecological amplitude and distribution may range from limited to widespread.
Limited: invasive but their ecological impacts are minor on a statewide level or there was not enough information to justify a higher score. Their reproductive biology and other attributes result in low to moderate rates of invasiveness. Ecological amplitude and distribution are generally limited, but these species may be locally persistent and problematic.

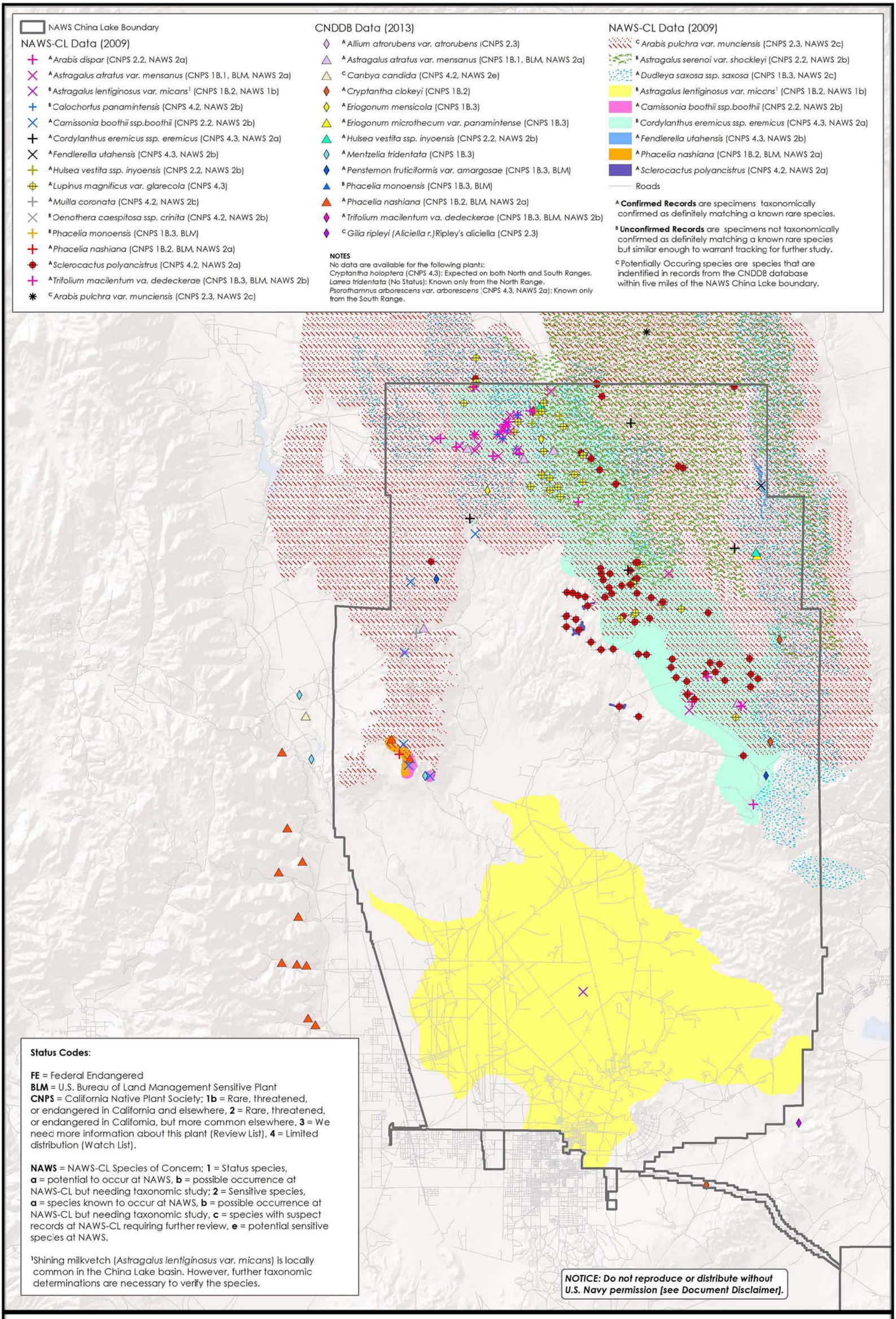
Current Management

The Station's Integrated Pest Management Coordinator is responsible for the coordination and oversight of the Station's pest management program and pest management plan.

Existing programs provide for the ongoing removal of tamarisk (salt cedar) (*Tamarix* spp.) and have also been utilized to remove an infestation of yellow star-thistle at the airfield and African rue on the South Range. Some wetland areas of NAWS-CL, which form the primary habitat for the federally endangered Mohave tui chub, have been seriously impacted by the infestation of tamarisk (*Tamarix ramosissima, T. chinensis,* or *T. gallica*). It is recommended that the eradication program prioritize the removal of outlying tamarisk plants, as it is more efficient to attack outlying plants since large groups of tamarisks compete against one another for resources and the rate of population increase will be slower than in outlying areas (Neill 1997). Further, this approach will result in a larger tamarisk-free area, so eradication efforts can then focus on the dense infestations.

The Integrated Pest Management Plan (DoD 2008) is a comprehensive, long-range document that captures all the pest management and pesticide-related activities conducted on NAWS-CL. The pest management program covers pest control and grounds maintenance for administrative and industrial facilities, the golf course, lessee pest control, and natural resources protection. The Plan conforms to the requirements of DoDI 4150.07, OPNAVINST 6250.4C, and OPNAVINST 5090.1C CH-1.

Map 3-10. Known locations of sensitive plant species at the North Range of Naval Air Weapons Station China Lake and the immediate vicinity (5-mile radius). Data sources: California Natural Diversity Database 2010 records, Integrated Natural Resources Management Plan 2000.



Special Status Plant Species that Occur or Have the Potential to Occur at NAWS China Lake North Range

Integrated Natural Resources Management Plan, NAWS China Lake

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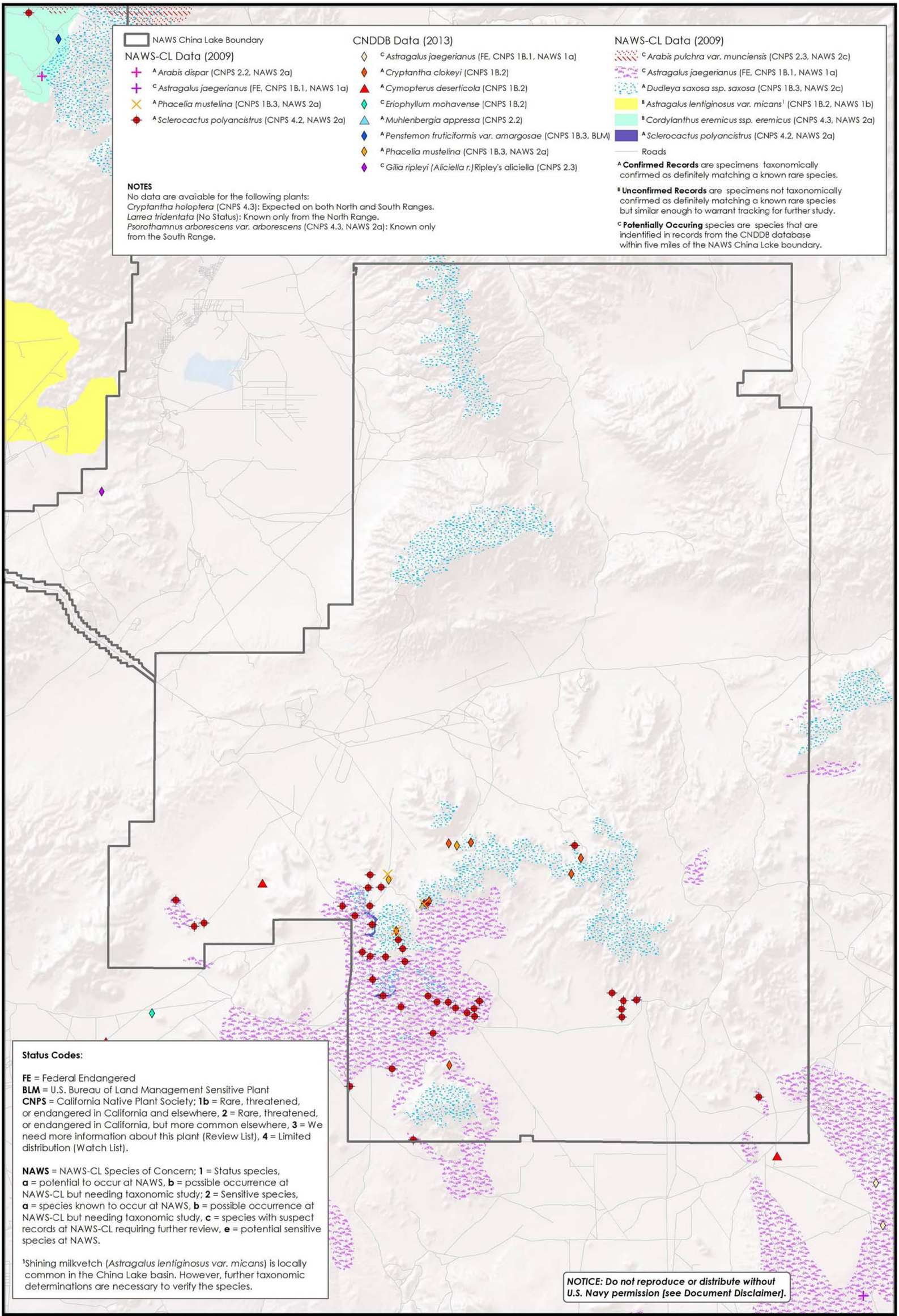

Map 3-11. Known locations of sensitive plant species at the South Range of Naval Air Weapons Station China Lake and the immediate vicinity (5-mile radius). Data sources: California Natural Diversity Database 2010 records, Integrated Natural Resources Management Plan 2000.

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The Navy (the Navy Region Southwest Botanist and NAVFAC Southwest Landscape Architect), jointly developed a preferred plant list as well as a "Do Not Plant" list for horticultural plants that are invasive in the wildland environment (see Appendix G).

Management Issues at NAWS-CL for Invasive Species

- Early detection is essential to minimize impacts of an invasive non-native species strategically and to minimize costs. This usually requires collaboration among jurisdictions for the most widespread and difficult of these, such as cheatgrass (*Bromus tectorum*), because the problem is landscape or regional in scale.
- Suggestions for future management are described below:
  - *Rate of spread is tied to weather patterns*. The spread of invasives in the western deserts is tied to weather cycles such as El Niño and the Pacific Decadal Oscillation. Seeds remain viable in the soil in dry years until a year with adequate rain allows germination. Natural resource managers should contribute to national phenological databases such as "Project Budburst," a collaborative effort of many government and academic institutions and part of the USA National Phenology Network.
  - *Invasive plants create hazardous fire conditions.* Invasive grasses such as Schismus spp. and cheatgrass often create a continuous carpet that can be a fire hazard. Disturbed areas often revegetate with these species. Climate change is accelerating fuel condition changes that make these landscapes flammable when they previously did not evolve with fire adaptations.
  - *Invasive plants exploit nitrogen.* Invasives in the western deserts seem to exploit nitrogen in soil that normally only gets use during spring wildflower blooms. Desert fires can destroy the shrub "islands of fertility" that act as "nurse plants" for cacti and other species (Wilson and Thompson 2005).
  - *Collaboration at multiple scales is needed to address the complexity and expense of invasive species management, especially when the problem is regional in scope.* While new or localized invasions (such as at springs) can be easily controlled once detected, some weeds are ubiquitous or so widespread that, as a practical matter, they are too expensive to be tackled. Some invasive species problems need to be addressed regionally, and may benefit from collaboration among scientists, agencies, practitioners, and policy makers. National and state invasive species plans, and regional MOUs such as the Mojave Weed Management Area MOU (BLM et al. 2002), provide a framework to work from.
  - *Protect the uninvaded areas and identify susceptible areas.* The remaining uninvaded Mojave vegetation, especially high-value areas of concern, such as designated Critical Habitat for the Mohave Desert Tortoise, should be protected from invasion and burning. These areas have zero or low tolerance for invasion. Susceptible desert areas are expected to be those with high species richness, low elevation (greater variability in water), available nitrogen, and disturbance.
  - *Standard invasive species protocols.* The basic response protocol for invasive species is part of both national and state approaches: early detection; rapid assessment; rapid destruction of initial foci and outliers; and surveillance. A key strategy is to break up the invasion/fuel load.

Current Management of Vegetation Communities

A specific vegetation mapping system for NAWS-CL was created to classify types of vegetation for management purposes. These vegetation classifications are series-based with simplified names. Vegetation descriptions are based on field observation, a review of past documents, and earlier vegetation maps.

As part of the MDEP's Central Mojave mapping project (Thomas et al. 2004), 40 releve transects were conducted on NAWS-CL land in 1996-1997 (Silverman 1997). Releves were systematically collected on many other properties in the Central Mojave during the MDEP 1997-2000 effort.

Long-term monitoring plots as part of a Rangeland Assessment program were established on the Lacey-Cactus-McCloud grazing allotment by the BLM in 1986 with the intention of tracking changes in vegetation cover, density, and disturbance, as well as forage. These continue to be monitored every three to five years. Although grazing leases ended in 2000, grazing pressure continues from native herbivores and a managed population of free-roaming horses and burros. The original 20 vegetation monitoring transects were modified in 2005, retaining 12 of the original transects and establishing eight new transects. The monitoring methods consist of the Quadrat Frequency, the Point-Intercept, and the Key Species methods. These methods were employed to varying degrees by the BLM in 1986 and 1993, Epsilon Systems Solutions in 2005 and 2006, and Tierra Data Inc. in 2010.

Assessment of range condition is currently based on an examination of ecological condition or status (the present state of the vegetation and soil protection of an ecological site in relation to the potential natural community).

Existing protocols for conservation of plant communities include:

- NAWS-CL has a general policy prohibiting plant collection without specific approval of the Commanding Officer of NAWS-CL.
- The CLUMP continues programs to conserve and protect wildlife habitat quality through the use of avoidance measures and education.

In the 2000 INRMP, localities with the richest vegetation including highest numbers of sensitive and unique flora were identified for voluntary consideration during land use planning. These are:

- Darwin Plateau (from Coso Village to lower Centennial Flat east to China Garden, Indian Garden, and Crystal Wash)
- Haiwee Spring area
- Pink Hill Spring area
- Red Hill Spring area
- Guzzler Number 14 area west of Etcherron Valley

Impacts to plant communities are also managed through the Site Approval Process under the National Environmental Policy Act and through the implementation of Range Regulations.

Specific Management Issues for Vegetation Communities

Various mapping approaches, besides the MDEP work described above, are in play in the Mojave Desert. These mapping efforts contribute to regional ecological knowledge and many results can be extrapolated to NAWS-CL environments. Vegetation maps provide the following elements:

1. Inventory: allows for a baseline description of existing vegetation types, their distribution, and an assessment of biological diversity/sensitivity.
2. Landscape analysis: facilitates evaluation of existing vegetation condition; determination of desired vegetation conditions; biodiversity analysis; baseline for wildlife habitat modeling; and baseline for threatened and endangered species modeling.

3. Collaboration and Comparative Baseline: allows planning and implementation of ground level actions to be done with a common baseline and platform for all agencies.
4. Management: Facilitates management activities at a variety of scales (monitoring impacts such as fire and weed invasion, development, and so on); facilitates implementation of land use plans. An example is the Mohave Desert Tortoise brief that is routinely presented.

In 2007, the State Legislature required the CDFW to develop a vegetation mapping standard for the state. California is now working toward the same standards as the federal and international agencies. One of the benefits of the new standard is that other concepts of stand dynamics and state-transition concepts may be incorporated into mapping. This is a better way of understanding many vegetation types and their changes over time and across the landscape, rather than the potential natural community concept.

The past vegetation monitoring program has primarily focused on the question of livestock and feral animal grazing, with the same protocols designed for BLM grazing allotments. Most federal land management agencies no longer conduct single-land use based monitoring, including the BLM, in part due to the inability to report reliably on the condition of public lands on a landscape scale. NAWS-CL has recently evolved its program to address more landscape-scale concerns beyond grazing, such as to answer questions on the effects of wildland fire. As part of this program, quantitative vegetation descriptions are becoming more fully developed. This will not only allow for cost-effective trend monitoring in the future, but key habitat elements for rare plants and wildlife can be more easily recognized and targeted for management.

Floristic inventories and monitoring change in abundance for special status species is needed. Though fewer species are expected from the South Range, it has a high potential for undocumented species because little floristic work has been done there. Three of NAWS-CL documented plant taxa have been recorded from the South Range only. Documentation of new plant species on the South Range is further limited by the nature of the flora, which has numerous annual species that are seasonally and weather restricted. There is also great geologic and topographic diversity on the South Range, and an island for relictual plant species has been created by the range of mountains from the Black Hills to the Eagle Crags. This area of higher elevation supports several unique plant occurrences and loosely divides endemic flora of the western Mojave, central Mojave, and eastern Mojave (see Table 3-6 and Table 3-7).

Management Issues

- Vegetation is a key indicator of habitat value for wildlife.
- Plant communities adjacent to springs and seeps reflect the condition of the water source. The health of these sites can be an early warning to other problems, yet no focused baseline monitoring information is available. Nevertheless, some incidental observations of vegetation have been made for various springs, and these records could prove useful as a historical reference. Fenced springs could provide an opportunity to conduct comparison studies between springs to identify potential foraging effects (Appendix L).
- Some scientists predict the loss of pinyon woodlands at low elevations or southernmost stands due to climate change (Clifford et al. 2011; Barger et al. 2009; Breshears et al. 2005).
- There has been a decline in perennial grasses, which may increase vulnerability to cheatgrass invasion. Perennial grass decline may not be reversed without management and reduces a habitat's wildlife value.
- California Partners in Flight (CalPIF) has adopted the Vegetation Classification and Mapping Program (Sawyer and Keeler-Wolf 1995) system of vegetation classification as the standard used for all CalPIF objectives.
- The California Wildlife Action Plan states that state and federal wildlife and land management agencies should create a Mojave Riparian and Spring Habitat Task Force to provide oversight and focus to restore and protect these habitats.

3.5.3 Invertebrates

3.5.3.1 Invertebrate Community

More than 1,800 insect and spider species have been collected at NAWS-CL (list updated as of 2010 with unpublished data from Gordon Pratt), mostly insects and a few spiders. While entomologists routinely record previously unknown species on NAWS-CL, many species of invertebrates likely continue to go undiscovered, due to their secretive nature and long periods of inactivity, particularly during dry years. It is possible that NAWS-CL hosts as many as 10,000 species of invertebrates (Pratt, letter dated 06 December 1996). The insect species collected thus far encompass 16 Orders and 233 Families (Table 3-10). The greatest diversity among the most studied families has been found in the Lepidoptera, with 441 species in 28 Families, followed by the Diptera (414 species, 55 Families), and Hymenoptera (362 species, 37 Families).

Table 3-10. Summary of invertebrate species known from Naval Air Weapons Station China Lake (list updated with data from G. Pratt 2010 unpublished data).

Order	# Families	# Species
Anostraca (Shrimp)	2	3
Araneae (Spiders)	17	38
Archaeognatha (Bristletails)	1	1
Blattodea (Cockroaches)	1	3
Coleoptera (Beetles)	38	263
Diptera (Flies)	55	414
Embiidina (Webspinners)	1	1
Hemiptera (True bugs)	24	113
Homoptera (Aphids, Hoppers & Cicadas)	15	92
Hymenoptera (Ants, Wasps & Bees)	37	362
Isoptera (Termites)	1	1
Lepidoptera (Moths & Butterflies)	28	441
Mantodea (Mantids)	1	2
Neuroptera (Net-winged insects)	8	54
Notostraca	1	1
Odonata (Damselflies & Dragonflies)	5	35
Orthoptera (Crickets & Grasshoppers)	7	34
Trichoptera (Caddisflies)	4	5
TOTALS	234	1,833

Various researchers from CDFW, private contractors, or others from academic institutions conducted periodic surveys of lake playas throughout the Inner Ranges of the North Range. To date, they have recorded tadpole, brine, and fairy shrimp, including giant fairy shrimp (*Branchinecta gigas*).

The many springs present at NAWS-CL provide potential habitat for a variety of snails, possibly including some rare and sensitive species. For example, Wong's springsnail (*Pyrgulopsis wongi*) is known from several springs located a short distance (5 miles or less) to the west of the North Range (CDFG 2009).

Surveys for snails have been conducted by Darrell Wong from the CDFW, who has collected snails from springs along the west slope of the Argus Mountains. Also, Robert Hershler from the National Museum of Natural History (Smithsonian Institution) has collected snails from Tennessee Spring.

3.5.3.2 NAWS-CL Special Status Invertebrates

Nine of the more than 80 species of butterflies found on NAWS-CL are considered NAWS-CL Special Status species. All nine are found on the North Range, and most are associated with small areas of habitat. According to investigators, three in particular merit special mention: the San Emigdio blue butterfly (*Plebulina emigdionis*), San Bernardino Mountains blue butterfly (*Euphilotes baueri vernalis*), and Great Basin wood-nymph (*Cercyonis sthenele*). The San Emigdio blue butterfly is an extremely rare butterfly species that inhabits shadscale scrub in desert canyons and near washes. It is known from fewer than a dozen localities. One large colony exists from the El Conejo Gate west through Big Petroglyoph Canyon on the North Range (Pratt 1998). On NAWS-CL, the San Bernardino Mountains blue butterfly occurs only in the Coso Mountains, utilizing areas used by its host, the Kennedy's buckwheat (*Eriogonum kennedyi*) (Pratt 1998). It is considered sensitive due to its restricted range, rarity within that range, and the threat of habitat degradation due to invasive weeds (Vaughan and Shepherd 2005). The Great Basin wood-nymph is found in Shepherd Canyon and the high elevations of the Argus and Coso Mountains. It inhabits chaparral, oak woodlands, open pine forest, juniper-pinyon woodlands, and sagebrush communities.

Dr. Gordon Pratt has completed 18 years of invertebrate surveys on the Station's North and South Range complex. Much of this work is completed through a Cooperative Agreement with UC Riverside, although entomology students and other specialists occasionally participate in survey efforts. More focused (species specific) surveys have focused on specific habitats, such as lakebeds and aquatic habitats.

3.5.3.3 Management of NAWS-CL Invertebrates

Current management of invertebrate species on NAWS-CL is accomplished primarily through general habitat conservation and avoidance measures as well as the protection of habitat around key seeps and springs as well as sensitive areas such as dunes and the El Conejo Gate area through pre-project planning. Avoiding and minimizing potential effects at these springs is an important resources management goal in that the springs support the greatest diversity of invertebrates at NAWS-CL.

Baseline data is still lacking for many of the invertebrate species known to occur or with the potential to occur on the Station, including presence, taxonomy, distribution, and habitat associations. Filling in data gaps should be a priority for invertebrate species at NAWS-CL. Protecting habitat will remain the primary management objective for many of these species, especially high-value seeps and springs.

On occasion NAWS-CL supports graduate or post-doctorate researchers with efforts to collect unusual, rare or otherwise highly restricted (habitat-wise) invertebrates. Examples include dune weevils (east of the K-2 Track), beetles restricted to a single species of salt bush (near the China Lake Playa), and aquatic insects (Water Canyon and Birchum Springs).

3.5.4 Fish

3.5.4.1 Fish Community

More than 120 springs, two seeps (i.e. pools formed by water slowly percolating to the surface), approximately 20 constructed ponds, and a large number of tanks and troughs are present on NAWS-CL. These areas provide habitat for five species of fish on the Station. All of these species—the federally endangered Mohave tui chub, mosquito fish (*Gambusia affinis*), bullhead catfish (*Ictalurus* sp.), goldfish (*Carassius auratus*), and largemouth bass (*Mieropterus salmoides*)—are introduced non-native species. The Mohave tui chub has been present on the Station since it was introduced in 1971. This endangered species was introduced because it had been extirpated from its historical habitat,

the Mojave River, from the introduction and establishment of predatory non-native fish. The Mohave tui chub, mosquito fish, goldfish, and bullhead catfish are known to exist in the Lark Seep System located on the south-central portion of the North Range. Goldfish are present in the North Channel of the Lark Seep System, and in constructed ponds on Station. Largemouth bass occur in ponds at Area R on the North Range (Navy 1998b, 2004b).

3.5.5 Reptiles and Amphibians

3.5.5.1 Reptile and Amphibian Community

The Western Toad (*Anaxyrus boreas*) and Pacific Treefrog (*Pseudacris regilla*) are two species of amphibians known to occur at NAWS-CL. The Western Toad is found throughout urban areas of China Lake, Ridgecrest, G1 Seep, Inyokern, and at Lark Seep. On NAWS-CL, Western Toads are confirmed at Haiwee Spring (Giuliani 1993; Michael Brandman Associates Inc. 1988). Genetic research started in 2005 on speciation of Western Toads found throughout the Great Basin desert of western North America and is ongoing. Work is being constructed by graduate students from the University of Nevada, Reno. The Pacific Treefrog has one record at Haiwee Spring (19 September 1980) but is also known from the southern Argus Range (Indian Joe Canyon) off the Station (Woodman, pers. obs.). Red-spotted Toads (*Anaxyrus punctatus*) were discovered by Ted Papenfuss and Tom Campbell east of Birchum Springs, in Great Falls Basin, and Indian Joe Canyon (2007) just outside the boundaries of NAWS-CL. Non-native American Bullfrogs (*Lithobates catesbeianus*) are prevalent in the North Channel of the Lark Seep System (Williams, pers. com. 2008).

Slender Salamanders (*Batrachoseps sp.*) are not known to exist on NAWS-CL. However, they are present in the Panamint, Inyo, and Sierra Nevada Ranges surrounding the Station and, therefore, have potential to occur on Station. They have also been recorded in Great Falls Basin in the south Argus Range by Dr. Kristin Berry.

Ted Papenfuss from UC Berkeley periodically installs and checks pit fall traps for Slender Salamanders and other amphibian species at numerous water sources on the North Range. Trapping efforts may also be conducted by a graduate student working on slender salamanders in the Inyo/White Mountains. Other UC Berkeley surveys for Panamint Alligator Lizards, small mammals and other species have been discussed; however, formal requests have not been received.

Reptiles are especially adapted to drought conditions and extreme temperatures and are well-represented on NAWS-CL. Predominately diurnal, many lizards are widespread, while others are habitat specialists. Common widespread species include: the Zebra-tailed Lizard (*Callisaurus draconoides*), Common Side-blotched Lizard (*Uta stansburiana*), Desert Spiny Lizard (*Sceloporus magister*), and Tiger Whiptail (*Aspidoscelis tigris*). Other lizard species that are widespread but less abundant include the Desert Horned Lizard, Long-nosed Leopard Lizard, and Desert Iguana (*Dipsosaurus dorsalis*). Habitat specialists include the Eastern Collared Lizard, Common Chuckwalla, Long-tailed Brush Lizard (*Urosaurus graciosus*), and Desert Night Lizard (*Xantusia vigilis*).

Common snake species include the Coachwhip (*Coluber flagellum*), Gophersnake (*Pituophis catenifer*), Western Patch-nosed Snake (*Salvadora hexalepis*),Western Shovel-nosed Snake (*Chionactis occipitalis*), and four rattlesnake species: Sidewinder (*Crotalus cerastes*), Mohave (green) Rattlesnake (*Crotalus scutulatus*) and Panamint Rattlesnake (*Crotalus stephensi*). Less common species include the Western Threadsnake (*Rena humilis*) and Western Groundsnake (*Sonora semiannulata*).

The Mojave Desert Tortoise, a federally listed species, is widespread on China Lake and is discussed in detail in Section 3.5.8

3.5.5.2 NAWS-CL Special Status Reptiles and Amphibians

Only four species of amphibians have been found at NAWS-CL and none of these species are listed as sensitive.

The Common Chuckwalla is accounted for by CNDDB, but is not a species that warrants state level status (Jennings and Hayes 1994). Although present, the distribution of Common Chuckwalla at NAWS-CL is unknown, but could potentially occur in all rocky areas of the Argus and Coso mountains from sea level to 6,000 feet and throughout rocky habitats on the South Range.

The Panamint Alligator Lizard is a California Species of Concern, as well as a BLM Sensitive Species. Panamint Alligator Lizards have a known distribution limited to between 2,500 and 6,800 feet in Inyo and Mono Counties in the White, Nelson, Inyo, Panamint, Coso, and Argus mountains (Jennings and Hayes 1994; Michael Brandman Associates, Inc. 1988). They are restricted to riparian areas with available open water, although they may utilize adjacent upland habitat. Potential Panamint Alligator Lizard habitat on NAWS-CL is restricted to the Argus and Coso ranges in the northern and northeastern North Range, within the vicinity of permanent springs or riparian habitat.

Five Panamint Alligator Lizards have been confirmed from NAWS-CL. Phillips, Brandt, and Reddick, Inc. (1983) reported a juvenile at Margaret Ann Spring; Giuliani (1993) recorded one at Haiwee Spring; Silverman (2001) captured two juveniles in Mountain Springs Canyon; and Bruce Garlinger (2001) observed one adult basking on a feral horse trail in Mountain Springs Canyon. Giuliani reported that Coso Cold Spring contained good habitat for the species. In 1988, several suspect and unconfirmed sightings of the lizard were reported. In 2001, Dr. Pratt conducted a survey at Lower Haiwee Spring and Mountain Springs Canyon; however, no Panamint Alligator Lizards were observed.

Gilbert's Skink (*Phrynosoma gilberti*) was previously considered a BLM sensitive species that may be used as an indicator species of habitat quality (BLM 1980b). It is widespread among springs and riparian habitat on NAWS-CL North Range. A graduate student from Cornell University has conducted surveys for skinks, primarily around Birchum Springs.

3.5.5.3 Management of NAWS-CL Reptiles and Amphibians

Management of the Mohave Desert Tortoise and areas designated as Mohave Desert Tortoise Critical Habitat is discussed in Section 3.5.8.2.

Though occurrence of many reptiles and amphibians has been documented at NAWS-CL, the Station is lacking abundance and distribution data for most species. The majority of springs and seeps at NAWS-CL have not had comprehensive herptile inventories and there is the potential that undocumented species might occur in these areas. When possible, participate in DoD Partners in Amphibian and Reptile Conservation and HerpNET in a better attempt to document, inventory and manage reptile and amphibian species found on NAWS-CL.

3.5.6 Birds

Table 3-11 lists birds associated with various habitats at NAWS-CL.

3.5.6.1 Bird Community

Game Birds

The Chukar (*Alectoris chukar*) is an introduced game bird found in mountainous areas of the North and South Ranges. The preferred habitat of the Chukar is steep, dry, rocky slopes with shrub-steppe vegetation and they are predominately ground foragers preferring cheatgrass. The widespread dominance of cheatgrass in the west is the most important factor in the establishment of Chukars in the Great Basin range and farther south. In the southern portion of its range, the Chukar may be found in saltbush (*Atriplex* sp.) scrub.

Table 3-11. Birds associated with various habitats on Naval Air Weapons Station China Lake. Habitat categories modified from California Wildlife Habitat Relationships System.

Habitat	Resident or Migrant, Expected Breeding	Migrants Only
Riparian Woodland	Lesser Goldfinch (*Spinus psaltria*), Blue-gray Gnatcatcher (*Polioptila caerulea*), Ash-throated Flycatcher (*Myiarchus cinerascens*), Inyo California Towhee (*Pipilo crissalis eremophilus*), Spotted Towhee (*Pipilo maculatus*), Verdin (*Auriparus flaviceps*), Black-throated Sparrow (*Amphispiza bilineata*), Bewick's Wren (*Thryomanes bewickii*), and Costa's Hummingbird (*Calypte costae*)	Wilson's Warbler (*Wilsonia pusilla*), Yellow-rumped Warbler (*Dendroica coronata*), Warbling Vireo *(Vireo gilvus*), Western Tanager (*Piranga ludoviciana*), Cassin's Vireo (*Vireo cassinii*), Dark-eyed Junco (*Junco hyemalis*), White-crowned Sparrow (*Zonotrichia leucophrys*), Orange-crowned Warbler (*Vermivora celata*), and Pacific-slope Flycatcher (*Empidonax difficilis*)
Pinyon	Pinyon Jay (*Gymnorhinus cyanocephalus*), Spotted Towhee, Chipping Sparrow (*Spizella passerina*), Black-throated Gray Warbler (*Dendroica nigrescens*), Dark-eyed Junco, Blue-gray Gnatcatcher, Dusky Flycatcher (*Empidonax oberholseri*), and Bushtit (*Psaltriparus minimus*)	Northern Flicker (*Colaptes auratus*), Red-breasted Nuthatch (*Sitta canadensis*), Yellow-rumped Warbler, Orange-crowned Warbler, and Wilson's Warbler
Joshua Tree Woodland	Cactus Wren (*Campylorhynchus brunneicapillus*), Bewick's Wren, Scott's Oriole (*Icterus parisorum*), Say's Phoebe (Sayornis saya), Ash-throated Flycatcher, Loggerhead Shrike (*Lanius ludovicianus*), and Ladder-backed Woodpecker (*Picoides scalaris*)	White-crowned Sparrow, Chipping Sparrow, Western Tanager, and Wilson's Warbler
Sagebrush	Sage Sparrow (*Amphispiza belli*), Say's Phoebe, Horned Lark (*Eremophila alpestris*), and Loggerhead Shrike	Sage Thrasher (*Oreoscoptes montanus*) and White-crowned Sparrow
Creosote Bush Scrub	Sage Sparrow, Black-throated Sparrow, Say's Phoebe, LeConte's Thrasher (*Toxostoma lecontei*), Loggerhead Shrike, and Greater Roadrunner (*Geococcyx californianus*)	Wilson's Warbler, Western Tanager, Yellow-rumped Warbler, and Warbling Vireo
Desert Wash	LeConte's Thrasher, Black-throated Sparrow, Loggerhead Shrike, Greater Roadrunner, and Northern Mockingbird (*Mimus polyglottos*)	
Manmade Habitats (Golf Course, Urban, Sewer Ponds)	Killdeer (*Charadrius vociferus*), Mourning Dove (*Zenaida macroura*), Great-tailed Grackle (*Quiscalus mexicanus*), Red-winged Blackbird (*Agelaius phoeniceus*), Gadwall (*Anas strepera*), Cinnamon Teal (*Anas cyanoptera*), American Avocet (*Recurvirostra americana*), Common Yellowthroat (*Geothlypis trichas*), and Virginia Rail (*Rallus limicola*)	Over 250 species have been documented at the golf course, Mainsite, and waste treatment plant.

Mountain Quail are another game bird found in mountainous areas of NAWS-CL. This species has a seasonal altitudinal migration in which birds walk down slopes of mountains that receive snow. While the ecology of Mountain Quail is not well known, breeding usually occurs in shrub-dominated communities at high altitudes. Some Mountain Quail have been relocated from NAWS-CL to Nevada and Idaho, due to declining population numbers in those regions.

Gambel's Quail (*Callipepla gambelii*) and California Quail (*Callipepla californica*) are resident at NAWS-CL. California Quail favor successional scrub vegetation with available forbs. Quail consume seeds, green plant material, and lesser quantities of insects. Gambel's Quail prefers riparian areas and springs. Adults eat mostly plant material, gleaning forb, shrub, and grass seeds from the ground surface. Chicks initially feed on insects.

Two other species, the See-see Partridge (*Ammoperdix griseogularis*) and Crested Tinamou (*Eudromia elegans*), were introduced on the North Range by CDFW in the late 1960s. The introduction was not successful, and neither species has been observed since its release.

Neotropical Migrants

Neotropical migrants, mostly songbirds, are those birds that winter mainly in Latin America and nest primarily in North America. They represent over half the species of North American birds. Migrants have become a concern because of widespread population declines due to habitat loss and fragmentation (eBird 2013). Since these birds

fill a variety of ecological roles (e.g., seed dispersers, pollinators, insect predators, and food for other species), their declines signal a broad deterioration in overall ecosystem health (Evans 1995).

After a wet winter, the China Lake and Airport Lake Playas have sufficient water to offer foraging or resting spots for migrants. The wastewater treatment ponds and the Lark Seep System, are reliable stopover sites in any year. There are numerous sightings of migratory bird species at NAWS-CL each year.

3.5.6.2 NAWS-CL Special Status Birds

Table 3-12 lists the bird species known (from the Kerncrest Audubon Society species list) to occur at NAWS-CL with a special status designation by federal, state, or non-governmental conservation organizations. The term "transient" refers to a species that occurs at the Station typically for a short duration while en route to another destination during migration. The term "migrant" refers to a species that occurs at the Station for longer periods during migration or that may winter on-Station. The term "vagrant" refers to a species whose occurrence in the area is rare or incidental; these species do not typically occur at the Station. These species do not require special management guidelines.

In addition to the resident Inyo California Towhee, six other state-listed bird species are non-resident migrants at NAWS-CL: Least Bell's Vireo, Peregrine Falcon, Southwestern Willow Flycatcher, Swainson's Hawk, Willow Flycatcher, and Yellow-headed Blackbird.

While it does not seem likely that the Navy's readiness activities would result in a population-level significant adverse effect to any migratory bird species, there would be at least a somewhat greater possibility that such effects could occur with respect to the following four species of birds protected under the MBTA: the golden eagle, prairie falcon (*Falco mexicanus*), burrowing owl (*Athene cunicularia*), and Le Conte's thrasher. The golden eagle is currently afforded a high level of protection and any take for any reason is prohibited. The prairie falcon, and LeConte's thrasher are all protected under the Migratory Bird Treaty Act and are subject to the provisions of the Migratory Bird Rule. Prairie falcons typically nest on cliffs and rock outcrops. Sea-van targets and some facilities mimic this habitat. NAWS-CL natural resources managers documented a pair nesting in a sea-van stack in 2011. Prairie falcons are uncommon at NAWS-CL and occur at very low densities. The latter three species are subject to the DoD exemption per the Migratory Bird Rule and are unlikely to be affected by military operations at the population level.

The burrowing owl is a NAWS-CL Special Status Species and a USFWS Bird of Conservation Concern. Burrowing owls use burrows and holes for nesting and roosting. Holes created under sea-vans and other targets that are created by construction, testing, or other means can be attractive to burrowing owls. Though the Mohave population is believed stable (eBird 2013), low population numbers elevate risks for the species. There is little data on burrowing owl populations at NAWS-CL, but their tolerance of human disturbance and habitat preferences present a higher risk of adverse effects from military operation activities.

LeConte's thrasher is a non-migratory bird that is restricted to open desert habitat. It is fairly common at NAWS-CL, but is highly sensitive to disturbance and occurs at low densities. Many of the existing operating areas at NAWS-CL overlap with LeConte's thrasher habitat, including the Airport Lake, Baker, and Superior Valley targets. As with most of the bird life at NAWS-CL, very little population level data is available. However, the species' ecology and habitat put it at greater risk of adverse effects from military activities.

Table 3-12. Avian species expected to occur at Naval Air Weapons Station China Lake (based on Kerncrest Audubon Society checklist for Indian Wells Valley) that have a special status designation by federal, state, or non-governmental conservation organizations.

Common Name (Scientific Name)	Status*	Use on NAWS-CL
Allen's Hummingbird (*Selasphorus sasin*)	BCC	Unknown
American Bittern (*Botaurus lentiginosus*)	NAW High	Transient
American Golden-Plover (*Pluvialis dominica*)	HC	Transient, uncommon
American White Pelican (*Pelecanus erythrorhynchos*)	BSSC	Transient, winter resident
Arctic Tern (*Sterna paradisaea*)	NAW High	Transient
Bald Eagle (*Haliaeetus leucocephalus*)	BCC, SE, Recovered FT	Transient, extremely rare
Bank Swallow (*Riparia riparia*)	ST	Transient, common
Barrow's Goldeneye (*Bucephala islandica*)	BSSC	Transient, rare
Black Skimmer (*Rynchops niger*)	BCC, BSSC	Transient, unknown
Black Swift (*Cypseloides niger*)	BCC, BSSC	Transient, rare
Black Tern (*Chlidonias niger*)	BSSC	Transient, unknown
Black Turnstone (*Arenaria melanocephala*)	HC	Transient, rare
Black-chinned Sparrow (*Spizella atrogularis*)	BCC	Summer resident, nesting in riparian areas
Brant (*Brants bernicla*)	BSSC	Transient, uncommon
Brewer's Sparrow (*Spizella breweri*)[2]	BCC	Transient, uncommon
Burrowing Owl (*Athene cunicularia*)[1]	BCC, BSSC	Year Round Resident
Cactus Wren (*Campylorhynchus brunneicapillus*)[1]	BCC	Summer resident, nests in cactus species, common
California Brown Pelican (*Pelecanus occidentalis californicus*)	CFP, Recovered FE	Transient, uncommon at Lark Seep
Calliope Hummingbird (*Stellula calliope*)	BCC	Transient, rare
Common Loon (*Gavia immer*)	BCC	Transient, extremely rare
Common Yellowthroat (*Geothlypis trichas*)	BCC	Transient, possible desert nesting in riparian areas
Costa's Hummingbird (*Calypte costae*)[1]	BCC	Winter resident, uncommon
Dunlin (*Calidris alpina*)	HCN	Transient, possible winter resident
Flammulated Owl (*Otus flammeolus*)	BCC	Transient
Golden Eagle (*Aquila chrysaetos*)	CFP	Year round resident
Grasshopper Sparrow (*Ammodramus savannarum*)	BSSC	Transient, unknown
Green-tailed Towhee (*Pipilo chlorurus*)[2]	BCC	Transient, rare
Horned Grebe (*Podiceps auritus*)	NAW High	Transient
Hudsonian Godwit (*Limosa haemastica*)	HC	Transient, rare
Inyo California Towhee (*Pipilo crissalis eremophilus*)	SE, FT	Resident, desert nesting in riparian areas
Lawrence's Goldfinch (*Spinus lawrencei*)[1]	BCC	Summer resident, nesting in riparian areas
Least Bell's Vireo (*Vireo bellii pusillus*)	SE, FE, BCC	Transient, extremely rare
Least Bittern (*Lxobrychus exilis*)	BCC, BSSC, NAW High	Unknown
Least Tern (*Sterna antillarum*)	NAW High	Transient
LeConte's Thrasher (*Toxostoma lecontei*)[1]	BCC, BSSC	Summer resident, rare
Lewis' Woodpecker (*Melanerpes lewis*)	BCC	Transient, unknown
Little Gull (*Hydrocoloeus minutus*)	NAW High	Transient
Loggerhead Shrike (*Lanius ludovicianus*)[2]	BCC, BSSC	Resident, common
Long-billed Curlew (*Numenius americanus*)	BCC	Transient, unknown
Long-eared Owl (*Asio otus*)	BSSC	Summer resident
Lucy's Warbler (*Oreothlypis luciae*)[1]	BCC, BSSC	Transient, uncommon
Marbled Godwit (*Limosa fedoa*)	HC, BCC	Transient, uncommon
Mountain Plover (*Charadrius montanus*)[1]	FC, BCC, BSSC, HI	Winter resident, uncommon
Northern Goshawk (*Accipiter gentilis*)	BSSC	Year round resident
Northern Harrier (*Circus cyaneus*)	BSSC	Year round resident
Oak Titmouse (*Baeolophus inornatus*)	BCC	Transient, common

Common Name (Scientific Name)	Status*	Use on NAWS-CL
Olive-sided Flycatcher (*Contopus cooperi*)	BCC, BSSC	Transient, possible nesting in desert riparian areas
Peregrine Falcon (*Falco peregrinus*)	Recovered, BCC, CFP	Winter resident, transient
Pied-billed Grebe (*Podilymbus podiceps*)	NAW High	Transient
Pinyon Jay (*Gynnorhinus cyanocephalus*)	BCC	Common resident
Prairie Falcon (*Falco mexicanus*)[1]	BSSC, BCC	Year round resident
Purple Martin (*Progne subis*)	BSSC	Transient, unknown
Redhead (*Aythya americana*)	BSSC	Winter resident, transient
Red Knot (*Calidris canutus*)	BCC, HCN	Transient
Ruddy Turnstone (*Arenaria interpres*)	HCN	Transient, rare
Sage Sparrow (*Amphispiza belli*)[2]	BCC	Common resident
Sage Thrasher (*Oreoscoptes montanus*)[2]	BCC	Winter resident, uncommon
Sanderling (*Calidris alba*)	HCN	Transient, rare
Short-billed Dowitcher (*Limnodromus griseus*)	BCC, HC	Transient, rare to uncommon
Short-eared Owl (*Asio flammeus*)	BSSC	Summer resident, desert nesting
Snowy Egret (*Egretta thula*)	NAW High	Transient
Snowy Plover (*Charadrius alexandrinus nivosus*)	BCC, BSSC, HI	Transient, rare summer resident
Solitary Sandpiper (*Tringa solitaria*)	HC	Transient, common
Sora (*Porzana carolina*)	NAW High	Transient
Southwestern Willow Flycatcher (*Empidonax traillii extimus*)	SE, FE	Transient, unknown
Summer Tanager (*Piranga rubra*)	BSSC	Transient, nesting in riparian areas
Swainson's Hawk (*Buteo swainsoni*)	ST	Transient, rare
Tri-colored Blackbird (*Agelaius tricolor*)	BCC, BSSC	Summer resident, rare
Vaux's Swift (*Chaetura vauxi*)	BSSC	Transient, rare
Vermilion Flycatcher (*Pyrocephalus rubinus*)	BSSC	Summer resident, desert nesting in riparian areas
Virginia's Warbler (*Oreothlypis virginiae*)	BCC	Transient, rare
Western Sandpiper (*Calidris mauri*)	HC	Transient
Whimbrel (*Numenius phaeopus*)	BCC, HCN	Transient, unknown
Willow Flycatcher (*Empidonax traillii*)	SE, BCC	Transient, common
Wilson's Phalarope (*Phalaropus tricolor*)	HCN	Transient, common
Yellow Warbler (*Dendroica petechia*)[1]	BCC, BSSC	Summer resident, common
Yellow-billed Cuckoo (*Coccyzus americanus*)	BCC, SE	Summer resident in Kern Valley, unknown
Yellow-breasted Chat (*Icteria virens*)	BSSC	Summer resident, nests in riparian areas
Yellow-headed Blackbird (*Xanthocephalus xanthocephalus*)	BSSC	Summer resident

*Abbreviations used in table:
BCC = Bird of Conservation Concern (USFWS 2008c)
BSSC = California Bird Species of Special Concern (California Department of Fish and Game 2008)
CFP = California Fully Protected
FT = Federally Threatened; FE = Federally Endangered (USFWS 2012)
NAW = North American Waterbird Conservation Plan Highest Concern, High Concern. Moderate Concern species documented at NAWS-CL are: California Gull (*Larus californicus*), Forster's Tern (*Sterna forsteri*), Heerman's Gull (*Larus heermanni*), Yellow-footed Gull (*Larus livens*), Bonaparte's Gull (*Chroicocephalus philadelphia*), Brown Pelican (*Pelecanus occidentalis*), Franklin's Gull (*Leucophaeus pipixcan*), Roseate Spoonbill (*Platalea ajaja*), Thayer's Gull (*Larus thayeri*), Black-crowned Night-Heron (*Nycticorax nycticorax*), Virginia Rail (*Rallus limicola*), Pacific Loon (*Gavia pacifica*), and Common Moorhen (*Gallinula chloropus*).
SE = State Endangered; ST = State Threatened (California Department of Fish and Game 2009)
U.S. Shorebird Conservation Plan (2004) High Priority Shorebirds: HC=High Concern global, HCN=High Concern North American Population, HI=Highly Imperiled
[1] Focal Species in The Desert Bird Conservation Plan (California Partners In Flight 2009). Other focal species expected to occur at NAWS-CL but not special status are: Common Raven (*Corvus corax*), Verdin (*Auriparus flaviceps*), Black-throated Sparrow (*Amphispiza bilineata*), Ash-throated Flycatcher (*Myiarchus cinerascens*), Phainopepla (*Phainopepla nitens*), Scott's Oriole (*Icterus parisorum*), and Ladder-backed Woodpecker (*Picoides scalaris*).
[2] Focal Species in Sagebrush Bird Conservation Plan (CalPIF 2005). Other focal species expected to occur at NAWS-CL but not special status are: Gray Flycatcher (*Empidonax wrightii*), Lark Sparrow (*Chondestes grammacus*), Vesper Sparrow (*Pooecetes gramineus*), and Western Meadowlark (*Sturnella neglecta*).

The Bank Swallow (*Riparia riparia*) and Willow Flycatcher (all three subspecies) are common migrants, whereas the Bald Eagle (*Haliaeetus leucocephalis*), Swainson's Hawk (*Buteo swainsoni*), Western Yellow-billed Cuckoo (*Coccyzus americanus occidentalis*), and Least Bell's Vireo (*Vireo bellii pusillus*) are extremely rare migrants. The Bald Eagle and Swainson's Hawk are non-resident species that depend on water bodies and grasslands, respectively. The flycatcher, cuckoo, vireo, and swallow are neotropical migrants that depend on the wetlands and riparian habitats on the NAWS-CL during their migrations. On two occasions immature California Brown Pelicans (*Pelecanus occidentalis californicus*), which are a California Fully Protected species (former federally threatened, delisted 17 December 2009), have been observed at Lark Seep.

3.5.6.3 Management of NAWS-CL Birds

Chukar are captured on NAWS-CL lands and sometimes transplanted to Nevada for hunting purposes and to Idaho for research (last release was 2007-2008). Chukar are also hunted on the North Ranges. NAWS-CL maintains a good working relationship with the Nevada chapter of Quails Unlimited and the Nevada Division of Wildlife, as well as CDFW and the local chapter of Quails Unlimited. They also collaborate on repairing guzzlers (game bird drinkers) on the North Range with Quails Unlimited providing labor, pumps and expertise to complete projects.

Mountain Quail have been relocated from NAWS-CL to Oregon, California, Nevada, Idaho, and Colorado resource management agencies, due to declining population numbers of Mountain Quail in those regions. These efforts have occurred each year, where numbers were allowed for translocation, over the past 11 years. Mountain Quail are becoming nearly extirpated in many portions of their range and the reintroduction efforts are an integral part of long-term management efforts by these states. However, due to low numbers and little to no reproduction in NAWS-CL population, quail have not been captured and transplanted in recent years.

For approximately the last 15 years, NAWS-CL has sponsored local Audubon Society access to the ponds at the Wastewater Treatment Facility to conduct bird surveys. They provide an annual report of species seen, numbers and usage frequency by month. In addition, the Audubon Society sponsors the annual Christmas Bird Count which has been held on-Station since the 1950s and the Annual Bird-a-thon, now in its 20th year.

The Boy Scouts of America have, on occasion, proposed projects or requested projects in support of their scout troop and Eagle Scout certifications. NAWS-CL has sponsored spring protection fencing at Birchum Springs and the construction of Burrowing Owl nests (ground burrows), near the Richmond Road gate.

Raptor surveys were conducted by Pete Bloom (California State Parks Raptor Research Center) in the 1980s, including California condor work. An associated effort banded Burrowing Owls in support of a CDFW range-wide assessment effort.

Past monitoring locations in the area are also documented under the CalPIF program (a bird conservation program focusing on landbirds) at Upper Mountain Springs Canyon, Indian Joe Springs, Upper Sand Canyon, Lower Sand Canyon, and several places along the Owens River. Mist netting was conducted in the past at Mountain Springs by Denise LaBerteaux when this was a station for the Monitoring Avian Productivity and Survivorship program (P. Woodman, pers. com. 2010). A Monitoring Avian Productivity and Survivorship station is part of a program created by the Institute for Bird Populations in 1989 to assess and monitor the vital rates and population dynamics of over 150 species of North American landbirds to provide conservation and management information on their populations. The Monitoring Avian Productivity and Survivorship Program utilizes standardized constant-effort mist netting and banding at a continent-wide network of monitoring stations. This program is now a partnership between the Institute for Bird Populations and the U.S. Geological Survey/Biological Resources Division in the National Biological Information Infrastructure web-based electronic information network.

The lack of current data on migratory bird populations at NAWS-CL has hindered the ability of natural resources managers to identify management concerns. For the purposes of the INRMP, the population is defined as the individuals residing with the IWV. The IWV is bounded by, and includes, the Coso Range, Argus Mountains, El Paso Mountains, and the east slopes of the Sierra Nevada. Birds do benefit from management approaches for listed species, such as the benefits of project planning procedures in managing Mohave Desert Tortoise populations and riparian habitat management for the Inyo California towhee. However, monitoring efforts need to be expanded to include all habitats at NAWS-CL to assist in sound decision-making regarding management priorities, supporting the major bird plans and initiatives for which DoD is a partner, and reporting as needed on possible significant population impacts to migratory birds, under the Migratory Bird Rule.

The avian species list (Appendix I) was compiled by local avian experts from the Kerncrest Audubon Society for the IWV, from observations beginning in 1988 (S. Steele, pers. com. 1988). The wastewater treatment ponds are routinely visited by Audubon volunteers. While many of the sightings occur off NAWS-CL, all of the 360 species identified are presumed to occur at NAWS-CL. Of these, 208 are songbirds, and 30 are raptors. Waterbird species (such as ducks and geese) total 38, and 47 species of shorebirds have been recorded. The annual Christmas Bird Count sponsored by the Audubon Society is the only spatially and temporally consistent monitoring effort currently in place at NAWS-CL. The count is conducted within a 15-mile diameter circle centered on the city of Ridgecrest. It is conducted each year during the third week of December and includes portions of the Mainsite, SNORT, Golf Course, and restricted Inner Range areas at NAWS-CL. Results for the Ridgecrest and China Lake count were obtained from the Christmas Bird Count website, dating back to 1993. Because the Christmas Bird Count is an early winter survey many migrant species appear in the counts for the Ridgecrest area. In addition, the emphasis on the area of the wastewater treatment ponds allows for a high count of migrants.

Although it does not appear that military readiness activities at NAWS-CL have a meaningful potential at present to have a significant adverse effect on a migratory bird species population, it would be desirable to implement a long-term monitoring protocol to more fully develop knowledge concerning the status of avian populations, consistent with mission execution requirements, availability of funding, and other relevant factors. Such monitoring could also facilitate management decisions for sensitive species and could be used in all NAWS-CL planning. Monitoring will also lead to informed management decisions for sensitive species and can be used in all NAWS-CL planning. Such a monitoring protocol could include the following elements:

- *Adequate habitat representation.* Monitoring should attempt to provide a representative sample of the major habitats found at NAWS-CL.
- *Repeatability.* Monitoring protocols should be simple enough to be repeated by any qualified person without extensive training in methodology. Protocols should not be based on limited access or specialized training and equipment.
- *Feasibility.* Any monitoring effort needs to be able to be fulfilled by personnel with limited time and access. Design should seek to minimize the amount of resources needed to collect accurate and useful data.
- *Scientific rigor.* Monitoring protocols should be based on the best available science. The data collected in a way that makes it valuable for a wide variety of management applications, including relative abundance estimates, trend analysis, habitat preferences, and rough density estimation.

Stationary targets such as tanks, sea-vans, and other structures (such as building and power poles) often provide suitable nesting or roosting substrates for many avian species. Although it is unknown to what extent these assets are being used, evidence of roosting and nesting has been found, and such roosting and nesting likely represents the highest risk of migratory bird "take" due to readiness activities at NAWS-CL. However, the possible presence of migratory bird species in such structures during mission activities does not appear to present a risk of

population-level significant adverse effect, therefore development of further data concerning the presence of such species within these operating areas is not required for purposes of the Migratory Bird Rule.[1] NAWS-CL could potentially conduct surveys at these operation areas during the breeding season (March–June), consistent with availability of funding and mission execution considerations, both to learn more about the use of operating areas by migratory bird species, and to explore the feasibility of developing measures to further minimize any impacts to avian species potentially present during military operations.

Military readiness activities will continue to be conducted in accordance with the MBTA military readiness waiver. However, both Federal and Navy guidance instruct the DoD to minimize impacts to migratory birds when possible. Potential impacts to MBTA or NAWSCL Special Status Species are reduced through the voluntary application of mission compatible avoidance or minimization measures. Any avoidance measures implemented would be conducted as practicable and without impact to mission requirements. While impact avoidance and minimization measures will continue to be developed and refined over time, the following measures may be used to avoid impacts to migratory birds.

- Covering large open holes;
- Restricting or eliminating suitable perches near possible nest sites when feasible and compatible with mission requirements;
- Removing nesting material from targets during the non-breeding season;
- Using hazing methods for seven days before conducting a test on a target with known avian use;
- Monitoring efforts will not be able to identify every raptor nest prior to a test. EMD will rely on range personnel to notify them of any nest found at a target during test preparations;
- If a nest without eggs or young is found, the nest should be removed by EMD personnel;
- If a nest with eggs is found, the eggs and nest may be removed and held for the duration of the test;
- If a nest with young is found, the young and nest may be removed and held for the duration of the test. If the young are old enough, they may be removed and turned over to a wildlife rehabilitation specialist for care and eventual release;
- Remove used or spent targets after the breeding season, when feasible and compatible with mission requirements.
- It should also be noted that when individual birds or a nesting pair are determined to be present in a test or target area, the application of mission compatible impact avoidance measures conducted prior to test events will generally afford an opportunity to either re-configure a test event to minimize potential effects or provide the opportunity to physically remove any migratory birds, in accordance with mission execution requirements.

No comprehensive baseline surveys have been conducted for birds across the range of habitats found at NAWS-CL. Bird species of the southwestern deserts tend to have smaller populations and smaller breeding ranges, rendering these species more vulnerable to ecological stresses (Rich et al. 2004). The land management decisions of federal agencies such as the Navy could have a large impact on global populations of Mojave Desert breeding birds (CalPIF 2009).

Sedentary species are more vulnerable to environmental impacts at the population level. For this reason several desert species (i.e. Le Conte's Thrasher) have been assigned special status designations (CalPIF 2009). For sedentary species, habitat fragmentation and barriers to movement can result in local population extirpation (Laudenslayer et al. 1992). See Section 3.5.8.3 for the Inyo California Towhee, which also falls into this category.

[1] It should also be noted that, insofar as individual birds or a nesting pair could potentially be present in a test or target area, visual sweeps conducted prior to test events will generally afford an opportunity to either re-align a test event or physically remove any such migratory birds, within mission execution constraints.

Fires resulting from Research, Development, Acquisition, Testing, and Evaluation and training activities are unlikely to have a significant impact on the population of the majority of avian species at NAWS-CL. However, several high elevation habitats including Pinyon Pine, Joshua Tree Woodland, and Great Basin Scrub are limited in extent within the IWV. Populations of avian species that are restricted to these habitats, such as the black-throated gray warbler, cactus wren, and Scott's oriole, have the potential to be significantly impacted by large fire events.

3.5.7 Mammals

3.5.7.1 Mammal Community

NAWS-CL ranges support more than 80 mammal species (see Appendix I). Many small mammals, such as several species of kangaroo rat, live in the driest portions of the desert, deriving all of the water they need from the seeds and leaves they eat. No federally protected mammal species occur at NAWS-CL, and only a single state protected species, the Mohave ground squirrel, has been recorded. The desert cottontail (*Sylvilagus audubonii*), black-tailed jackrabbit (*Lepus californicus*), and white-tailed antelope squirrel (*Ammospermophilus leucurusare*) are widespread throughout the Mojave and at NAWS-CL. The single-leaf pinyon pine (*Pinus monophylla*) and other woodlands support an additional mix of small mammals, including the Panamint chipmunk (*Neotamias panamintinus*), pinyon mouse (*Peromyscus truei*), dusky-footed woodrat (*Neotoma fuscipes*), common porcupine (*Erethizon dorsatum*), and striped skunk (*Mephitis mephitis*) (Navy 1989b, 1998b, 2004b).

Several wide-ranging carnivores are in the desert, including coyote (*Canis latrans*), desert kit fox, ring-tailed cat (*Bassariscus astutus*), long-tailed weasel (*Mustela frenata*), American badger (*Taxidea taxus*), mountain lion, and bobcat (Navy 1989b, 1998b, 2004b). The common gray fox (*Urocyon cinereoargenteus*) occurs in the pinyon pine and other woodlands. Larger mammals include mule deer, Nelson's bighorn sheep (*Ovis canadensis nelsoni*), and feral horses and burros (Navy 1989a, 2004b). Feral horse and burro history and management is discussed in Section 3.5.7.4.

3.5.7.2 NAWS-CL Special Status Mammals

From past surveys records and species or subject matter experts, several mammals that occur at NAWS-CL are considered sensitive by the BLM or the CDFW (Table 3-13).

Table 3-13. Sensitive mammal species that occur at Naval Air Weapons Station China Lake.

Common Name	Scientific Name	Status
Nelson's bighorn sheep	*Ovis canadensis nelsoni*	BLM
Western mastiff bat	*Eumops perotis californicus*	BLM, CSC
Pallid bat	*Antrozous pallidus*	BLM, CSC
Townsend's big-eared bat	*Corynorhinus townsendii*	BLM, CSC
Spotted bat	*Euderma maculatum*	BLM, CSC
Western red bat	*Lasiurus blossevillii*	CSC
Western small-footed myotis	*Myotis ciliolabrum*	BLM
Long-eared myotis	*Myotis evotis*	BLM
Fringed myotis	*Myotis thysanodes*	BLM
Yuma myotis	*Myotis yumanensis*	BLM
American badger	*Taxidea taxus*	CSC
Mohave ground squirrel	*Xerospermophilus mohavensis*	BLM
Ring-tailed cat	*Bassariscus astutus*	CSC
Vole*	*Microstus* sp.	BLM, CSC
Note: BLM = Bureau of Land Management Sensitive Species; CSC = State of California Species of Concern. *the taxonomic status of the voles occurring at NAWS-CL is currently unresolved		

3.5.7.3 Management of NAWS-CL Mammals

Larger mammals and bats have been generally well documented at NAWS-CL, though little monitoring is conducted. Small mammals such as voles and shrews are less well known, and there are unresolved taxonomic and habitat association issues.

Threats to bats on NAWS-CL are generally from intrusion of roost sites and degradation of water sources (Map 3-12). Protection of key roosting and foraging sites, water sources, and food supply are key to management of healthy bat populations (Brown-Berry Biological Consulting 1996). Management of these resources, prior to use of mines for testing, should enhance bat protection on NAWS-CL. Mines that are bat roost sites should not be used for NAWS-CL activities. Mines that provide significant roost sites include Star of the West, Redwing, and Josephine (Brown-Berry 1996). The placement of gates and signage and maintaining open water will enhance bat colonies on NAWS-CL. Protection of key mines, possibly with bat gates and/or seasonal restrictions should be a high priority for conservation of the Station's bat population, particularly Townsend's big-eared bat (*Corynorhinus townsendii*).

Mohave ground squirrels are a BLM Sensitive Species that have been recorded at NAWS-CL. Past surveys within the KGRA were conducted as part of the development of geothermal resources. NAWS-CL has continued to support research and survey efforts.

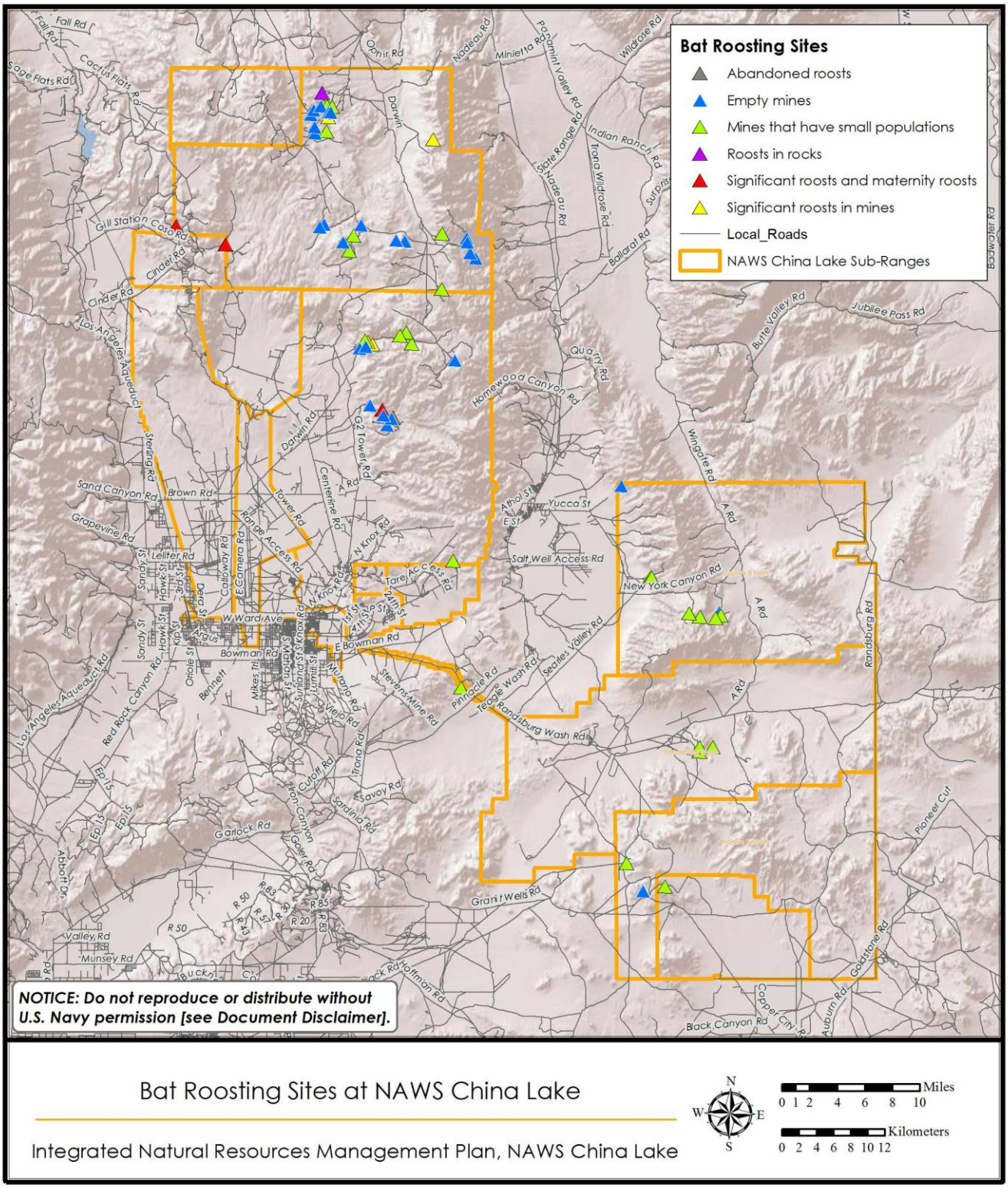
The genetic relationship of voles found at NAWS-CL to other populations north and south of the Station is unknown. Threats to the species are degradation or loss of habitat due to feral horses and burros (in areas such as Paxton Ranch and Mountain Springs Canyon) (T. Campbell, pers. com. 2012). Constraints to NAWS-CL activities, due to the presence of voles, are expected to be minimal due to their restricted distribution.

The taxonomy of the desert shrew complex has undergone a major revision with the splitting of one wide-ranging species into four separate species. With only one individual captured at NAWS-CL, it is unknown how this individual or population relates to others across its range.

3.5.7.4 Feral Horses and Burros

Feral burros can be found in the Coso and Argus Range in the North Range and the Eagle Crags, Slate, and Brown Mountains on the South Range. Their movements and distribution are generally temperature related. During the summer months, burros may become somewhat solitary and will often retreat to the higher elevations and canyons with reliable sources of water. In the late fall, burros may move down to lower elevation alluvial fans and valleys throughout the Creosote Bush Scrub and Mojave Mixed Woody Scrub zones. During periods of moderate to heavy rainfall, and particularly during the springtime, they will disperse many miles from perennial water sources in search of green vegetation.

Wild horses use portions of NAWS-CL and surrounding BLM lands on a yearlong basis. The horses in the area of the Argus Range are generally located in the blackbrush (*Coleogyne ramosissima*) scrub, grass covered lava mesas, and Joshua Tree Woodland, where they may graze on remnants of bunch grasses and other vegetation. Horses are split into two key population centers: one in the southern portion of the Argus Range, in areas immediately north and south of Mountain Springs Canyon, and between Wilson Canyon and Shepard Canyon along the eastern boundary of the North Range; and the other in the Coso Range between Upper Cactus Flat and Coles Flat, and in the western and eastern portion of Wild Horse Mesa. Small, relatively isolated groups can be found throughout the remaining area. Horses generally stay in the higher elevation areas during the spring and summer months and will often move down to lower elevation areas in the winter. While it is possible to see a few horses in lower elevations during any time of the year, most of the bands are rarely seen below 2,600 feet.



Map 3-12. Bat roosting sites at Naval Air Weapons Station China Lake.

The California Desert Conservation Area Plan specifically addressed the issue of wild horse and burro management at NAWS-CL. The 1980 California Desert Conservation Area Plan determined that lands within NAWS-CL carried range resource capacity sufficient to support a target population of 168 horses and 1,137 burros in the Centennial Herd Management Area (HMA) and 408 burros in the Slate Range HMA. The California Desert Conservation Area Plan was amended in 1999 as a result of the 1994 California Desert Protection Act (CDPA). The amended California Desert Conservation Area Plan states that "Herd Management Areas will not be established on military land." As a result the Centennial Herd Management Area was not established on military land and the Slate Management Area was deleted as burro habitat. The CDPA assigned management of NAWS-CL lands and resources to the Secretary of the Navy (CDPA 1994).

The CDPA (PL 103-433-October 31, 1994, Section 805[g][4]) states "The Secretary of the Navy shall be responsible for the management of wild horses and burros located on the NAWS-CL lands and may utilize helicopter and motorized vehicles for such purposes" (The land withdrawal for NAWSCL was recently renewed with the signing of the Fiscal Year (FY) 2014 National Defense Authorization Act (NDAA) on December 26, 2013. The FY 2014 NDAA includes provisions for continued Navy management of wild horses and burros on essentially the same basis as previously set forth in the California Desert Protection Act of 1994.). The CDPA also required that an Interagency Agreement cooperative management arrangement be initiated between the Secretary of the Navy and the Secretary of the Interior. The CDPA as well as the Wild Free-Roaming Horse and Burro Act give specific requirements and recommendations on the management of wild horse and burro herds.

3.5.7.4.1 Feral Horse and Burro Management

Removals of wild horses and burros were first implemented on NAWS-CL in the early 1980s. These gathers were necessitated by an acute overpopulation of animals and the resulting adverse effect they were having on Navy operations, safety, range facilities, cultural and biological resources, and overall horse and burro herd health.

Current Management

The Navy conducts horse and burro roundups with the assistance of the BLM to try to reach herd management population levels. All animals are currently made available to the general public through the BLM's Wild Horse and Burro Adoption Program. Currently, roundups are being conducted in accordance with the 2010 Memorandum of Agreement between the BLM and NAWS-CL. From 1980 through 2009, a total of 3,541 horses and 10,496 burros have been removed from NAWS-CL ranges (see Appendix M). There are currently about 150 burros and 450 to 500 horses on NAWS-CL. Should the BLM not be capable of accepting animals into their program, the Navy may consider placement with other organizations or individuals capable of properly caring for excess animals.

A NAWS-CL Wild Horse and Burro Management Plan (WHBMP) was completed in November 2013 and is incorporated as a component of the INRMP. The WHBMP is attached as Appendix M. It discusses the current status of the horse and burro herds, and provides new wild horse management prescriptions.

The current management level for burros is set at zero animals. Burro population levels were initially determined to be 1,137 burros in the Centennial HMA and 408 burros in the Slate Range HMA. Due to conflicts with military operations Amendment 24 to the CDCA plan was approved in 1981 and established an appropriate herd level of zero burros in this HMA.

The horse herd management level of 168 animals was established in 1980 in the California Desert Conservation Area (CDCA) Plan. The attached WHBMP proposes to maintain a horse herd of 100 to 168 animals. This level will remain in effect until further analysis from habitat and animal monitoring efforts support an increase or decrease in numbers. Any change in herd size must ensure that management objectives for the horses, native plant

and animal resources, as well as the mission of NAWS-CL can be sustained. The INRMP and WHBMP will be put out for public review and comment together with an Environmental Assessment of their likely environmental impacts, and they may be implemented subsequent to such review and comment.

The Goals of the WHBMP are to:

- Maintain the Centennial Horse Herd within a range of 100 to 168 animals to allow for range recovery, and to maintain genetic variability and herd health. Allow for changes in this initial range over time based on habitat condition, vegetation utilization, animal numbers and distribution, and herd health.
- Achieve and maintain the burro population at zero.
- Keep the Herd healthy and self-sustaining by maintaining and improving rangeland condition. Remaining horses will be healthier and better able to survive stressful periods such as prolonged droughts and harsh winters when the rangeland resource is in a self-sustaining condition.
- Maintain herd genetic variability/diversity by periodically conducting genetic analysis on the horse herd and, if warranted, by the possible introduction of animals from other suitable herd areas, removal of young animals and/or by increasing the number of male horses and therefore the number of possible harems.
- Implement a proactive fertility control program through the application of contraceptive to breeding age mares.
- Increase the health and adoptability of horses by taking only young animals when extracting excess, by allowing the breeding herd to live out their lives on the range, and by carefully selecting the young animals to be retained. The younger animals are more marketable to the adopting public, and the herd genetic quality will improve through thoughtful selection of breeding herd recruitment.
- Minimize the cost of reducing and maintaining desired population levels.
- Minimize damage to water resources, riparian areas, uplands, and cultural resources through Herd reduction, and thereby facilitate and increase the rate of native plant and animal population recovery, including federally listed species.
- Provide for an enhanced habitat assessment program to monitor forage utilization and recovery) and an animal monitoring program to document herd size, health, and distribution.

The subjects relevant to wild horse management are Appropriate Management Levels (AMLs), census, gathering, removal, fertility control, sex ratio, adoption, herd monitoring, and genetic variability. Modeling is applied to analyze four Management Alternatives using the Jenkins Model WinEquus and detailed management recommendations are provided. The findings demonstrate that the current management practices are not sustainable financially or ecologically. Horse removal rates are currently not keeping up with recruitment.

Management Issues

The WHBMP discusses AMLs, census techniques, gathering methods, fertility control, manipulation of herd sex ratios and age distribution, adoption and use of sanctuaries, herd and habitat monitoring, and genetic variability.

Initial Plan findings demonstrate that the current management practices are not sustainable financially or ecologically and that removals are not keeping up with recruitment.

Management of burros is anticipated to continue to involve capture and removal by helicopter assisted gathers and either roping individual burros or capture of larger groups through the utilization of run traps.

Four horse herd management options/approaches are being considered and are being analyzed using the Jenkins Model WinEquus. Costs were based on fiscal year 2008 data; current cost would likely be considerably higher. The four horse herd management approaches being considered include:

- Management Strategy 1 considers the existing management program (removal of only young adoptable animals) with no changes. The results from the model show that the Alternative does not control the growth of the herd, and the herd will continue to grow. After 11 years, the herd could exceed 1,600 animals with a projected ten-year cost of $1,040,600. This option would only be utilized during years when the BLM's ability to process and adopt animals is minimal and/or when available funding is limited.
- Management Strategy 2 applies a "gate-cut gather" and removal every two years to bring the population down to the lower level of the AML range (100 animals). The gate-cut method gathers a portion of the herd every two years with all animals captured being removed. Older animals would be sent to approved sanctuaries. This approach can achieve AML quickly, which is beneficial for the habitat, but may create a significant loss of genetic variability at extreme expense due to the large number of unadoptable horses that must be placed in long term holding. The projected ten-year cost is $2,243,300.
- Management Strategy 3 implements an 80% gather of the entire herd on a four-year cycle. This incurs a one-time but significant expense in the first gather to remove enough animals (including unadoptable animals) to reach lower AML. This is followed by implementation of fertility control to diminish the recruitment rate, plus removal of only two-year-olds and younger that are highly adoptable. The breeding herd will live out their life on the range. The projected ten-year cost is $1,887,850.
- Management Strategy 4 implements an 80% gather on a three-year cycle without a large front-end gather. No unadoptable horses would be removed, so the achievement of AML may take up to 20 years. A fertility control regime is implemented to diminish the recruitment rate, plus only two-year-olds and younger, readily adoptable, animals are removed. The breeding herd would be allowed to live out their life on the range. The projected ten-year cost is $1,374,200.

The selection of which management options is implemented may require that a combination of options be implemented over time. Selection of which option is utilized may be dependent on:

- Obtaining adequate Navy funding to conduct gathers and place animals by adoption to private individuals or place older unadoptable animals in sanctuaries;
- Obtaining a long-term commitment of funds to implement a comprehensive contraception program;
- Obtaining significant blocks of Range time that allow for adequate access to restricted areas and that do not impact mission requirements;
- Availability of space and manpower at BLM holding facilities and ability of BLM to process and adopt adequate numbers of horses and burros;
- Availability of space in sanctuaries for older horses;
- The need to conduct gathers. Gathers may be limited or unnecessary if animal numbers are at or near prescribed management levels or if animals (burros) are so widely dispersed that gathers are uneconomical.

Continuation of the current horse gathering method, which involves only the removal of young horses, could result in the Centennial Horse Herd doubling in four to seven years. If the tripling is allowed to occur, costs to get wild horse numbers down to prescribed management levels will similarly increase.

To meet the management goals discussed above within a reasonable period of time it appears that a combination of Management Strategies 3 and 4 are most appropriate when adequate funding is available. Blending these two

Options would allow for removal of lower numbers of unadoptable horses at the outset, coupled with commensurate extensions of time to get to AML. Additionally, Alternative 1 should continue to be used to do selective roping on short budget years so that some removals are accomplished every year.

The Centennial Herd population is now 450 to 500 animals. To get the herd down to AML (100 to 168), fertility control (possible utilization of the contraceptive PZP) must be applied to reduce annual herd recruitment. Use of fertility control will require approval of fertility control plan and acquisition of a license from the Environmental Protection Agency. A commitment to use fertility control must be made by the Navy to apply initial and follow-up treatments on a systematic schedule. The management budget must become sufficient and reliable to accomplish the action. Selection of the specific form of contraceptive that will be administered will be based on the specific compound's suitability for application to the herd, approval by the Environmental Protection Agency (EPA), costs and funding availability, and through consultation with appropriate agencies, organizations and individuals. Although use of contraceptives is the preferred method of fertility control the Navy may also consider chemically or surgically sterilizing male and female individuals.

The WHBMP also provides for a habitat monitoring program to assess how horse use (and other factors) is affecting the vegetation resource and functionality in riparian areas associated with springs and other water sources that occur on Station. A qualitative assessment method that has already been developed and is recommended for monitoring riparian areas is the Properly Functioning Condition Assessment Method. The WHBMP can be found in Appendix M.

Continuation of cooperative management efforts with the BLM is essential if horse and burro herd management efforts are to be effective. The Navy and BLM currently cooperate in matters of joint responsibility such as conducting animal census, gathering excess animals, removing excess animals, and planning and budgeting the cooperative activities. Partnering with Death Valley National Park (operated by the NPS), and the National Training Center at Fort Irwin will also be required to efficiently control burro numbers since feral burros are widespread in the area on and around the Naval Air Weapons Station. Considerable time and expense is devoted to capturing and removing burros that propagate from residual reservoirs of animals on lands of neighboring agencies. A cooperative management plan with all nearby land owners is recommended.

Reliable funding and a substantial front-end investment are required to stabilize the horse herd and continue to remove burros. However, it is anticipated that the large initial investment will be recovered by a 50% or more reduction in annual maintenance costs. Savings in annual gather costs can be applied to addressing impacts of the wild horses and burros to natural resources including federally listed species, as well as cultural resources, and avoid impacts to the military mission.

3.5.8 Federally Listed Species

Six animal species recorded at NAWS-CL are federally listed as endangered (three species) or threatened (three species) (Table 3-14). However, only three species present management issues for NAWS-CL: the Mohave tui chub, Mohave Desert Tortoise, and Inyo California Towhee. The other three are migratory birds. In addition, the mountain plover (*Charadrius montanus*) was recently a candidate for federal listing, and the state-listed Mohave ground squirrel was under review for listing, but neither was federally listed.

Table 3-14. Federal status species recorded on Naval Air Weapons Station China Lake.

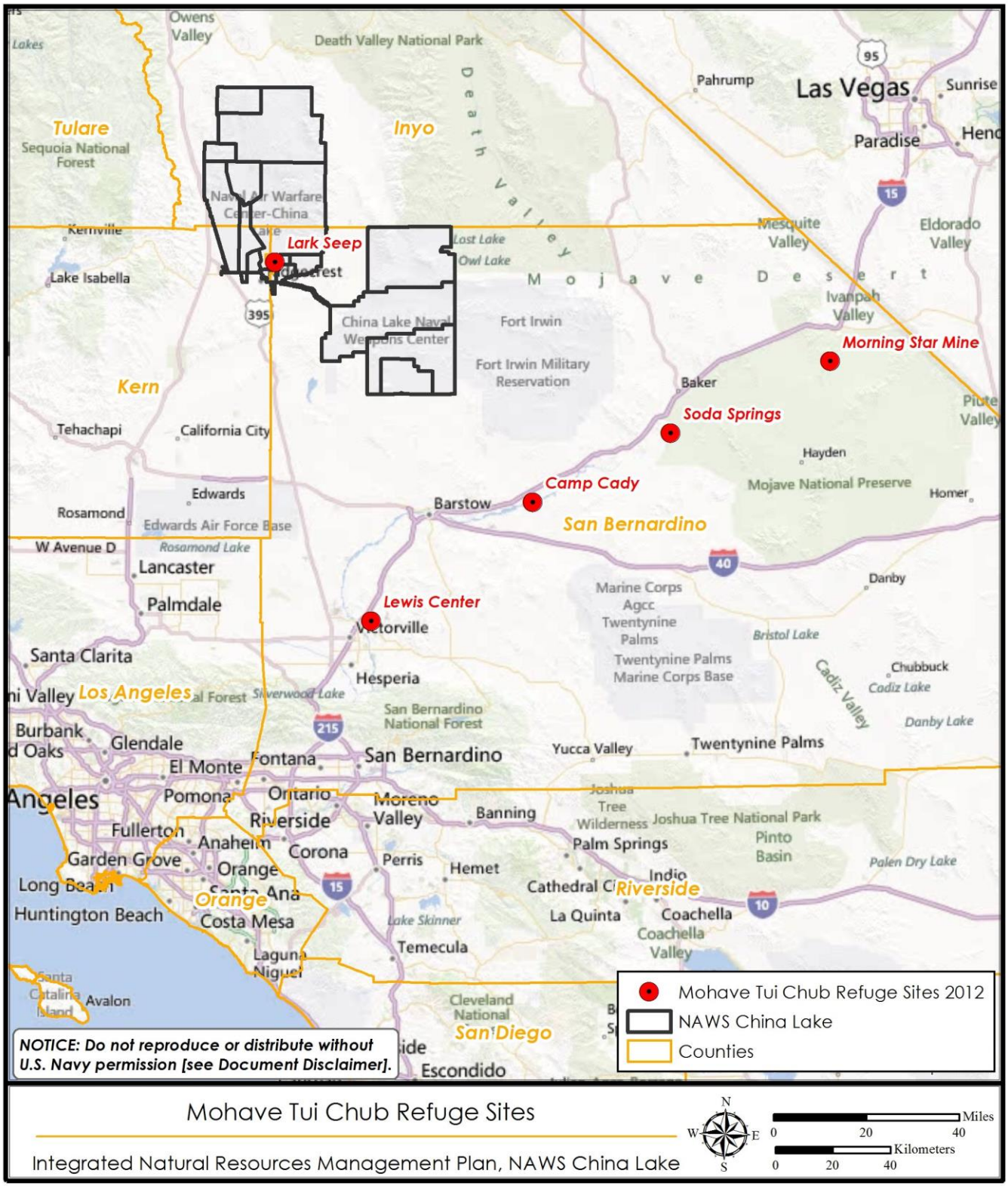
Common Name	Scientific Name	Status
Fish		
Mohave tui chub	*Siphateles bicolor mohavensis*	FE, SE
Reptiles & Amphibians		
Mojave Desert Tortoise	*Gopherus agassizii*	FT, ST
Birds		
Inyo California Towhee	*Pipilo crissalis eremophilus*	FT, SE
Least Bell's Vireo	*Vireo bellii pusillus*	FE, SE
Southwestern Willow Flycatcher	*Empidonax traillii extimus*	FE, SE
Western Snowy Plover*	*Charadrius alexandrinus nivosus*	FT, BSSC
Notes: FE = Federally Endangered; FT = Federally Threatened; SE = State Endangered; ST = State Threatened; BSSC = California Bird Species of Special Concern; *Only the Pacific subpopulation of Western Snowy Plover is Federally Threatened, not the inland population.		

3.5.8.1 Mohave Tui Chub

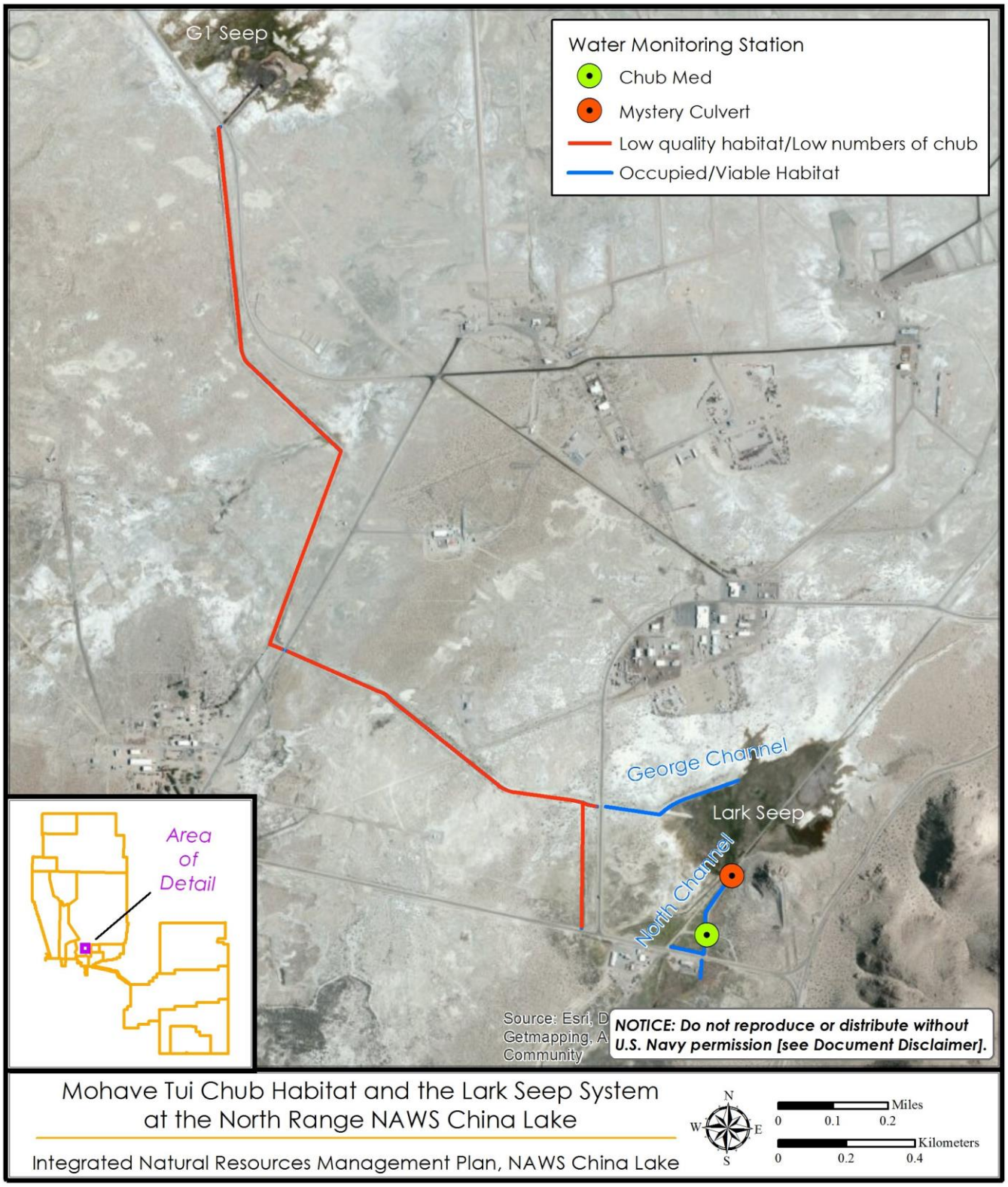
The Mohave tui chub are small fish rarely larger than 6.7 inches. They have thick bodies with a large head that begins to establish a concave profile as the fish grows (Garron 2006). They have a short snout with a small terminal mouth that is slightly angled downward and does not extend to the eye.

Mohave tui chub were historically restricted to the Mojave River from the base of the San Bernardino Mountains to its terminus at Soda Dry Lake, and are typically associated with deep pools and slough-like areas of the Mojave River. The decline of this species is due in large part to habitat modification and the introduction of arroyo chub (*Gila orcuttii*) into the river system. The arroyo chub hybridized with the Mohave tui chub. By 1967, few pure Mohave tui chub remained in the river (USFWS 1984), and the only native habitat where pure Mohave tui chub remained was at Soda Springs, located near the terminus of the Mojave River and adjacent to Soda Dry Lake near Baker, California. The Mohave tui chub no longer exist within the Mojave River, and were federally listed as endangered in 1970 and state listed as endangered in 1971. Current refuge sites for the tui chub and their status are depicted in Map 3-13. The location of tui chub and its habitat at NAWS-CL are depicted in Map 3-14.

In 1972, in an attempt to preserve this population at Soda Springs, several refuges were created by the USFWS and the CDFW, and chub were transplanted from Lake Tuendae (the largest of the three habitats at Soda Springs) to 14 sites. Only three transplants were successful: the Desert Research Station, Hinkley; California Information Center, Barstow; and Lark Seep System, NAWS-CL. Of these, however, only the Lark Seep System still contains Mohave tui chub. In 1986, CDFW established another refuge site at Camp Cady Wildlife Area. Two 0.25-acre ponds were constructed, and groundwater was pumped from the nearby Mojave River drainage channel. A 1994 population census estimated 2,000 chub at that site. In 2008, another translocation was undertaken, from NAWS-CL to the Lewis Center in Apple Valley, California. A total of 541 Mohave tui chub that measured 100 millimeters or less were placed in a special holding tank and transported by the USFWS and CDFW to the Lewis Center. It was the first time since the early 1980s that Mohave tui chub fish were transplanted to a new refuge (Mojave Desert Mountain Resource Conservation and Development [RC&D] Council 2011).



Map 3-13. Mohave tui chub refuge sites in southern California.



Map 3-14. Mohave tui chub habitat at Naval Air Weapons Station China Lake.

The largest known population of Mohave tui chub is in the Lark Seep System on NAWS-CL. The Lark Seep System consists of two seeps and about two and a half miles of interconnecting channels. Initially, 400 chub were introduced into the Lark Seep lagoon in 1972 (St. Amant and Sasaki 1971). This introduction was augmented with 75 additional chub in 1976 (Hoover and St. Amant 1983). As the population grew, chub migrated into the channels. Mark and recapture studies indicate that typically 90% of the chub are found in the channels. Slow flowing water within channels is thought to emulate the chub's natural river habitat. Considerable monitoring of the Lark Seep system occurred in 1983 (Feldmeth 1984), 1988 (Feldmeth et al. 1989), and 1991 (Bilhorn and Feldsmeth 1991). These studies documented important features of the system, including groundwater regime, water quality parameters, biotic characteristics, and chub ecology.

Mohave tui chub initiate spawning in March or April, when water temperatures range from 63–79°F, and continue throughout the spring. Eggs are free-spawned in the water column over vegetation to which the eggs attach. Aquatic ditchgrass (*Ruppia maritima*) is the preferred egg attachment substrate for this particular species of chub. The eggs hatch in six to eight days at temperatures of 64–68°F. The hatchlings will spend 12 hours on the bottom of the pool before swimming to the surface and establishing schools of small fry in shallow areas. The species feeds primarily on zooplankton and benthic invertebrates (Navy 2004a). At Soda Springs, natural foods found in the intestines of Mohave tui chubs consisted of gyrinid larvae, chironomid larvae, organic debris, and one small Mohave tui chub (USFWS 1984). The stomach contents of transplanted Mohave tui chubs living at Lark Seep contained vascular plants, Spirogyra, young chubs, Daphnia, chironomids, amphipods, Trichopteran cases, and detritus (Feldmeth et al. 1985).

May et al. (1997) studied the genetic variability among the Mohave tui chub, Owens tui chub (*Siphateles bicolor snyderi*), and Lahontan tui chubs (*S. b. obesa* and *S. b. pectinifer*) to determine subspecies status. The study also compared genetic structures of Mohave tui chub and arroyo chub to determine if refugia populations are pure. The results of this study support the view that the Mohave tui chub is genetically pure and a distinct evolutionary lineage that should be regarded as a separate subspecies. The study also found 8,104 Mohave tui chubs in the 1997 NAWS-CL population. Current monitoring of the Mohave tui chub supports the findings of the earlier monitoring programs conducted in the 1980s and 1990s. Population estimates from the late 1990s ranged from 3,143 to 10,405, but all had very high confidence intervals. More recent monitoring of the Mohave tui chub includes the following studies: a 2002 viable habitat study in all possible habitats; November 2004 mark and recapture sample effort along the George and G1 channels; October 2007 survey in the North Channel; April 2008 mark and recapture sample effort along North Channel; October 2008 mark and recapture sample effort in G1 channel; and mark-recapture sampling in the fall of 2009 and 2010. It should be noted that the November 2004 mark and recapture sample effort study used a different type of sampling method than the studies conducted in April and October of 2008, which both used similar methods. During relative abundance sampling in 2008, 2,634 individuals were captured (of which 541 were translocated to the Lewis Center). The findings of the October 2008 study indicate that fish in different areas differ in average size. For example, most of the fish in Lark Seep were between 50 and 100 mm in length, whereas the fish in the North Channel averaged between 75 and 150 mm (Desert Mountain RC&D Council 2009). In 2010, 1,104 individuals were captured in relative abundance sampling, while 3,638 were captured in absolute abundance sampling. Based on the number captured and tagged and then recaptured, the total population in 2010 was estimated at 4,844 (95% CI - 4,571-5,133) (Desert Mountain RC&D Council 2011).

Current Management, Assessment, and Recommendations

The Lark Seep System is composed of two seeps and approximately two and a half miles of channel. Cattails (*Typha* sp.) growing in the channel restrict water flow, which if left unchecked, would take over all Mohave tui

chub habitat. To maintain the water distribution through the channels, cattails are routinely excavated. To better maintain water quality, NAWS-CL began removing cattails with a lake mower attached to a small Jon boat. This method of controlling cattails has to be repeated on a regular basis; however, the water quality and fish viability is not compromised. The initial Biological Opinion (BO) regarding the removal of cattails and its impacts on the chub on NAWS-CL was produced in 1990. In 1996, a request for re-initiation of Section 7 consultation was submitted to USFWS to update the existing BO. During 1997, funding through the USFWS allowed NAWS-CL to enhance Mohave tui chub habitat by widening and deepening 250 feet of Lark Seep's North Channel. Mohave tui chub were found naturally in deeper sloughs of the Mojave River, thus the channel deepening was expected to more closely approximate preferred habitat, while also lessening maintenance of aquatic vegetation in this area. A BO concerning enhancement of chub habitat on NAWS-CL was issued for this project in May 1997. A second BO was issued in August 1997 to increase aquatic vegetation removal in chub habitat on NAWS-CL. Amendments to this BO were issued in 2002 to modify the techniques of the mark-recapture program, and in 2003 to increase the time period when vegetation removal could occur.

Vegetation was removed by backhoe using in-house personnel and equipment; however, current vegetation is removed by hand. Since the channels were originally constructed to divert water flow from adjacent facilities, funding for vegetation removal has historically been furnished by the PRFD, but current efforts are funded by NAVFAC. Removal of cattails occurred along the North Channel, the channel between Pole Line Road and G1 Road, and G1 Channel in 2007.

Currently, the Desert Mountain RC&D Council conducts the cattail removal program at NAWS-CL. Priority is given to removal programs at the George, G1, and North Channels. This recent cattail removal program uses mechanical harvesters to harvest excess cattails from tui chub habitat to maintain and expand open-water habitat largely free of emergent vegetation. When time and resources allow, this program will experimentally stabilize test sections of eroding channel bank by transplantation of native threesquare bulrush (*Schoenoplectus americanus*), from within the Station or from local sites in the IWV. It should be noted that this technique has been successfully used by CDFW elsewhere to stabilize banks, provide competition to established cattails, eliminate germination sites for cattail reinvasion, and provide hiding cover for larval fish (Desert Mountain RC&D Council 2011). The Mohave Tui Chub Recovery Plan (Taylor and Williams 1984) contains inventory and monitoring techniques, minimum water levels, and recommended water quality standards for survival of the chub.

Constant water quality monitoring has met with varied success due to metering system failures. Parameters such as pH, dissolved oxygen, temperature, and conductivity are used to monitor chub habitat and support chub survival efforts. Water quality results generally indicate that water temperature varies little while dissolved oxygen varies greatly. The 2002 population sampling resulted in some mortality of fish in the North Channel. It was presumed that the loss was due to low dissolved oxygen levels; however, more information was needed before further population studies could be conducted within the North Channel. A topographical analysis was conducted along the North Channel, from which a three dimensional model was made. An in-depth study of dissolved oxygen levels along the North Channel was also made. Meters that collect (pH, conductivity, temperature, dissolved oxygen) 24-hours daily were installed in two locations (Chubmed and Mystery Culvert) along the North Channel. In addition, a quarterly study of dissolved oxygen and temperature within water columns was conducted from 2004 through 2006. Measurements were also taken in 2010 (Desert Mountain RC&D Council 2011). Water quality, currently monitored at nine sites, appears stable.

The data show that dissolved oxygen levels increase as one moves downstream from the source near Bologna Pool, and thus the North Channel has a much lower dissolved oxygen content than the G1 Channel. Temperatures in the North Channel are also consistently higher than the G1 Channel, which has large seasonal fluctuations. Studies

conducted throughout the water column in the North Channel concluded that the dissolved oxygen was low throughout the water column. The middle and upper layers had more consistent readings. In the North Channel, dissolved oxygen is usually between 1-4 ppm, while the G1 Channel has dissolved oxygen levels of 8-15 ppm (Desert Mountain RC&D Council 2011). In comparison, at Lake Tuendae in Soda Springs, which has a fountain that aerates water, the average dissolved oxygen level is 13 ppm. The North Channel's lower dissolved oxygen could be the result of a larger concentration of cattails and other vegetation. The G1 Channel is largely devoid of cattails due to its steep U-shaped bed. This channel also reflects ambient air temperature more closely due to its shallower depth, and thus gets much colder during the winter months (Desert Mountain RC&D Council 2011).

NAWS-CL has been working in cooperation with the CDFW, USFWS, NPS, the Lewis Center for Educational Research (Lewis Center) and various universities to support chub research and to assist in the delisting process. The Lewis Center owns lands along the Mojave River, and students there worked with USFWS and CDFW assistance to construct ponds on campus where chub were then introduced and monitored by students in 2009. Another project is ongoing in Deep Creek, the headwaters of the Mojave River. An inventory of existing aquatic wildlife is being completed with the hopes of introducing chub back into the headwaters of the Mojave River. NAWS-CL personnel have assisted the Mojave National Preserve at Zzyzx Desert Studies Center (Zzyzx) in a multi-agency chub population study. A University of North Dakota doctoral student researching the chub found another possible refuge location at Morning Star Mine in the Mojave National Preserve. Water quality is good, based on samples tested by the Mojave National Preserve and the CDFW. The CDFW has implemented further genetics studies, and the results indicate that new populations should have fish from Zzyzx and NAWS-CL to rebuild genetic diversity for future populations (Chen et al. 2006). The Lark Seep system has become an important component of a variety of complex groundwater issues at NAWS-CL, not only because of the chub, but also due to wetland issues associated with resident and transient bird species, Installation Restoration Program constraints, Bird/Animal Air Strike Hazard, and maintenance requirements for the system and the chub. Evaporation ponds are unlined, and water percolates from them north toward the China Lake Playa. A number of buildings and facilities are in the water flow path, and foundations of several are exhibiting signs of stress due to the high water table.

Channels were constructed in the 1950s and 1960s to drain water from the high groundwater mound in the Lark Seep area away from buildings and nearby roadways. The situation is greatly complicated by endangered chubs as they must be ensured an adequate flow of water to maintain the channels and seeps. Thus, any change to the groundwater regime (quantity or quality) has a high potential to affect the seep and the chub.

Annual cattail removal will continue throughout the Lark Seep System. This cattail removal has brought about beneficial results; water clarity increased at all sites where the removal has taken place. Additional habitat enhancement efforts will also be considered in other sections of the channel system. In addition, NAWS-CL will participate in additional genetics studies if initiated by state or federal agencies.

During the summer of 2012, unexpected loss of Mohave tui chub habitat (i.e., the drying of G-1 Channel) prompted the EMD to move stranded tui chubs to other areas in the Lark Seep System. The EMD also noted the degradation of habitat quality and quantity at other locations in the Lark Seep System in the summer of 2012. It was believed that excess cattails in the channels between Lark Seep and G-1 Seep were impeding water flow, and an emergency action was implemented to restore water flow to G-1 Seep. In the past, the hydrologic connections between areas within the Lark Seep System included open channels and culverts with flowing water. However, in recent years, many of these areas with open water have become choked with cattails. The Navy has an ongoing program to keep the waterways from becoming choked with cattails (USFWS 2009). During interagency meetings, the Navy committed to investigate the cause(s) of this recent habitat loss/degradation and develop and implement a solution to ensure the long-term persistence of the Mohave tui chub population at NAWS-CL.

To determine the cause(s) of the summer 2012 loss and degradation of Mohave tui chub habitat in the Lark Seep System, NAWS-CL is proposing a twofold project. Initially, NAWS-CL is proposing to collect hydrologic and topographic data to determine the current flow rates and locations of surface water through the Lark Seep System, along with the locations, dimensions, and effectiveness of existing culverts. Upon completion of this study, the data gathered would be used to develop and implement an effective long-term, low maintenance solution to improve the quality and persistence of habitat for the Mohave tui chub in the Lark Seep System, and to develop and implement a management strategy for the species.

NAWS-CL will work closely with both the USFWS and CDFW during all phases of project development and implementation. The project will begin with a prescribed burn of 30 acres of dense cattails. This will allow survey crews to more easily access the system, and will potentially open up areas of previously unsuitable habitat. Following the burn, NAWS-CL will implement surveys to map and characterize the hydrology and topography of the Lark Seep System. As stated above, the data from these surveys will allow NAWS-CL, along with state and federal partners, to design and implement a long-term, low maintenance program to improve and preserve habitat for the Mohave tui chub. Since the eventual management strategy is dependent on data gathered during hydrologic surveys, the detailed proposal for the improvement and preservation of the habitat will be developed following the data collection phase.

NAWS-CL personnel will attend meetings and conferences applicable to management of the chub.

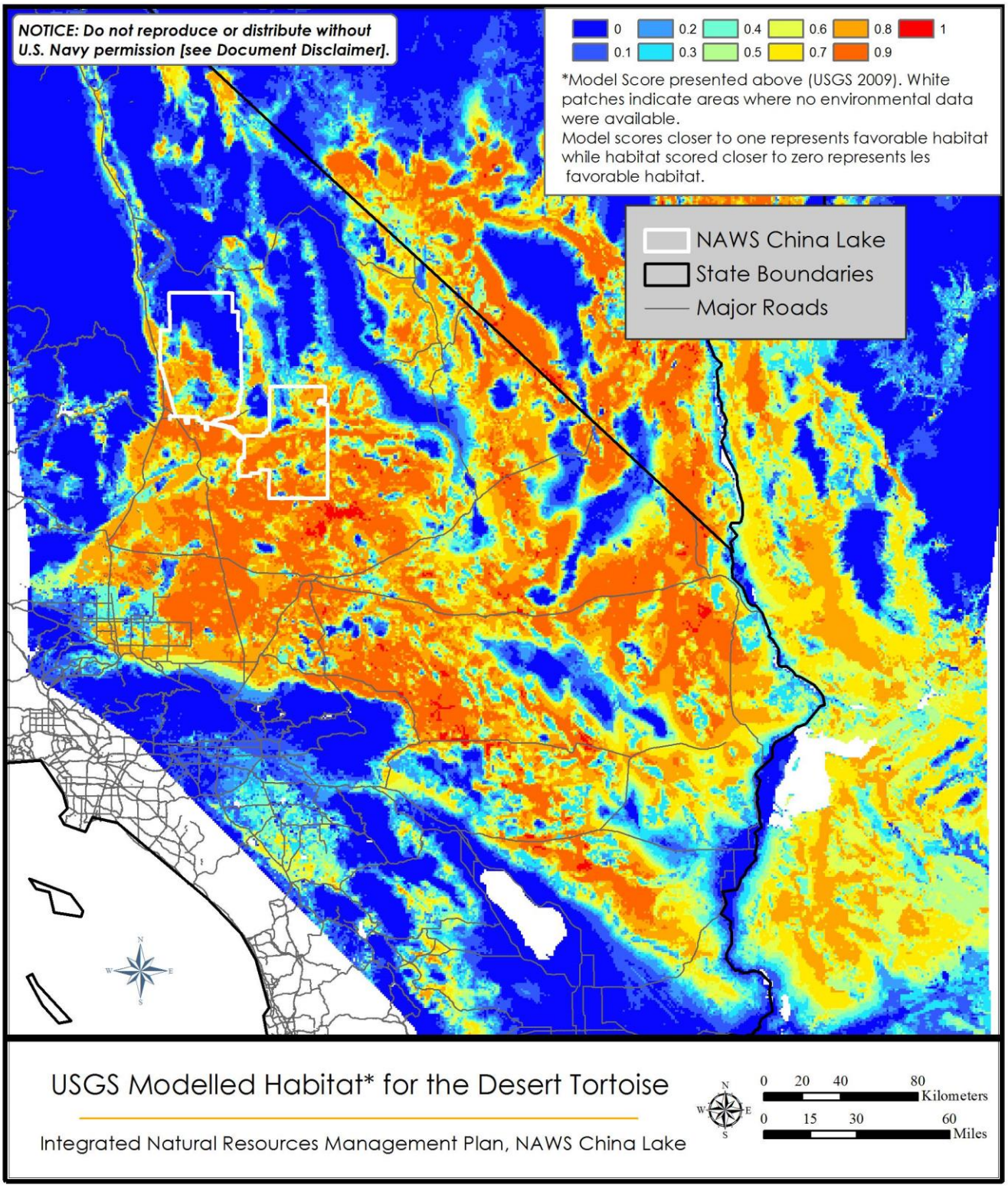
Maintenance of flows away from the high groundwater mound is essential for protection of NAWS-CL buildings, roads, and other structures, but a viable chub population must also be maintained. Operations at the City of Ridgecrest-operated Waste Water Treatment Facility may be affected as any modifications in management of the facility could affect the chub.

This species will be eligible for downlisting consideration when six populations (minimum 500 fish each) have been established on a self-sustaining basis for ten years (USFWS 1984). Currently, three established populations exist, and two new populations were recently established, a population at the Lewis Center in 2008 and a population at Morning Star Mine pond in 2011. NAWS-CL is currently in consultation with the USFWS to develop a long-term habitat management strategy for the Mohave tui chub.

Another concern for the tui chub is the presence of non-native bullfrogs within the North Channel of the Lark Seep System. Bullfrogs are voracious predators and could impact recovery efforts for the chub.

3.5.8.2 Mojave Desert Tortoise

The Mojave Desert Tortoise occurs in a wide variety of habitats throughout the Mojave and Colorado deserts north and west of the Colorado River. Tortoises prefer Creosote Bush Scrub communities, where precipitation ranges from two to eight inches annually and perennial and ephemeral plant species are abundant. The highest density tortoise habitat tends to be on gently sloping bajadas in Creosote Bush Scrub with sandy-loam to pebbly soils. The Mohave Desert Tortoise population was state listed as threatened in 1989 and federally listed as threatened in 1990. The Mohave population of the Mohave Desert Tortoise was recognized as a full species in 2012. Mohave Desert Tortoise populations have declined dramatically in the last 25 years. In some areas of occupied habitat, tortoise density has dropped 50 to 90%; near some desert towns, they have been almost completely extirpated (Berry 1999, 2003; Jones, pers. com. 2005). Modeled habitat (U.S. Geological Survey 2009) for the Mohave Desert Tortoise is depicted in Map 3-15.



Map 3-15. U.S. Geological Survey (2009) modeled habitat for the Mohave Desert Tortoise.

Adult tortoises average 9 to 15 inches in upper shell (carapace) length. The Mojave Desert Tortoise digs underground burrows where it spends at least 95% of its life. These burrows allow the tortoise to live where ground temperatures may exceed 140ºF. From October to February, the Mohave Desert Tortoise hibernates in its burrow to protect against freezing weather. Much of the tortoise's water intake comes from moisture in the grasses and wildflowers they consume in the spring. Adult tortoises may survive a year or more without access to water.

Mojave Desert Tortoises are a long-lived species (80-100 years) and reach sexual maturity in 13-20 years. The frequency of reproduction depends on food supply and habitat condition, and can occur annually under optimal conditions. Courting and copulation may occur at any time that the tortoises are above ground; particularly in late summer and early fall when testosterone levels peak in males. Females store sperm and lay four to eight eggs in May, June, or July. Hatchlings experience relatively high mortality early in life due to predation pressure from Common Ravens (*Corvus corax*), kit foxes, badgers (*Taxidea taxus*), roadrunners (*Geococcyx* sp.), and coyotes; all natural predators of the Mojave Desert Tortoise. Only a few eggs out of every hundred actually make it to adulthood.

More than 20 stressors affecting tortoise populations have been identified, and the cause of population decline has been the cumulative impact of human-related activities. Habitat degradation and fragmentation, the increase in exotic plant species, increased fire, collection for pets or food, shooting, crushing by off-road and military vehicles, disease, predation by dogs and by human-induced expanded raven populations, agricultural activities, development of roads, utility corridors, and residential communities have all taken their toll on the tortoise and its habitat (BLM 2005; Doak et al. 1994; USFWS 2004).

Upper respiratory tract disease is a chronic infectious disease that has also contributed to the decline of wild Mojave Desert Tortoise populations. It was first discovered in wild populations in the 1970s at the Beaver Dam Slope population in Utah and later discovered in Mojave Desert Tortoise populations at the Mojave Desert Tortoise Natural Area Kern County, California in 1988. Symptoms include mucopurulant discharge from the nares, eyelids, recessed eyes, and dullness to the skin and scutes. Long-term studies have not found a specific cause, although many studies indicate a bacterial cause. More than 70% of adult tortoises died from 1988-1992 due to complications from this disease (K. Berry, pers. com. 2004). No evidence of upper respiratory tract diseases or die-offs has been documented on NAWS-CL.

The explosion of the raven population in the desert illustrates how indirect effects of human activities can disrupt ecological balances. Ravens are both predators and scavengers. They have been described as "bears with wings" because they become pests that feed on human-produced garbage. Ravens proliferate near garbage dumps, sewage ponds, agricultural areas, and along roads, all of which provide unnaturally abundant food, water, perches, and nest sites. Common Ravens increased by 1,500% in the Mojave Desert between 1968 and 1988 (Boarman and Berry 1995). Ravens consume juvenile tortoises and likely prey upon other less-studied native reptiles. Ravens have also been observed tipping adult tortoises onto their backs and then preying on them. Estimates of tortoise mortality in localized areas due to raven predation range from nine to 72% (BLM 2005; Liebezeit and George 2002).

The life history of the tortoise dictates that even under very favorable conditions, its population may grow at a rate of only 1 to 2% annually, making recovery very slow. Even with the stressors significantly reduced, it would require 200 years for tortoise numbers to increase from ten to 80 animals per square mile (USFWS 1994).

The central strategy for saving the tortoise, pursuant to the 1994 Recovery Plan (and furthered by the 2011 Recovery Plan), has been the establishment of Desert Wildlife Management Areas (DWMAs), designed to provide special protection for the tortoise and other wildlife. The Recovery Plan described the special management actions to be implemented in each DWMA to protect and recover the Mohave Desert Tortoise. However, most of the special management actions have not been implemented or have only been partially implemented. The recovery plan

recommended tortoise barrier fencing be installed within the DWMAs where tortoises are prevalent to keep them from being killed on major highways and roads. In the Joshua Tree DWMA that lies nearly entirely within lands managed by the NPS, barrier fencing has not yet been installed to protect tortoises. The recovery plan also called for reducing raven numbers in DWMAs to reduce predation on young tortoises, but this has been hindered by legal challenges. In addition, the recovery plan called for eliminating livestock grazing to reduce the degradation of tortoise habitat. With some exceptions, cattle grazing continue on lands within the DWMAs and on Mohave Desert Tortoise Critical Habitat in the western Mojave. Another action to protect tortoises that has yet to be implemented is to construct fences in key areas to keep free-roaming dogs out. (K. Berry, pers. com. 2004; USFWS 1994).

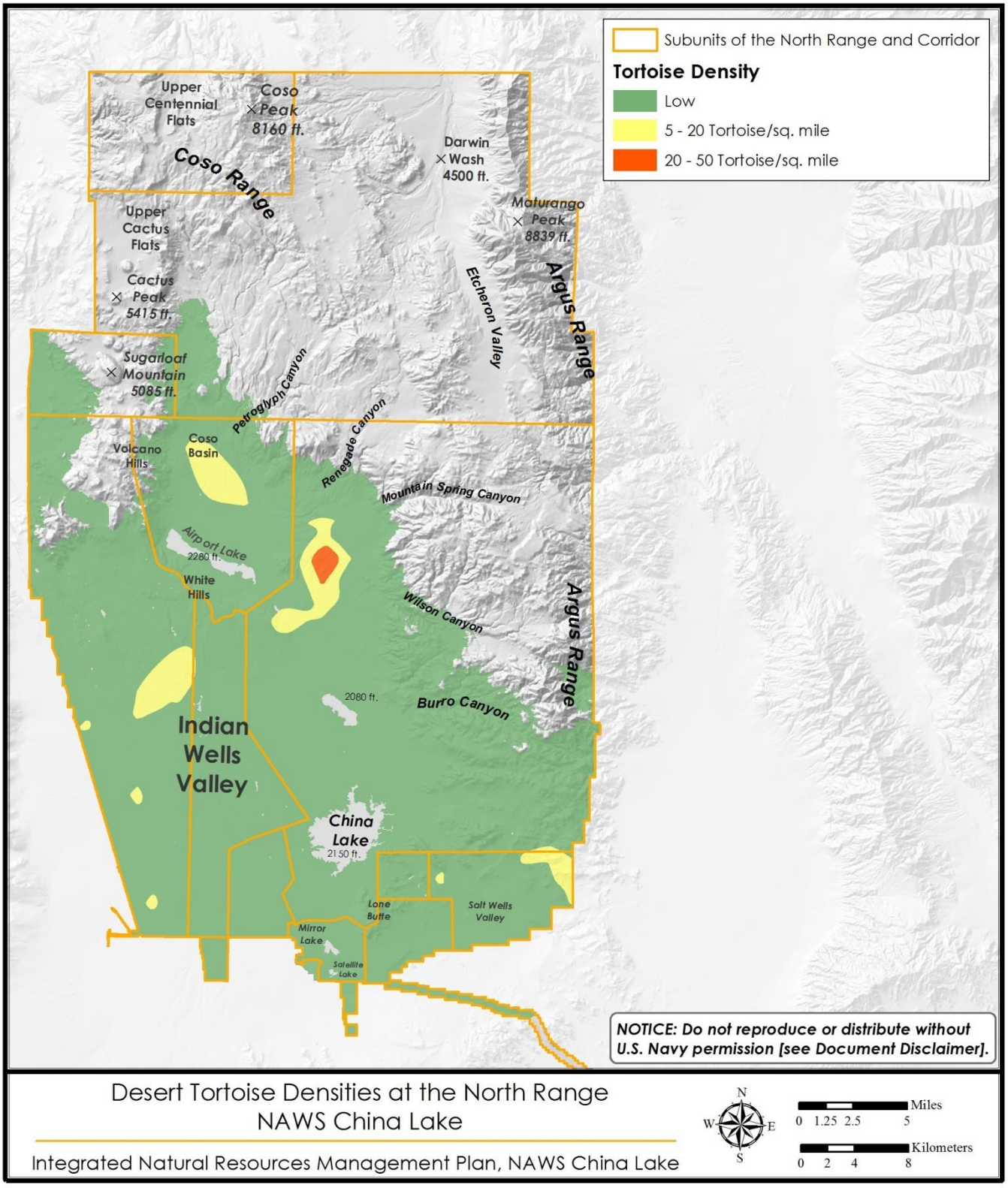
In 2004, the Mohave Desert Tortoise Recovery Plan Assessment Committee, a team of experts assembled by the USFWS, completed a report evaluating the science and implementation of the 1994 Recovery Plan. The committee found that the recovery effort over the last decade was unsuccessful, primarily because the plan was only partially implemented. The lack of coordinated and range-wide tracking of implementation has also prevented success (Tracy et al. 2004; USFWS 2011). Mojave Desert Tortoise populations continue to decline, especially in the West Mojave Recovery Unit. The committee concluded that recovery of the tortoise requires additional research on the animal's demography and population dynamics.

The USFWS has established a new Mohave Desert Tortoise recovery office and recovery implementation work groups. The Desert Manager's Group is providing coordination of federal, state, and local agencies to assist with Mohave Desert Tortoise recovery and management of natural resources.

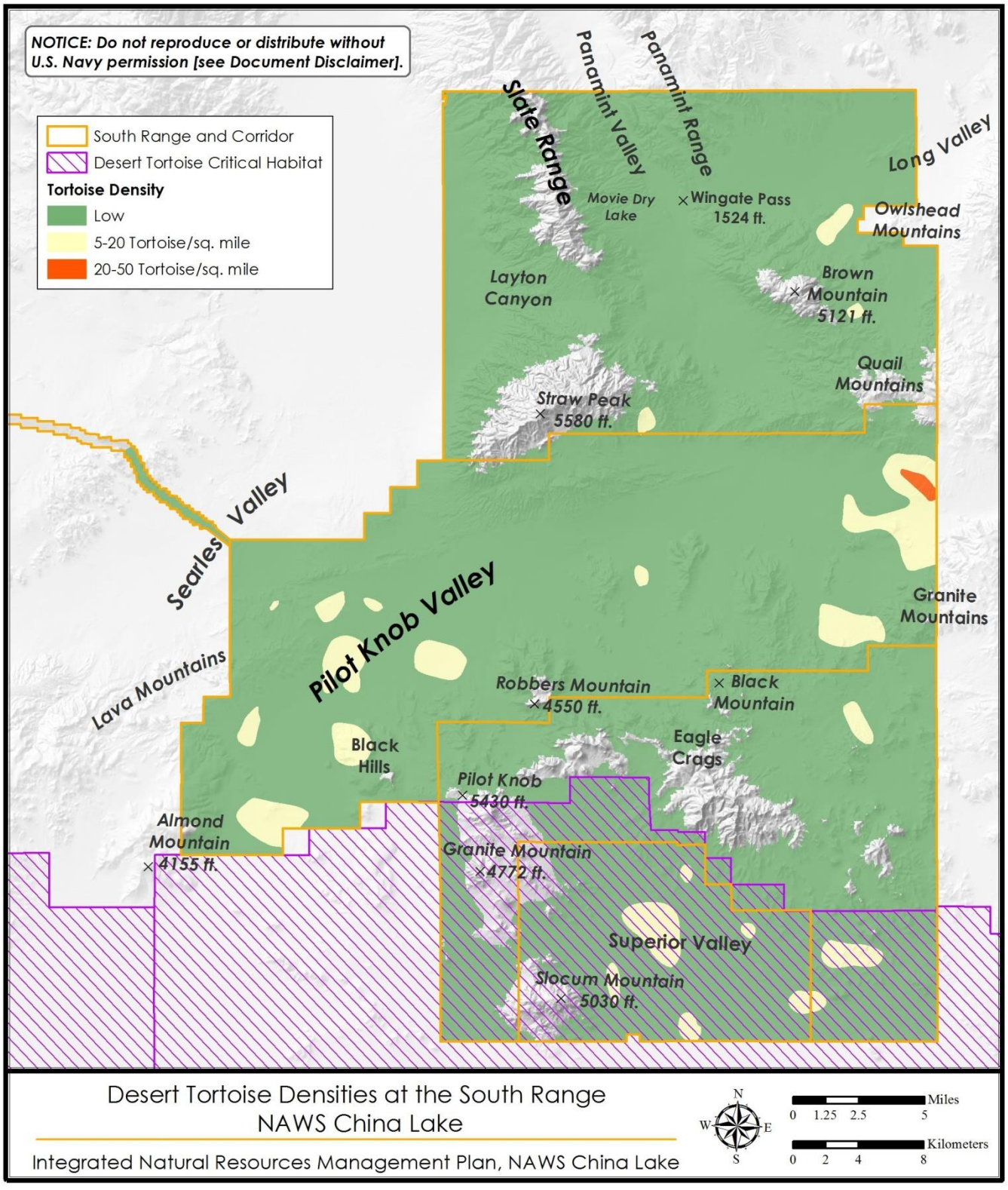
NAWS-CL tortoise populations are within the West Mojave Recovery Unit, which has sustained severe and rapid population declines of up to 10% or more annually since about 1980 (BLM 1988a). In 2008, the USFWS issued a Revised Recovery Plan which emphasizes partnerships to direct and maintain focus on recovery action implementation.

At NAWS-CL, tortoises are found in the Creosote Bush Scrub and Mojave Mixed Woody Scrub (USFWS 1994). A survey of the North and South ranges was conducted by Kiva Biological Consulting in 1990 and 1991 and was repeated again in 2004 by Epsilon Systems. Relative abundance transects conducted in 2004 on the North and South Ranges indicate that tortoises have a wide distribution on NAWS-CL (Kiva Biological Consulting and Epsilon Systems Solutions Inc. 2004). Estimated tortoise densities for the North and South ranges are depicted in Map 3-16 and Map 3-17. Relative abundance transects are conducted utilizing standard 1.5 mile long by 10-yard wide transects usually in a triangle shape. Focused Mojave Desert Tortoise surveys were conducted in seven areas of NAWS-CL in 2010, with one live tortoise found in the North Range and several burrows and other signs found at every site but one (Southern Sierra Research Station 2011). In 2000, USFWS implemented a regional monitoring program within the Mojave Desert Tortoise Ecological Recovery Units. Spring 2001 was the first year that range-wide Line Distance Sampling was implemented. Although useful data were gathered, 2001 was a learning year and Line Distance Sampling techniques were developed, tested and modified for future years. Since 2001, randomly selected line distance transects have been walked annually on NAWS-CL within the Critical Habitat area. This data comprises part of the data set complied for the Superior-Cronese DWMA. This data is maintained by the USFWS.

On the South Range, three regions were estimated to have densities greater than five tortoises per square mile: the west end of Pilot Knob Valley, the east end of Pilot Knob Valley, and Superior Valley. On the North Range, three regions were estimated to have densities greater than five tortoises per square mile: Coso Basin (north and east of Airport Lake), a portion of Baker Range, and the eastern portion of Salt Wells Valley. Surveys in 2005 by Applied Biological Consulting were conducted to verify these high densities. These surveys consisted of 100% coverage of the initial survey areas and resulted in only one area (FAE target area) identified as high density (Applied Biological Consulting 2005).



Map 3-16. Estimated tortoise densities at the North Range, Naval Air Weapons Station China Lake.



Map 3-17. Estimated tortoise density and Critical Habitat at the South Range, Naval Air Weapons Station China Lake.

Current Management, Assessment, and Recommendations

NAWS-CL was issued a programmatic BO by the USFWS in 1992, which was superseded by a 1995 BO after a reconsultation when critical habitat (Refer to Map 3-16) was designated in 1994 (T. Campbell, pers. com. 2012). The 1995 BO was replaced by a BO issued by the USFWS in February of 2013. This document contains guidelines for performing project reviews and provides standard protective and mitigation measures for all tortoise habitat on NAWS-CL. The primary means of eliminating or minimizing potential impacts to desert tortoise (consistent with the previous BO) is through the continued use of avoidance and minimization procedures. As directed by the BO, an annual report is submitted to the USFWS with information on all surveys of new projects completed by NAWS-CL and the resultant impacts to Mohave Desert Tortoise. In addition, the report includes all mitigation actions and their effectiveness. Surveys of areas proposed for use by the Range as well as other areas suspected of supporting (relatively) high densities of tortoises are annually funded. Desert-wide annual Line Distance Sampling surveys are sponsored by the U.S. Geological Survey, BLM, and DoD.

Desert tortoise management will continue to be implemented in accordance with the 2013 BO and successor documents. Specifically:

- Desert tortoise monitoring and surveys are conducted for activities that have the potential to create new habitat disturbance in areas of known or potential tortoise habitat. Activities within existing test and target areas (including area preparation, target set up, actual test or training event, target removal, site cleanup, etc.) would not require biological monitoring.
- Surveys for desert tortoises will be accomplished for any project that occurs in potential habitat. Surveys will be conducted to support the analysis conducted under the National Environmental Policy Act, for new surface disturbing projects not analyzed in the record of decision for the Legislative Environmental Impact Statement for the land withdrawal, and where new disturbance may occur in desert tortoise habitat. Surveys and/or monitoring are generally conducted for pre-project NEPA reviews, final site clearance, or as a post-project support activity in areas with desert tortoise habitat. These pre- and post-project reviews support assessment of resource condition and help ensure compliance with federal regulations (Endangered Species Act) and Navy natural resource management guidance (OPNAVINST 5090.1C).
- To minimize potential impacts to desert tortoises during testing and training activities, operations personnel will conduct a final visual sweep of the target areas or test impact area and remove any tortoises that may be present, in accordance with the applicable BO protective measure.
- All personnel conducting range operations at NAWS-CL are required to receive an EMD awareness briefing on tortoise natural history, critical habitat areas, and the Station's BO requirements.

New guidance for the management of the threat of fires to Mohave Desert Tortoise is provided in the 2013 BO. The USFWS has prescribed the use of “adaptive fire management as a framework that recognizes biological uncertainty, while accepting a mandate to proceed on the basis of the best available scientific knowledge (USFWS 2013).” As part of this practice the Navy will implement the following measures:

- Construct fire-fighting equipment access roads (which may provide some utility as a fire break), on an as needed basis, in support of fire containment capabilities around targets. NAWS-CL would use targets and the existing road network to determine where an access road may be prudent to prevent a fire from spreading into a roadless area. The utility of constructing access roads would be discussed with NAWS-CL’s Fire Department to determine where they would be useful to reduce the risk of fire and/or aid in fire suppression;
- Survey areas identified for access road/firebreak construction prior to ground disturbing-activities to ensure the proposed area is clear of Mohave Desert Tortoises;

- The Navy would evaluate the benefits of constructing and maintaining access roads relative to both the economic and environmental cost. Access roads would be approximately 12 feet (3.6 meters) in width. The Navy would, to the extent practicable, continue to access fire prone locations using areas naturally devoid of vegetation, including natural barriers such as washes and lava flows or existing roadways to minimize maintenance costs and impacts to native species;
- Continue to remove excessive vegetation (vegetation at a density that would sustain a fire) growth within the test and target areas. Vegetation would be removed as needed to minimize the potential for a large, catastrophic wildfire as a result of test and training operations. Environmental staff would monitor the annual vegetation growth and work in conjunction with the Range and Fire Departments to determine when and where vegetation management is warranted;
- Continue the control of invasive species to reduce degradation of plant and wildlife habitats and to reduce the supplemental fuel loading that could increase the frequency and extent of wildfires on NAWS-CL;
- Continue to maintain existing mutual aid fire-fighting agreements with other agencies (BLM, USFS, and County of San Bernardino) and continue to pursue the establishment of new mutual aid agreements;
- Conduct post-fire biological surveys when fires leave target or test impact areas and affect Mohave Desert Tortoise habitat or Critical Habitat, in accordance with the 2013 BO. Surveys will be focused to determine if any tortoises have been injured or killed. Surveys will document the date, time, location, cause, and acreage of the fire. Post-fire surveys will be limited to an annual cumulative acreage not to exceed 2,000 acres (1,000 acres in Mohave Desert Tortoise Critical Habitat and 1,000 acres outside of Mohave Desert Tortoise Critical Habitat). In the event of an unforeseen fire that exceeds this acreage, the Navy will consult with USFWS as soon as possible;
- Continue to evaluate the effectiveness of the NAWS-CL fire management strategy and refine applicable procedures in accordance with data driven lessons learned.

Since ravens have been documented to be a considerable predator of juvenile Mohave Desert Tortoises, an Environmental Assessment proposing methods to reduce raven predation on the Mohave Desert Tortoise and other reptiles and mammals throughout the deserts of southern California was published in 2008 by the USFWS. The proposed action involves a combination of a reduction in the human subsidies to the raven population (in the form of food, water, and nest sites) and removal of ravens that are known predators of Mohave Desert Tortoises (USFWS 2008a). Coordination of raven management with the USFWS, U.S. Department of Agriculture Animal and Plant Health Inspection Service, and BLM should be a key component of Mohave Desert Tortoise management on NAWS-CL.

Constraints to NAWS-CL activities may be considerable since Mohave Desert Tortoise habitat covers 55 to 60% of the total land area. Tortoises are widespread throughout alluvial fans and bajadas in Creosote Bush Scrub and Saltbush Scrub vegetation communities, and many of these areas are heavily used for facilities, infrastructure, and test sites. Mohave Desert Tortoises are an issue for any construction or testing that occurs within this habitat type. However, within the existing BO, survey and mitigation requirements are specified for projects within tortoise habitat, and are routinely implemented.

3.5.8.3 Inyo California Towhee

The Inyo California Towhee is a gray-brown, sparrow-like songbird with an orange vent. It is medium sized, approximately 17–19 centimeters in length, and the sexes are similar in size and color. Towhees mate for life; only when one bird dies does the other pursue another mate. Courtship and nest building begins in March, coinciding with local plant growth and flowering. The first clutches, consisting of two to four eggs, are generally laid in April. If the first clutch fails, a breeding pair may produce a second clutch as late as May or early June.

Only the female incubates eggs, but both parents brood and feed the young. Eggs hatch after 14 days of incubation, and the young fledge eight days after hatching (USFWS 1998).

Inyo California Towhees are essentially non-migratory (Childs 1968; LaBerteaux 1989); however, during extreme winter weather they may move altitudinally. Territories are centered around desert riparian vegetation, but range into adjacent upland plant communities such as Mojave Creosote Bush Scrub, Mojave Mixed Woody Scrub, Blackbrush Scrub, or Big Sagebrush Scrub (Holland 1986) with or without a Joshua tree overstory (LaBerteaux 1989, 1994).

While California Towhees (*Melozone crissali*) are widespread across western California, the Inyo population is confined to a very limited area in the Mojave Desert. Its preferred canyon riparian habitat has been historically altered by cattle, horses, burros, mining, and altered fire regimes, and could be further adversely impacted by future land use changes (USFWS 1987). For these reasons, the Inyo California Towhee was federally listed as threatened in 1987 and state listed as endangered in 1980 (USFWS 1987; California Department of Fish and Game 1980). Critical habitat was designated in 1987 (USFWS 1987) (Map 3-17) and a recovery plan was completed by the USFWS in April 1998 (USFWS 1998). In October 2008, the USFWS published a five-year review with recommendations for delisting the Inyo California Towhee (USFWS 2008b).

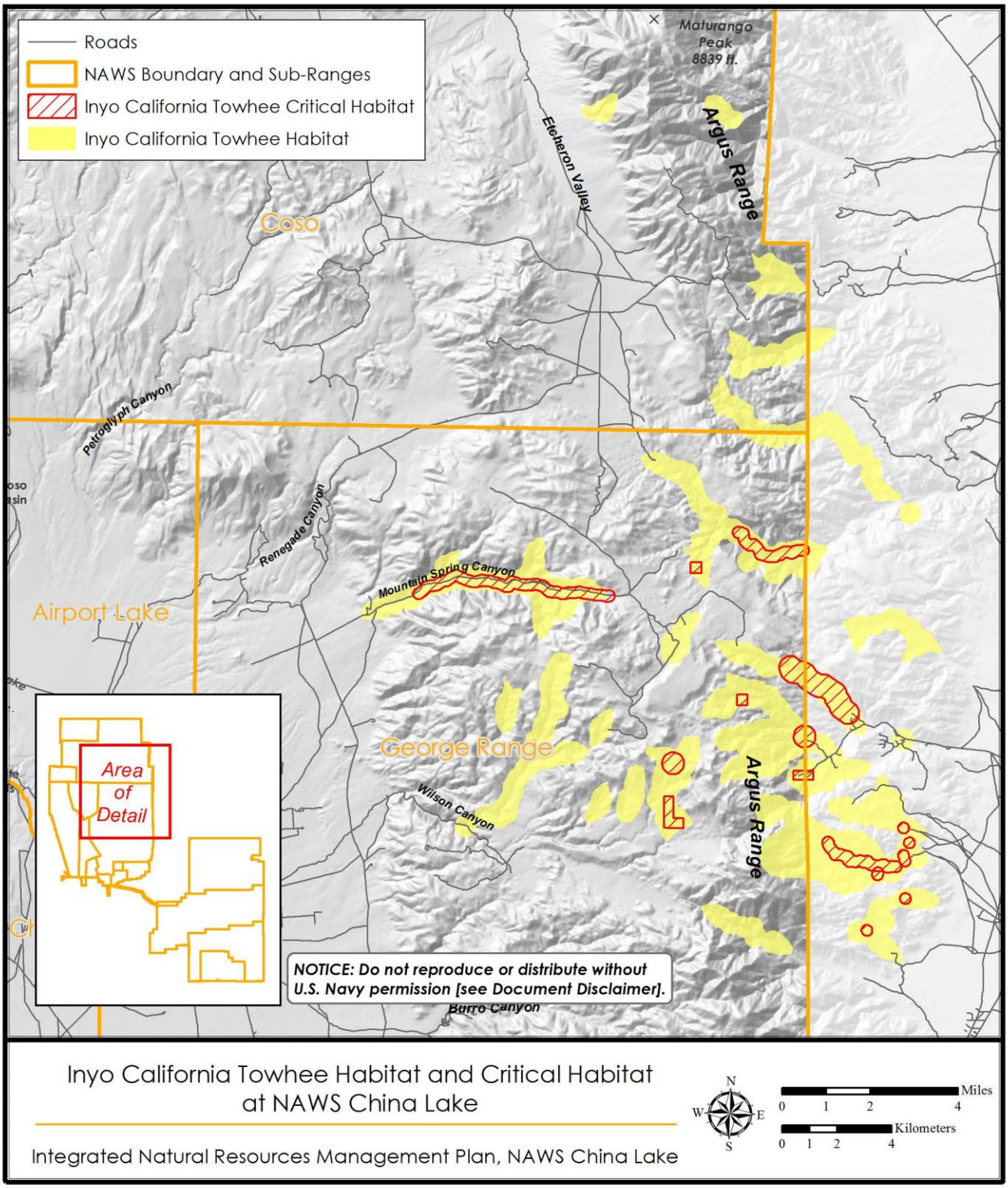
Configuration of habitat is important in territory selection (Cord and Jehl 1979). Territories of single pairs of towhees in riparian areas ranged from 3,750 square feet at Indian Joe Spring to 30,000 square feet at Ruby Spring. Highest densities of towhee pairs are found in linear habitats, where a pair requires a minimum of 4,000 square feet and a minimum of 450 linear feet of riparian habitat with linear vegetation (Cord and Jehl 1979). Laabs et al. (1992) estimated that a pair of towhees occupies an average 487 feet of linear riparian habitat. The size of territories usually ranges from 24.7 to 61.8 acres.

Until recently, the total known range of the Inyo California Towhee was thought to lie within a 14-mile diameter circle in the southern Argus Mountains, randomly distributed in riparian habitat between 2,680 and 5,630 feet above mean sea level, ranging from Indian Joe Canyon in the south to Mountain Springs Canyon and Water Canyon in the north.

Cord and Jehl (1979) conducted a range-wide survey in the spring and fall of 1978, LaBerteaux (1989) conducted population and behavioral surveys from 1984 to 1986 for a Master of Science thesis, and Laabs et al. (1992) conducted a survey in the Great Falls Basin Area of Critical Environmental Concern in spring 1992. Despite these efforts, there remained many nearby potential habitat areas that had not been surveyed. Surveys in 1998 expanded the known range of the towhee (primarily to the north) by about nine miles, closely associated with open water. LaBerteaux (1994) estimates that towhees are in about 32 miles of canyons, 22 miles (68%) of which occur on NAWS-CL. Remaining habitat is located on BLM and state lands (Indian Joe Canyon).

Refer to Map 3-18 for a depiction of habitat occupied by Inyo California Towhee.

Previously, numbers of Inyo California Towhees had been estimated between 138 (Cord and Jehl 1979) and 180 adults (LaBerteaux 1994). LaBerteaux estimated that 69 (38%) towhees were on BLM and state land and 111 (62%) were on NAWS-CL. In 1998, a survey was conducted on NAWS-CL, BLM, and state lands covering most of the potential habitat in the southern Argus Mountains (LaBerteaux and Garlinger 1998). These surveys revealed a total population of 640 adult towhees with an estimated 317 pairs. LaBerteaux followed up with population censuses in 2004 (on BLM land) and 2007 (on NAWS-CL), which resulted in a total population count between 706 and 741 adults (USFWS 2008b).



Map 3-18. Inyo California Towhee habitat and Critical Habitat at Naval Air Weapons Station China Lake. See Map 5-2 for the locations of springs and towhee observations. This map is comprised of a combination of field data gathered by experts and known vegetation associations based on the best available vegetation maps.

Previous research indicates that almost all towhee nest sites were confined to willows, cottonwoods, and desert olives. It appears that one of the primary reasons that towhees have expanded their range is due to the removal of cattle and extensive ongoing efforts to remove feral burros from the riparian habitats throughout the Argus Range. It further appears that towhees can utilize marginal habitats. Thus, riparian areas that do not presently support towhees may serve as refugia for unpaired individuals or for pairs that do not have territories in higher quality habitat. These marginal sites may benefit the overall stability and long-term viability of the population.

Current Management, Assessment, and Recommendations

The Inyo California Towhee Recovery Plan identifies the protection and management of towhee habitat, and guides NAWS-CL management of towhees. Surveys of portions of known and potential towhee habitats is an annually funded effort designed to assess population levels, breeding success, dispersal of young, and effects of range fires.

On NAWS-CL, the primary threat to Inyo California Towhees is habitat loss and degradation due to overuse of riparian and nearby upland areas by feral horses and, to a lesser extent, by feral burros. Since 1992, removal efforts have been jointly funded with the BLM and have been successful at maintaining numbers at relatively low levels. Most springs and riparian habitats in towhee range are in fair to good condition on NAWS-CL, with the exception of a few that continue to be overused by feral burros and horses (T. Campbell, pers. com. 2012).

The majority of adverse impacts to towhee habitats occur on BLM lands. Cord and Jehl (1979) and Laabs et al. (1992) indicate that several springs which either supported towhees or had riparian vegetation that could have supported towhees were degraded by human (pre-Navy mining and grazing activities) and/or burro use. The BLM is unable to fund routine (annual) burro removal in towhee habitat. The Navy will continue limited removal in these areas as funding is made available. In addition, several springs have been severely degraded by human use either by destruction of riparian habitat or alteration of water flows by piping water for offsite use.

Surveys of riparian habitat at known and potential towhee locations should be performed a minimum of every four years (with at least three surveys to be conducted every 12 years), preferably in conjunction with surveys on BLM lands.

Constraints to NAWS-CL activities due to the presence of towhees will probably be minimal. Paving Mountain Springs Canyon Road greatly decreased erosion of riparian areas and nearly eliminated the need to routinely maintain the roadway, which typically would wash out after even minor rainfall events. Towhee strikes by motor vehicles, which can now travel through the canyon at a much higher rate of speed, have not yet been recorded. Towhees are riparian obligates; thus, they are dependent on riparian vegetation which is dependent on surface or subsurface water. Any proposal to divert or modify these water flows would require significant evaluation with respect to potential impacts to the towhee.

3.5.8.4 Other Avian Species

Neotropical Migrants

The Least Bell's Vireo is a rare migrant in the IWV, while the status of the southwestern subspecies of the Willow Flycatcher (*Empidonax traillii*) on the base is unclear. Willow Flycatchers have been noted commonly during migration, but whether these observations refer to the federally listed *extimus* subspecies or one of the other two subspecies that occur in California is unknown. The *extimus* subspecies does breed on the south fork of the Kern River less than 25 miles from the western border of NAWS-CL. No breeding Willow Flycatchers or Least Bell's Vireo have been documented on the Station.

Western Snowy Plover

Western Snowy Plovers (*Charadrius alexandrinus nivosus*) are common during spring at the wastewater treatment ponds, but are not considered by the USFWS to be members of the federally Pacific coastal population. However, color-banded Western Snowy Plovers from the Pacific Coast population have been observed in the southern San Joaquin Valley and may wander to NAWS-CL. It is possible that members of the non-listed populations of Western Snowy Plovers nest at the wastewater treatment ponds or at G1 Seep, where flight-capable juveniles (fledged) have been observed. However, no observations of nests or of unfledged juveniles have occurred at NAWS-CL, which likely indicates that breeding does not occur on the Station.

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4.0 Natural Resources Management Strategy and Prescriptions

This chapter describes management strategies for Naval Air Weapons Station China Lake's natural resources viewed in an ecosystem context. By looking at the physical, chemical, and biological roots of the natural resources values described in Chapter 3 with an ecosystem approach, conservation measures can be better applied.

4.1 Managing with an Ecosystem Approach

Related Sections

3.1 Ecoregional Setting
3.4 Vegetation Communities and Wildlife Habitat
5.1 Supporting Sustainability of the Military Mission in the Natural Environment
5.1.1 Integrated Military Mission and Sustainable Land Use Decisions
5.2 Adapting to Regional Growth and Climate Change
5.7 Beneficial Partnerships and Collaborative Planning
5.10 Integrating Other Internal Plans
5.12 Natural Resources Information Management and Reporting

Summary of Issues for Ecosystem Management at NAWS-CL

The U.S. Department of the Navy (Navy) is required to manage its lands using an ecosystem-based approach. Naval Air Weapons Station China Lake's (NAWS-CL) natural resources program has already adopted many elements of an ecosystem approach (see Section 3.1 for examples). Past management has focused on a single high-risk species, such as the Mohave Desert Tortoise (*Gopherus agassizii*), and used that species as an umbrella to protect other similar species in the environment. The annual metrics meeting with partner agencies addresses general ecosystem health and the status of management indicator species. To conserve ecosystem integrity, all of the resources, processes, and interdependencies that may be affected need to be considered.

Strategy for Ecosystem Management

Project Summary	Legal Driver
Implement a coordinated monitoring program that can be implemented cost-effectively over time and that facilitates reporting on natural resources conditions to other areas and annual Integrated Natural Resources Management Plan program metrics questions. Set habitat objectives based on ecological sites, ecosystem function indicators, and focus species. Do so in a manner that can be scaled up to the work of other agencies. Map subregions for natural resources management, data summary, effects analysis, and reporting at NAWS-CL based on relatively uniform military use and/or ecological subregions.	Sikes Act (as amended), Executive Order 13186 on Migratory Birds, Executive Order 13112 on Invasive Species, Department of Defense guidance on ecosystem approach, Department of Defense Interagency Memorandum of Understanding on federal data standards, Navy guidance on annual Integrated Natural Resources Management Plan program metrics, Department of Defense Instruction 4715.03, Naval Operations Instruction 5090.1C CH-1, Navy 2006a.

Objectives and Guidelines for Ecosystem Management

Objective: *Maintain the natural health and integrity of the NAWS-CL ecosystem.*

Metric: *Outside of target, test, and other operational areas, native vegetation composition, structure, and diversity are maintained or returned to native characteristics whenever possible. Hydrologic systems provide adequate water resources. Fire-regimes follow historical patterns as closely as possible.*

I. As a first priority, address long-term threats to the stability of the natural environment.

A. Address long-term, ecosystem-level, primary threats and stresses to wildlife and habitat.

1. Climate change (see Section 5.2)
2. Growth and development (see Section 5.2)
3. Ground water management conflicts (see Section 4.2.1)
4. Non-native species, especially as they affect fire regime (see Section 4.7.3)

Setting priorities and reconciling conflicts are guiding principles of ecosystem management for federal agencies because of scarce funding.

B. Wind erosion

C. Habitat fragmentation

1. Avoid the proliferation of roads.

II. Maintain and improve the sustainability and integrity of the ecosystem at both small and large scales.

A. The U.S. Department of Defense (DoD) ecosystem management mandate is accomplished on the Station by applying principles of sustainable use at varying scales including regional, geographical (i.e., watershed), species specific, and habitat based.

B. Management Units are useful to provide a more refined scale for making natural resources management decisions.

1. The following ecoregions on NAWS-CL may be considered large-scale management units, but may be broken down further depending on management needs:
   a. Indian Wells Valley (West Mojave ecoregion)
   b. Coso Range, Etcherron Valley, etc. (North Mojave/Great Basin Ecotone Hills and Valleys of the North Range)
   c. South Slate Range, south Panamint Range, Layton Canyon, Long Valley (North Mojave/Great Basin Ecotone of the South Range)
   d. Pilot Knob Valley and associated hills, Searles Valley (Central Mojave ecoregion)
   e. Superior Valley and associated hills (Central Mojave ecoregion)

2. Adopt a map of priority management areas to minimize conflict with the military mission. Existing management areas include the Mohave Desert Tortoise Habitat Management Area (DTHMA) and designated Critical Habitat for the Inyo California Towhee (*Pipilo crissalis eremophilus*) and Mohave tui chub (*Siphateles bicolor mohavensis*). Others are identified in Section 4.6.

C. Integrate the ecosystem approach of this Integrated Natural Resources Management Plan (INRMP) with Station plans and programs, including the Comprehensive Land Use Management Plan, Integrated Pest Management Plan, Bird/Wildlife Aircraft Strike Hazard (BASH) Prevention Plan, and others. See also Section 5.10.

D. Improve the classification of vegetation alliances, based on floristic methods used by the Mojave Desert Ecosystem Program (MDEP) (Thomas et al. 2004), and previously implemented in 1996-1997 at NAWS-CL (Silverman 1997). See also Section 4.5.

E. Develop quantitative assessment benchmarks for ecosystems and habitats.

1. Habitats should sustain biodiversity and Critical Habitat should be able to sustain viable populations of those species for which it was designated. Assessment criteria could include:
   a. Vegetation composition (relative abundance of species)
   b. Vegetation structure (life forms, cover, height, and age classes) at potential or recoverable condition
   c. Vegetation distribution (patchiness, corridors)
   d. Vegetation productivity
2. Maintain habitat productivity and soil stability.
3. Avoid or minimize disturbance, as compatible with mission requirements. Use ecological site descriptions to establish objectives for the condition of habitats and their functions.

F. Use focus species to scale analysis to ensure management decisions are achieving the desired outcome (see III below).

III. Facilitate the shift from single species to multiple species conservation. Along with the soil/vegetation health monitoring update to the Range Assessment Program, the INRMP proposes to monitor a set of "ecological indicators" and certain target species to detect trends and provide management cues.

A. Adopt a set of management focus species by modifying those already identified by NAWS-CL for voluntary consideration during land use planning (Navy 2000a). These include Special Status Species and the federally listed wildlife and 39 plant species with special status (California Native Plant Society listed as threatened) that occur or have the potential to occur at NAWS-CL (see Appendix J and Section 4.7).

Using benchmarks, such as the status of focus species, to monitor and evaluate outcomes is a principle of ecosystem management for federal agencies (DoD Instruction 4715.03).

1. Monitor species that may be regional indicators of climate change (i.e., sagebrush [*Artemesia* sp.] and pinyon pine [*Pinus monophylla*]) (see Section 5.2).
2. Monitor species that may decline or increase with altered fire regime (see Section 4.4).
3. Monitor the status of the Townsend's big-eared bat (*Corynorhinus townsendii*).
4. Consider beneficial pollinators in ecosystem management (see Section 4.7).
5. Monitor the following avian species annually on permanently established transects in the appropriate habitat.
   a. Mountain Quail (*Oreortyx pictus*), due to possible competition with Chukar (*Alectoris chukar*).

Supporting sustainable uses is a guiding principle of ecosystem management for federal agencies (DoD Instruction 4715.03).

b. Of the 14 species from the Partners in Flight (PIF) Desert Bird Conservation Plan (primarily selected based on breeding range and the need for successional stages of vegetation), these nine are the best representatives for NAWS-CL to use for indicators due to range: Burrowing Owl (*Athene cunicularia*), Costa's Hummingbird (*Calypte costae*), Ladder-backed Woodpecker (*Picoides scalaris*), Ash-throated Flycatcher (*Myiarchus cinerascens*), Verdin (*Auriparus flaviceps*), LeConte's Thrasher (*Toxostoma lecontei*), Phainopepla (*Phainopepla nitens*), Black-throated Sparrow (*Amphispiza bilineata*), and Scott's Oriole (*Icterus parisorum*).

c. For coniferous habitat, monitor the status of the Pinyon Jay (*Gynnorhinus cyanocephalus*), Bushtit (*Psaltriparus minimus*), and Black-throated Gray Warbler (*Setophaga nigrescens*).

IV. Protect basic components of the ecosystem's sustainability and resilience to disturbance.

A. Plan for and anticipate recurring disturbance (see Section 4.3).

B. Control invasive plant species through early detection, maintenance of healthy soils, diverse native plant communities, intact hydrology, and management of an appropriate fire regime (see Section 4.7.3).

DoD shall restore or rehabilitate altered or degraded landscapes and associated habitats to promote native ecosystems and land sustainability, when such action is practicable and does not conflict with the military mission or capabilities consistent with Executive Order 13514 "Federal Leadership in Environmental, Energy, and Economic Performance" 08 October 2009.

V. Develop and maintain partnerships to manage ecosystems that cross boundaries. Ecosystem boundaries are rarely synonymous with property ownership. NAWS-CL will continue to form cooperative partnerships with agencies and nearby communities, as appropriate, and take part in public awareness initiatives in an effort to manage ecosystems more successfully.

A. Participate in interagency partnering efforts, which include the Navy, Death Valley National Park, and the Bureau of Land Management (BLM) Ridgecrest office.

B. Support regional partnering efforts to protect ecosystem values, while providing for military mission requirements.

C. Use the best available scientific information in decision-making through data sharing with partner agencies such, as the Desert Manager's Group and the MDEP.

VI. Improve the sustainability of energy and water use as part of an Environmental Management System, as required under the Executive Order (EO) on Federal Leadership in Environmental, Energy, and Economic Performance [05 October 2009]. See Section 5.1.

4.2 Water Resources

4.2.1 Surface Water Resources, Springs, and Seeps

Related Sections

3.3.4 Water Resources
3.3.4.1 Watersheds and Surface Water
3.3.4.2 Springs and Seeps
3.3.4.3 Floodplains and Flooding
Appendix F: Spring Specific Information

Groundwater use, water use efficiency, and surface waters developed for use at NAWS-CL are addressed in Chapters 2 and 5. Water, as a natural resource, including groundwater that comes to the surface at seeps and springs, is addressed here. (See also Appendix F for a summary of documentation on individual springs.)

White House Office on Environmental Policy, "Protecting America's Wetlands: A Fair, Flexible, and Effective Approach," 24 August 1993.

Summary of Management Issues for Surface Water Resources, Springs, and Seeps

The protection and enhancement of surface water resources continues to be a major focus of natural resources management. There are more than 120 documented springs or other surface water features known on NAWS-CL. Management of water resources at NAWS-CL involves the identification, monitoring, permitting, use, maintenance, protection, and enhancement of surface waters and groundwater. Some springs have been fenced, and many have been surveyed for invertebrate and vertebrate species, water quality, and other attributes. While geologic and hydrologic mapping of some springs has been achieved, more long-term monitoring (including water quality) is needed. Desert springs, often the sole source of water for wildlife, support wetland and wetland/upland transition ecosystems, including rare and endemic species. Some springs could be developed for firefighting and other uses. Regionally consistent methods of monitoring would allow comparison locally and regionally.

EO 11990: Protection of Wetlands directs all federal agencies to "take action to minimize the destruction, loss, or degradation of wetlands, and to preserve and enhance the natural and beneficial values of wetlands." Under this EO, agencies are also required to consider "factors relevant to a proposal's effect on the survival and quality of the wetlands." One such factor is the "...maintenance of natural systems, including conservation and long term productivity of existing flora and fauna, species and habitat diversity and stability, hydrologic utility, fish, wildlife, timber, and food and fiber resources..."

Although about 25 of these water resources have been protected, most continue to be vulnerable to feral horse (*Equus caballus*) and burro (*Equus asinus*) grazing and trampling. The benefit of current fencing on the springs and wildlife could be improved. Limited monitoring is currently specifically designed to answer these questions and to ensure that fenced-off springs do not become refuges for the invasive tamarisk (*Tamarix* spp.). In order to understand these systems so that work is appropriate and properly prioritized, managers are challenged to evaluate the connections between grazing impacts and other environmental controls on the springs.

Management Strategy for Surface Water Resources

Project Summary	Legal Driver
Develop an integrated spring monitoring, enhancement, and adaptive management plan. Update and collect additional baseline data.	Endangered Species Act, EOs on Migratory Birds, Invasive Species, Sustainability

Objectives and Guidelines for Surface Water Resources, Springs, and Seeps

Objective: *Protect and enhance springs, seeps, other water sources, and associated adjacent habitats.*

Metric: *Surface water resources, springs, and seeps are protected from degradation by non-native species. Tamarisk occurrence is reduced and exclusion fences are installed to prevent damage caused by horses and burros. Water quality and flow rate are sufficient to provide for native vegetation, wildlife use, and firefighting capability as needed.*

I. Inventory, protect, and enhance springs, seeps, other water sources, and associated habitats as described in the Comprehensive Land Use Management Plan.

II. Ensure availability of adequate water to meet natural resources management objectives.

A. Maintain or promote the desired natural plant community and biodiversity.

1. Control invasive species.

B. Continue to fence and maintain fences without damaging the habitat.

1. Maintain the fence at Birchum Spring and other springs within known and potential range of the Inyo California Towhee.
2. Continue to fence water sources and riparian vegetation with bighorn sheep safe fencing made of panels or wire, spaced such that mule deer (*Odocoileus hemionus*) and bighorn sheep (*Ovis canadensis*) have access to water sources but feral burros and horses do not. Provide water sources outside fenced areas for feral animals, as necessary.
3. Fenced areas will be monitored as practicable. Any damage will be repaired as time and resources permit.

III. Continue the long-term program to characterize springs, seeps, and other water sources as practicable.

A. Document which playas contain fairy, brine, and tadpole shrimp.

B. Springs with potential to support the Panamint Alligator Lizard (*Elgaria panamintina*), Slender Salamanders (*Batrachoseps* sp.), unique vegetation, or unique invertebrates should have high survey priority.

4.2.2 Water Quality

Related Sections

3.3.6 Water Quality
3.3.7 Geothermal Water

Summary of Management Issues for Water Quality

The Environmental Management Division's (EMD) ongoing water quality efforts have characterized certain water quality parameters of surface water resources. However, the connections between water and other natural resources, such as fish and wildlife, and indicators of surface water quality need to be described and quantified.

Management Strategy for Water Quality

Objectives and Guidelines for Water Quality

Objective: *Maintain the quality of waters in compliance with state and/or federal water quality standards.*

Metric: *Surface and sub-surface water quality meets state and federal standards.*

I. The work characterizing the water at springs should continue as part of an integrated springs management plan with the natural resources program (see Section 4.2.1).

4.2.3 Floodplains

Related Sections

3.3.4.3 Floodplains and Flooding

Summary of Management Issues for Floodplains

EO 11988 (24 May 1977) requires agencies to avoid adverse impacts associated with the occupancy and modification of floodplains.

The Federal Emergency Management Agency (FEMA) regulates floodplains. Flood zones are geographic areas that FEMA defined according to varying levels of flood risk. These zones are depicted on a community's Flood Insurance Rate map or Flood Hazardous Boundary map. Each zone reflects the severity or type of flooding in the area (FEMA 2009). See Map 4-1 for the floodplain map available from FEMA for the Ridgecrest area.

Naval Operations Instruction (OPNAVINST) 5090.1C CH-1 states that the Navy will avoid direct or indirect development of floodplains and will restore and preserve the natural and beneficial values served by floodplains. Potential effects of actions in floodplains must be evaluated and early opportunities for public review of proposals in floodplains must be provided. This includes any development that may obstruct, divert, or retard flood flows or that may affect flood elevations and flood protection. While NAWS-CL developed its flood-control projects in the early 1980s with major diversion ditch construction, flood avoidance measures remain a requirement.

Management Strategy for Floodplains

Project Summary	Legal Driver
Assist Navy planners in creating a flood hazardous boundary map so that the severity and type of flooding may be predicted and impacts to floodplains may be avoided. Identify any special or unique flora and fauna associated with floodplains to identify the natural and beneficial functions provided by floodplains.	EO 11988

Objective and Guidelines for Floodplains

Objective: *Avoid direct or indirect effects on floodplains and restore and preserve the natural and beneficial values served by floodplains.*

Metric: *Support the development of a flood hazards boundary map. Through the National Environmental Policy Act (NEPA) process, minimize adverse effects on floodplains.*

EO 11988 states that the NEPA determination of effect on floodplains shall be made according to a Department of Housing and Urban Development floodplain map or a more detailed map of an area, if available.

I. Preserve and restore the natural and beneficial values provided by floodplains.

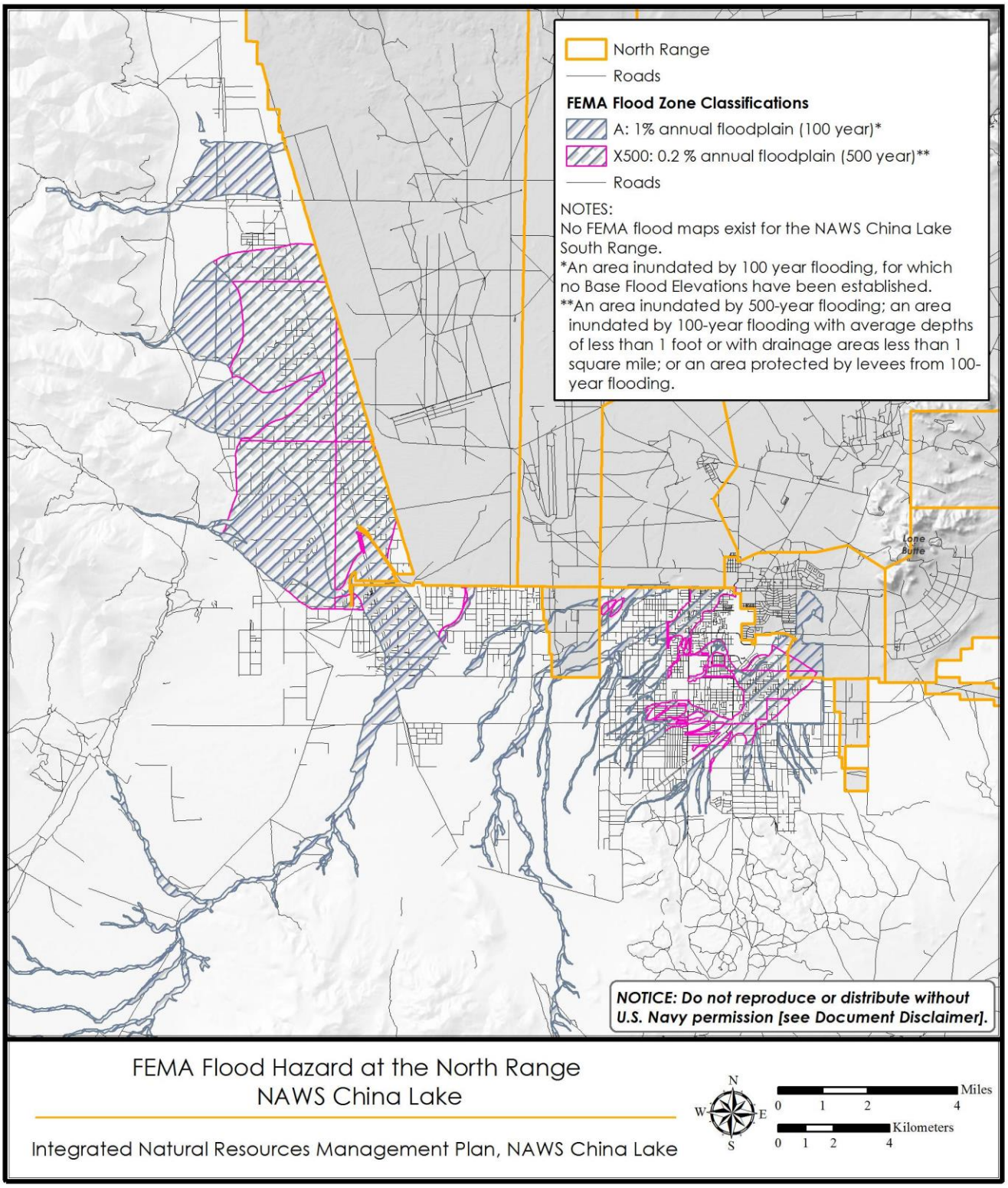
II. Evaluate through the NEPA and site approval process the potential effects of actions in floodplains. This includes any development in a floodway and floodplain that may obstruct, divert, or retard flood flows or that may affect flood elevations and flood protection.

Adverse impacts on floodplains shall be avoided, when possible. The direct or indirect support of floodplain development shall be avoided where there is a practicable alternative in accordance with EO 11988.

III. The Navy should be involved in discussions with the City of Ridgecrest to assist the City in developing its flood management plan.

IV. Determine whether surface waterway connections to the Owens River, Amargosa River or Mojave River in NAWS-CL watersheds that form part of those drainages are sufficient to deem these areas jurisdictional waters of the U.S. (see Section 4.6.2).

- **A.** Determine whether Clean Water Act (CWA) Section 404/401 permit requirements could apply in these drainage areas.



Map 4-1. Federal Emergency Management Agency floodplain map for the Ridgecrest vicinity. No known floodplain maps are available for Naval Air Weapons Station China Lake.

4.3 Soil Resources

Related Sections

3.3.3 Soils and Soil Condition
3.3.3.1 General Soil Characteristics
3.3.3.2 Soil Classification and Mapping
Appendix K: Soil Descriptions

Summary of Management Issues for Soil Resources

Federal agencies must manage lands to control and prevent soil erosion by implementing soil conservation measures. The Sikes Act (as amended), CWA, Clean Air Act (CAA), DoD Instruction (DoDI) 4715.03, and OPNAVINST 5090.1C CH-1 require Best Management Practices (BMPs) for soil and water resources on federal lands; and the CAA regulations restrict particulate matter emissions that result from soil disturbance.

The guidance for INRMPs (Navy 2006a) requires the reporting of soils inventory at least to the association level; this is provided in Chapter 3 and Appendix K. Steep slopes and erodible soils are also required to be identified (OPNAVINST 5090.1C CH-1). Soils mapping is a function of the federal government under the Natural Resources Conservation Service, but characterization of soils also occurs through vegetation classification and mapping protocols, wildlife habitat values mapping, and in engineering studies associated with construction projects.

DoD components shall comply with applicable nonpoint source laws respecting the control and abatement of water pollution in accordance with section 1323 of Title 33 U.S. Code. DoD shall incorporate the best management practices for runoff for the State in which the installation is located to minimize nonpoint sources of water pollution. DoD shall prevent and control soil erosion, and implement soil conservation measures in accordance with 590a-590q 3 of Title 16 U.S. Code (also known as "Soil Conservation") (DoDI 4715.03).

Management Strategy for Soil Resources

Project Summary	Legal Driver
Continue to implement the best management practices and ensure compatibility with local agencies for wind and water erosion control, such as from the three counties (within Station boundaries) and the City of Ridgecrest, the U.S. Department of Agriculture Agricultural Research Service, and other federal agencies; evaluate for use at NAWS-CL in a Wind and Water Erosion Best Practice Manual.	Sikes Act (as amended), CAA, CWA
Consider the long-term development of a Geographic Information System layer of ecological sites useful for land management through the collection of soil data points and field assessments, based on standards from the Natural Resources Conservation Service and the U.S. Department of the Interior.	Sikes Act(as amended)

Objective and Guidelines for Soil Resources

Objective: *Conserve soil productivity, nutrient functioning, water quality, air quality, and wildlife habitat through effective implementation of BMPs.*

Metric: *Federal and state guidelines are followed to minimize soil erosion at high use areas and construction sites. Vehicle traffic is limited to approved roads or construction sites to minimize soil erosion and compaction. Proper revegetation strategies minimize soil loss and promote the regrowth of a robust plant community.*

I. Soil conservation shall be considered in all site feasibility studies, project planning, and construction. Appropriate conservation work (BMPs) and associated funding shall be included in project proposals and construction contracts and specifications.

A. Compile and evaluate local agency specifications for wind and water erosion control (BLM, U.S. Department of Agriculture [USDA], City of Ridgecrest, and county guidelines) for use at NAWS-CL. The measures would be used for NEPA planning, scopes of work and construction specifications, and a soil erosion correction plan, if needed.

B. As per OPNAVINST 5090.1C CH-1, ensure incorporation of BMPs in the preliminary engineering, design, and construction of facilities involving ground disturbance.

1. Use the specific guidance for selecting BMPs as presented in the California Storm Water Best Management Practices Handbook (State of California Department of Transportation 2000) and wind erosion/dust control measures (USDA Agricultural Research Service).

DoD shall incorporate the best management practices for runoff for the State in which the installation is located to minimize nonpoint sources of water pollution (DoDI 4715.03).

   a. Site disturbance should be minimized and naturally established plants should be protected to the extent practicable.

   b. Typically, a restoration project must stabilize site disturbance, control erosion, repair soil damage, and return plants to the site.

   c. Continue to minimize disturbance by locating staging areas in disturbed or previously disturbed areas.

C. The EMD should monitor effectiveness of BMPs for use in NEPA planning.

II. Provide guidance for routine maintenance activities. Restoration work should be prioritized based on the following criteria:

A. Safety or security, as for emergency or military vehicle access on secondary roads;

B. Potential for affecting high-value facilities or areas crucial to the military mission;

C. Likelihood of affecting a federally listed species;

D. Volume of potential soil or habitat loss due to environmental conditions such as rain or wind;

E. Cost-effectiveness of the repair or control measure.

III. Ensure margins of springs, streams, and seeps have adequate stability.

A. Ensure appropriate native plant cover and diversity and maintain the native vegetation cover condition.

B. The soil indicator for stream banks is bank stability. For springs it is stability of the margins and lack of soil compaction.

1. Maintain or promote residual vegetation for stream flow, energy dissipation, sediment capture, groundwater recharge, and bank stability.

   a. Channels of desert washes should have natural width/depth ratio, channel roughness, sinuosity, bank stability, plant cover (amount, spacing, life form), and large woody debris. Riparian vegetation should have structural and species diversity characteristic of the stage of drainage channel succession in order to provide forage and cover; to capture sediment; and to capture, retain, and safely release water (watershed function).

   b. Springs and seeps are functioning properly when adequate vegetation is present to facilitate water retention, filtering, and release. Spring vegetation should have structural and species diversity.

IV. Stabilize disturbed sites.

A. Use appropriate native erosion control plants or protective materials.

1. Consider biological crust and mycorrhizae to be indicators of successful larger restoration area stabilization.
2. Consider the needs of plants dependent on specific pollinators while planning restoration.

B. Ripping compacted soils for decompaction, followed by constructing divets or depressions that naturally collect water, has been found to be a cost-effective way to initiate self-recovery of roads and highly compacted trails.

V. Locally severe sources of fugitive dust may need to be treated. Fugitive dust is particulate matter that is suspended in the air by wind or other disturbance and does not come from a point source.

A. Dust control BMPs generally stabilize exposed surfaces and minimize activities that suspend or track dust particles.

1. Prevent dust emissions during construction activities by:
   a. Confining the surface area to be disturbed;
   b. Limiting vehicle traffic to 15 miles per hour;
   c. Controlling the number and activity of vehicles on a site at any given time;
   d. Scheduling construction activities to minimize exposed areas;
   e. Stabilizing disturbed soils using vegetation, mulching, spray-on adhesives, calcium chloride, or stone/gravel layering;
   f. Stabilizing key access points prior to construction;
   g. Directing most construction traffic to stabilized road surfaces.
2. Tackifiers (compounds used in formulating adhesives to increase the stickiness) can be used to prevent dust from piles, but should be used with caution. They have been found to work best only where there is no traffic or other subsequent disturbance. Tackifiers require a compact soil surface and sufficient moisture holding capacities.

B. Adopt effective planting techniques to manage dust and erosion, using native species whenever possible. Effective methods include: decompaction of soil to manage runoff and recover seed germination sites, creating water catchments, and amending the soil.

C. Continue to use native seed or local BLM sources for revegetation.

1. Contractors should contact the Natural Resources Program Manager for permission to collect seeds on the Station.
2. Benefit pollinators by including seeds of species they favor.

VI. Support soil data collection and vegetation classification to increase the ability to assess soil health, disturbance recovery, and site restoration potential. Update results in Appendix K and Appendix L.

A. Include soils in long-term monitoring protocols and create a Geographic Information System (GIS) layer of existing soils macrodata.

B. Continue to improve soil mapping capabilities and resources.

4.4 Wildland Fire Management

Related Sections

3.5.8.2 Mohave Desert Tortoise
4.1 Managing with an Ecosystem Approach
4.5 Vegetation and Habitats
5.1 Supporting Sustainability of the Military Mission in the Natural Environment

Summary of Wildland Fire Management Issues at NAWS-CL

The DoD adopted federal wildland fire management policy through DoDI 6055.6 (DoD Fire and Emergency Services [F&ES] Program 2006), which provides policy and criteria for the allocation, assignment, operations, and administration of the DoD F&ES and Emergency Medical Service programs. Federal policy mandates that all federal lands with burnable vegetation have a Wildland Fire Management Plan and resources to safely mitigate losses. A Wildland Fire Management Plan is a strategic document that guides the full range of fire management related decisions, including evaluating the potential for allowing fire to play its natural ecological role. It addresses all aspects of wildland fire management consistent with federal fire policy (DoD 2011).

The DoD adopted federal wildland fire management policy through DoDI 6055.6 (DoD Fire and Emergency Services Program 2006). This policy mandates that all federal lands with burnable vegetation have a wildland fire management plan and resources to safely mitigate losses.

Fires are a serious threat to natural communities and the habitat of listed and sensitive species on NAWS-CL. Lightning and military test and training operations have caused fires on the North Range, and occasional fires adjacent to the various target areas in Superior Valley. Wild fires on the North Range have been infrequent (21 total fires in 15 years) but have resulted in large fire footprints. These fires have occurred within the same general area and were caused by unpredictable aircraft crashes or test article impacts. South Range wild fires occurred primarily in Superior Valley and were more frequent (209 fires in 15 years), but much smaller in acreage affected. These wild fires averaged about 73 acres per year with a maximum recorded burn of 450 acres. NAWS-CL is particularly concerned about fires occurring in the Superior Valley area because of the potential effects of wild fires on Mohave Desert Tortoises and designated Critical Habitat. The potential effects of wild fires could include direct mortality to individual Mohave Desert Tortoises and, in the longer term, type conversion of the plant community composition. This effect reduces the area's carrying capacity by allowing the establishment of non-native grasses that can out-compete the existing native vegetation needed for food by the Mohave Desert Tortoise. An additional concern is that these invasive species grow rapidly during years of sufficient rainfall and produce large amounts of biomass. The added biomass provides a supplemental fuel source, allowing fires to spread more rapidly and burn with increased intensity. Wild fires on NAWS-CL burned approximately 450 acres of tortoise Critical Habitat in 2011. Since 1998, a total of 199 fires have consumed approximately 1,090 acres of tortoise Critical Habitat in the Superior Valley bombing range.

Fire management capabilities at NAWS-CL were developed by the Fire and Emergency Services Department commonly referred to as FedFire. FedFire prepared a NAWS-CL Fire Management Plan (FMP) in 2007 and updates that Plan annually. The FMP did not have a formal fire management policy addressing natural resources protection. However, the FMP did include a wildfire management procedure that provides support for fires affecting natural resources, including tortoise habitat. The primary goal of the FMP is to suppress all fires occurring at NAWS-CL, while maintaining operational requirements and safety of personnel involved in fire management operations.

While the FMP did not have specific management objectives to conserve and protect natural resources, the NAWS-CL INRMP did contain a fire management strategy. The fire management strategy included the following elements:

- Maintaining previously cleared target areas (cleared unexploded ordnance and vegetation) in Superior Valley to reduce the potential for fuel buildup and thereby reduce the potential for fires to catch and spread into adjoining Critical Habitat areas. To the extent possible, move target objects from the periphery into the target area center;
- Continuing to maintain the existing mutual aid fire-fighting agreements with supporting agencies, and continuing to pursue the establishment of new mutual aid agreements;
- Reviewing standard procedures for initial response and fire suppression in Superior Valley test and training operations; and
- Using existing roads, cleared target areas, and washes as part of a fire break system.

Management Strategy for Wildland Fire

Project Summary	Legal Driver
Continue to work with local fire officials to identify high-value resource areas, assess fire danger, track fire patterns, and assess burn area recovery and the need for rehabilitation in these areas. Integrate this information into a wildland fire management plan.	Endangered Species Act, Sikes Act (as amended), Migratory Bird Treaty Act-Migratory Bird Rule, California Desert Protection Act, DoDI 6055.6, DoDI 4715.03

Objectives and Guidelines for Wildland Fire Management

Objective: *Protect the human, infrastructure, natural and cultural resources of NAWS-CL from the harmful impacts of wildfire and fire management interventions.*

Metric: *Support the development of a Wildland Fire Management Plan. High-risk areas are identified and fuel loads are managed to prevent wildland fires that may result from Research, Development, Acquisition, Testing and Evaluation activities.*

I. Implement the fire management program detailed in the Draft Environmental Impact Statement/Legislative Environmental Impact Statement and the revised Station-wide Biological Opinion (BO) to comply with DoDI 6055.6 and federal fire policy. This program is designed to reduce the effects of fire on threatened or endangered species and other biological resources. This revised fire management strategy, described below, is designed to control any fires that may occur in the NAWS-CL threatened or endangered species habitat or Critical Habitat located in the Superior Valley Land Management Unit, as well as in other areas.

- **A.** Maintaining previously cleared target areas (cleared unexploded ordnance and vegetation) in Superior Valley to reduce the potential for fuel buildup and thereby reduce the potential for fires to catch and spread into adjoining Critical Habitat areas. To the extent possible, move target objects from the periphery into the target area center;
- **B.** Continuing the control of invasive species, such as tamarisk (*Tamarix* sp.) to reduce degradation of plant and wildlife habitats, to reduce the associated fuel loading, and to minimize the frequency and aerial extent of wild fires on NAWS-CL;
- **C.** Continuing to maintain the existing mutual aid fire-fighting agreements with supporting agencies, and continuing to pursue the establishment of new mutual aid agreements;
- **D.** Reviewing standard procedures for initial response and fire suppression in Superior Valley test and training operations;
- **E.** Using existing roads, cleared target areas, and washes as part of a fire break system.

F. Proposed changes to the fire management strategy include the adaptive fire management measures contained in the 2013 BO. These measures are intended to minimize and avoid fire effects to Mohave Desert Tortoise and associated habitat, and to maintain the safety of fire management personnel involved in the containment and suppression of wild fires. The revised fire management strategy for NAWS-CL includes the following measures:

1. Construct fire-fighting equipment access roads (which may provide some utility as a fire break), on an as needed basis, in support of fire containment capabilities around targets. NAWS-CL would use targets and the existing road network to determine where an access road may be prudent to prevent a fire from spreading into a roadless area. The utility of constructing access roads would be discussed with NAWS-CL's Fire Department to determine where they would be useful to reduce the risk of fire and/or aid in fire suppression;
2. Survey areas identified for access road/firebreak construction prior to ground disturbing-activities to ensure the proposed area is clear of Mohave Desert Tortoises;
3. The Navy would evaluate the benefits of constructing and maintaining access roads relative to both the economic and environmental cost. Access roads would be approximately 12 feet (3.6 meters) in width. The Navy would, to the extent practicable, continue to access fire prone locations using areas naturally devoid of vegetation, including natural barriers such as washes and lava flows or existing roadways to minimize maintenance costs and impacts to native species;
4. Continue to remove excessive vegetation (vegetation at a density that would sustain a fire) growth within the test and target areas. Vegetation would be removed as needed to minimize the potential for a large, catastrophic wildfire as a result of test and training operations. Environmental staff would monitor the annual vegetation growth and work in conjunction with the Range and Fire Departments to determine when and where vegetation management is warranted;
5. Continue the control of invasive species to reduce degradation of plant and wildlife habitats and to reduce the supplemental fuel loading that could increase the frequency and extent of wildfires on NAWS-CL;
6. Continue to maintain existing mutual aid fire-fighting agreements with other agencies (BLM, U.S. Forest Service, and County of San Bernardino) and continue to pursue the establishment of new mutual aid agreements;
7. Conduct post-fire biological surveys in accordance with the 2013 BO when fires leave target or test impact areas and affect tortoise habitat or Critical Habitat. Surveys will be focused to determine if any tortoises have been injured or killed. Surveys will document the date, time, location, cause and acreage of the fire. Post-fire surveys will be limited to an annual cumulative acreage not to exceed 2,000 acres (1,000 acres in Mohave Desert Tortoise Critical Habitat and 1,000 acres outside of Mohave Desert Tortoise Critical Habitat). In the event of an unforeseen fire that exceeds this acreage, the Navy will consult with the U.S. Fish and Wildlife Service (USFWS) as soon as possible;
8. Continue to evaluate the effectiveness of the NAWS-CL fire management strategy and refine applicable procedures in accordance with data driven lessons learned.

II. Consider development and implementation of other wildland firefighting practices that may enhance the measures listed above. These measures would be developed and implemented on an as needed basis. The NAWS EMD would assist the China Lake Fire Department and Range Department in the development and implementation measures should they be required. These measures may include the following.

A. Map vulnerable facilities, areas of human occupation, shelter and evacuation areas, and sensitive natural and cultural resource sites.

B. Identify drivable roads and water sources for helicopter or firefighting vehicle use.

C. Analyze fire risk, fire weather, and fire spread scenarios with respect to vulnerable resources. Consider modifying test scenarios (such as the use of high explosives or flame-producing spotting charges) that may involve high fire risks.

D. Identify pre-defined locations to establish fire containment areas and to stage apparatus or water close to expected fire control efforts.

E. Analyze situations where a fire should be contained to as small an area as possible, and define situations where fires should be allowed to burn to a natural barrier, such as roads, ridges or washes.

F. Analyze the need for supplemental fire fighter training to enhance on-site response.

G. Analyze the cost-effectiveness of pre-staging firefighting resources in response to fire hazards, identified high value resources (such as pinyon pine areas, high value habitats and sensitive cultural resources), and specific test or training events. Continue current practice in which some testing is modified based on fire danger, such as in the Coso pinyon pine area.

DoD shall restore or rehabilitate altered or degraded landscapes and associated habitats to promote native ecosystems and land sustainability, when such action is practicable and does not conflict with military mission or capabilities consistent with EO 13514 "Federal Leadership in Environmental, Energy, and Economic Performance," 08 October 2009.

H. Identify areas where the use of fire retardant should be avoided.

I. Consider managing fuels loads in other high risk areas (i.e., targets) throughout test and target sites and in other developed areas.

J. Establish a database to track all fires, including acres burned, suppression techniques, fire cause, fire perimeters, and fire severity.

K. Consider implementation of post-suppression site stabilization and restoration needs in specific areas.

L. Consider development of specific tactics and initial attack schemes based on buildings occupied by humans, highly valuable infrastructure, and presence of high value natural and cultural resources.

4.5 Vegetation and Habitats

Related Sections

3.1 Ecoregional Setting
3.4.3 Vegetation Communities at NAWS-CL
3.5 Plant, Fish and Wildlife Populations (Management Focus Species and Pollinator Protection)
3.5.1.3 NAWS-CL Special Status Plant Species
Map 3-10 Known locations of sensitive plant species at Naval Air Weapons Station China Lake and the immediate vicinity (5-mile radius). Data sources: California Natural Diversity Database 2010 records, INRMP 2000.

Summary of Management Issues for Vegetation and Habitats

When NAWS-CL participated in mapping the Central Mojave through the MDEP 40 vegetation plots were sampled to quantitatively classify vegetation at NAWS-CL (Silverman 1997). This is the only quantitative classification of vegetation known at NAWS-CL.

The Range Assessment Program (Navy 1996, 2012b) has been the primary means of assessing vegetation trends. The key benefit of those plots has been their long-term record, but the methods used over time have varied and

some of the historical value has been lost. In addition, standard methods used to monitor vegetation as an early warning sign of degraded land health, including when the primary objective is to assess grazing, have changed.

Current vegetation mapping is not consistent with the federal standards, which are quantitative, hierarchical systems that combine vegetation physiognomy and floristics. By developing quantitative vegetation descriptions, key habitat for rare plants and wildlife can be better defined. Soil crusts, which affect recovery rates post-disturbance, should also be considered.

Management Strategy for Vegetation and Habitats

Project Summary	Legal Driver
Improve the classification of vegetation alliances over time based on standards adopted by the Federal Geographic Data Committee, used by the MDEP (Thomas et al. 2004), and previously implemented in 1996-1997 at NAWS-CL (Silverman 1997).	Interagency Memorandum of Understanding on federal geospatial standards, Sikes Act (as amended)
Update the Range Assessment Program to answer more specific questions about grazing impacts, land health, and recovery from disturbance. Expand work to include key habitats. As opportunities arise, restore the perennial grasses and perennial forbs appropriate for sites.	Sikes Act (as amended), Endangered Species Act, EO 13186
Develop a long-term plan for riparian, wetland, seep, and spring protection, restoration and enhancement. Protect and enhance riparian, spring, seep, and wetland habitats, and restore degraded riparian, spring, seep, and wetland areas. Reduce burro and horse numbers. Participate in a Mojave Riparian and Spring Habitat Task Force. Consistent with the California Desert Protection Act Plan, protect and restore unusual plant assemblages classified as wetland riparian.	California Desert Protection Act, Sikes Act (as amended), EO 11990, EO 13186, California Wildlife Action Plan, DoD Memorandum of Understanding on Ecosystem Approach (partnerships)

Objective and Guidelines for Vegetation Types and Habitats

Objective: *Establish a baseline inventory of natural resources.*

Metric: *Identify essential habitats for rare plants and wildlife. Range assessment tools are used to monitor the condition of protected areas, areas at risk for type conversion, and invasive species distribution. Support the development of higher resolution habitat maps.*

I. Conserve and enhance vegetation communities and habitats.

II. Classify and map vegetation using federal standards.

- **A.** Improve the classification of plant communities by building on the work of Silverman (1997). Track any changes in Appendix L of the INRMP.
  1. The work done by Thomas et al. (2004) and Silverman (2007) generally follows the International Vegetation Classification (Grossman et al. 1998) and Vegetation Classification and Mapping Program systems. The U.S. National Vegetation Classification System and Vegetation Classification and Mapping Program systems comply with requirements of the Federal Geographic Data Committee, and thus with DoD requirements.
  2. Use a 5-hectare minimum mapping unit, but a finer-scale minimum mapping unit in areas where sensitive resources are concentrated.
  3. Any remote sensing or field work associated with vegetation classification should include mapping soils, habitat values, and the presence/absence of management focus species.

III. Establish protocols for monitoring the condition and trend of the land, including climate and weather, soil, the type and amount of plant cover, and disturbance (including grazing).

- **A.** Increase the use of remote sensing and GIS to maximize the efficiency of field efforts.

B. Monitor post-disturbance recovery and determine if intervention is needed to stabilize soils and increase native plant community recovery.

IV. Implement BMPs to avoid or minimize vegetation disturbance. Track successful measures.

A. Develop criteria for post-fire recovery based on site condition and vulnerability.

B. Develop mitigation measures on sites known to be habitat for threatened, endangered, or special status species prior, to disturbance.

V. Rehabilitate, reclaim, or revegetate areas subjected to surface-disturbing activities, where feasible.

A. As a first priority, stabilize disturbed areas from wind and water erosion.

B. Use vegetation maps to plan recovery strategies for disturbed areas.

1. Restore habitat productivity for management focus species.
2. Revegetate strategically, considering soil stabilization, the use of islands for source material, and pollinators.

C. Use feasible and easily measurable recovery benchmarks for restored areas (see Section 4.1).

1. Restored habitat should closely resemble surrounding undisturbed habitat. This is primarily measured through diversity, abundance, and cover of native plants.
2. Restore the perennial grasses and perennial forbs appropriate for the sites.
3. Recovery of total cover, density and species composition of perennial vegetation.

VI. Map habitat areas of concern for NAWS-CL special status species. Consider the Coso Peak Lava Flow, Coso Known Geothermal Resource Area, springs, mines, and plants that are essential hosts to special status wildlife.

A. Identify and map habitat value for the Inyo California Towhee, to ensure that a sufficient quality and quantity of important habitat components are available and are contributing to Recovery Plan criteria.

1. Protect and enhance riparian, spring, seep, and wetland habitats, and restore degraded areas. Conserving these wet habitats is key for maintaining wildlife diversity in the desert.
    a. Map vegetation patterns that can be used to delineate surface and subsurface water resources.
    b. Continue to reduce burro and horse numbers, where they have a detrimental effect on riparian and other sensitive habitats for wildlife.
2. Complete assessments on spring and seep vegetation.
3. Improve spring and seep vegetation by implementing protection measures such as fencing and/or establishing alternate water sources away from the spring or seep.
4. Restore and maintain each spring and seep to a healthy, functioning condition.
    a. Control both floral and faunal invasive species.
    b. Improve groundwater recharge.

VII. Continue to allow access for researchers and specialists, and maintain a database of their observations.

A. Encourage non-vascular plant specialists and research on taxonomic questions, since unknown endemics may be present at NAWS-CL.

4.6 Habitats Protected By Regulation

4.6.1 Critical Habitat Designation

Related Sections

3.5.8.1 Mohave Tui Chub
3.5.8.2 Mohave Desert Tortoise
3.5.8.3 Inyo California Towhee
4.8.1.1 Mohave Tui Chub
4.8.1.2 Mohave Desert Tortoise
4.8.1.3 Inyo California Towhee
6.1 Project Prescription Development and Priority Setting
Appendix O: Reporting on Benefits for Endangered Species and Critical Habitat Concerns

Management Issues for Designated Critical Habitat

The Endangered Species Act (ESA) was revised via the National Defense Authorization Act of the 2004 fiscal year (Public Law 108-136) to recognize INRMP conservation measures and species benefit that could obviate the need for Critical Habitat designation on Navy lands. The species benefit must be clearly identifiable in the document and should be referenced as a specific topic in the INRMP table of contents.

Critical habitat is defined in Section 3(5)(A) of the ESA as "(i) the specific areas within the geographical area occupied by the species at the time it is listed, on which are found those physical or biological features (I) essential to the conservation of the species and (II) which may require special management considerations or protection … and specific areas outside the geographical area occupied by the species at the time it is listed … upon a determination … that such areas are essential for the survival of the species.." The designation of Critical Habitat for a listed species is one of several protection measures aimed at aiding recovery of the species and its removal from federal listing. The Navy requires Chief of Navy Operations level review of changes to, or proposals for, Critical Habitat per the Secretary of the Navy Memorandum of 25 November 2002.

Section 4(a)(3) of the revised ESA states that: "The Secretary [of the Interior] shall not designate as Critical Habitat any lands or other geographical areas owned or controlled by the DoD, or designated for its use, that are subject to an integrated natural resources management plan prepared under section 670a of this title (section 101 of the Sikes Act [as amended]), if the Secretary determines in writing that such plan provides a benefit to the species for which Critical Habitat is proposed for designation."

Mohave Tui Chub

Critical habitat has not been designated for the Mohave tui chub at this time, and was not included as a recommendation in the most recent five-year review of the species (USFWS 2009). The 1984 recovery plan (USFWS 1984) is still in effect.

Mohave Desert Tortoise

The final ruling for Mohave Desert Tortoise Critical Habitat designation occurred in 1994 (USFWS 1994), and no proposed revision is scheduled. The southern 20% of the South Range (approximately 87,264 acres) is within the Superior-Cronese Critical Habitat Unit, an area determined to be Critical Habitat (refer to Map 3-17). A BO on NAWS-CL's Mohave Desert Tortoise Habitat Management Plan has been operational since 1992 with updates in 1995 and 2013. The 2013 BO largely continues the use of avoidance and minimization measures previously

implemented under the BO issued in 1995, and also includes these further measures required in order to maintain the non-jeopardy opinion from the USFWS:

- Construct firefighting access roads, on an as needed basis;
- Remove excess vegetation growth within the test and target sites;
- Conduct post fire surveys when fires leave the target area and enter adjoining Critical Habitat and will document if any Mohave Desert Tortoises are killed or injured;
- Limit post-fire surveys to an annual cumulative acreage of 2,000 acres (1,000 acres in Mohave Desert Tortoise Critical Habitat and 1,000 acres outside of Mohave Desert Tortoise Critical Habitat).

Inyo California Towhee

In 1987, Critical Habitat was designated for the Inyo California Towhee (USFWS 1987; refer to Map 3-18). Riparian corridors and surrounding upland habitats in approximately 32 miles of canyons, within the southern and central portions of the Argus Range on the North Range, are occupied by the towhee. Designated Critical Habitat for this species encompasses 5,800 acres of desert riparian scrub habitat near springs and streambeds in the Argus Range, including portions of Mountain Springs Canyon, Water Canyon, Homewood Canyon, and Moscow Springs (LaBerteaux and Eremico Biological Services 2006). Critical habitat is also found on BLM land, adjacent to the eastern boundary of NAWS-CL.

Management Strategy for Designated Critical Habitat

Project Summary	Legal Driver
Continue to survey and map all unoccupied but suitable habitat for the Inyo California Towhee.	ESA, National Defense Authorization Act 2004
Monitor the condition of habitat that potentially supports the three listed species and Lane Mountain milk-vetch.	ESA, National Defense Authorization Act 2004, Sikes Act (as amended)

Objectives and Guidelines for Designated Critical Habitat

Objective: *Provide a conservation benefit to the Mohave Desert Tortoise and Inyo California Towhee by preparing and implementing a management plan for these species.*

Metric: *Implement current BOs for the Mohave Desert Tortoise and Inyo California Towhee to protect Critical Habitat.*

I. All Navy installations must structure the INRMP using the USFWS three-point criteria test to avoid the need to designate Critical Habitat.

II. The cumulative benefits of the management activities identified in the INRMP, for the length of the INRMP, must maintain or provide for an increase in a species' population or the enhancement or restoration of its habitat within the area covered by the plan (i.e., those areas deemed essential to the conservation of the species). A conservation benefit may result from reducing fragmentation of habitat, maintaining or increasing populations, improving resilience to catastrophic events, enhancing and restoring habitats, buffering protected areas, or testing and implementing new conservation strategies. Provisions must be made for the long-term conservation of the species.

A. Mohave Tui Chub. The population and habitat of this species introduced to NAWS-CL is managed under USFWS-issued BOs (1997, amended in 2002 and 2003). NAWS-CL works with government agencies and private entities to provide a source population for the re-introduction of chub into other potential refuges. See Section 4.8.1.1.

B. Mohave Desert Tortoise. Comply with the 2013 BO guidelines for project review and standard mitigation measures for all tortoise habitat on NAWS-CL. See Section 4.8.1.2.

1. Continue to further the recovery of the West Mojave population of the Mohave Desert Tortoise.
2. As directed by the BO, submit an annual report to the USFWS with information on all project surveys.

C. Inyo California Towhee. A Cooperative Management Agreement between NAWS-CL and the USFWS, California Department of Fish and Wildlife (CDFW), and BLM (USFWS 2010) is the basis for management of the towhee. Feral horse and burro removal and habitat fencing have provided direct benefit to habitat (see Section 4.8.1.3). The towhee is under consideration for de-listing.

D. Lane Mountain Milk-Vetch (*Astragalus jaegerianus*). While this federally endangered species has not been documented on NAWS-CL, potential habitat is present. This potential habitat is protected as part of the DTHMA (refer to Map 4-2).

E. Mohave Ground Squirrel (*Spermophilus mohavensis*). Some protection is afforded this species' habitat through the designation of Critical Habitat and management areas for the Mohave Desert Tortoise, as well as widely implemented Mohave Desert Tortoise habitat protection. Additionally, the Common Raven (*Corvus corax*) has been suggested as a potential predator of this species, so any future raven removal efforts, in conjunction with Mohave Desert Tortoise protection, would also provide ancillary benefit to this species. See Section 4.8.1.4.

III. The following criteria will be considered to assess and ensure that the conservation effort is effective. The plan includes 1) biological goals and objectives; 2) quantifiable parameters by which progress will be measured; 3) provisions for monitoring and, where appropriate, adaptive management; 4) provisions for reporting progress on implementation (based on compliance with the implementation schedule) and effectiveness of the conservation effort; and 5) a duration sufficient to implement the plan and achieve its goals and objectives.

Each DoD component should use heritage and other natural resources database networks whenever appropriate. These are database networks that provide precise locations and conditions of known listed and at-risk species and ecological communities. They can be used to identify Critical Habitats, aid in land use planning, guide natural resources use and development decisions, and set conservation priorities. The heritage database network allows for consistent collecting and managing of data to be shared and combined regionally, nationally, and internationally, leading to effective ecosystem-based management (DoDI 4715.03).

A. Mohave tui chub. See Section 4.8.1.1.

B. Mohave Desert Tortoise. See Section 4.8.1.2.

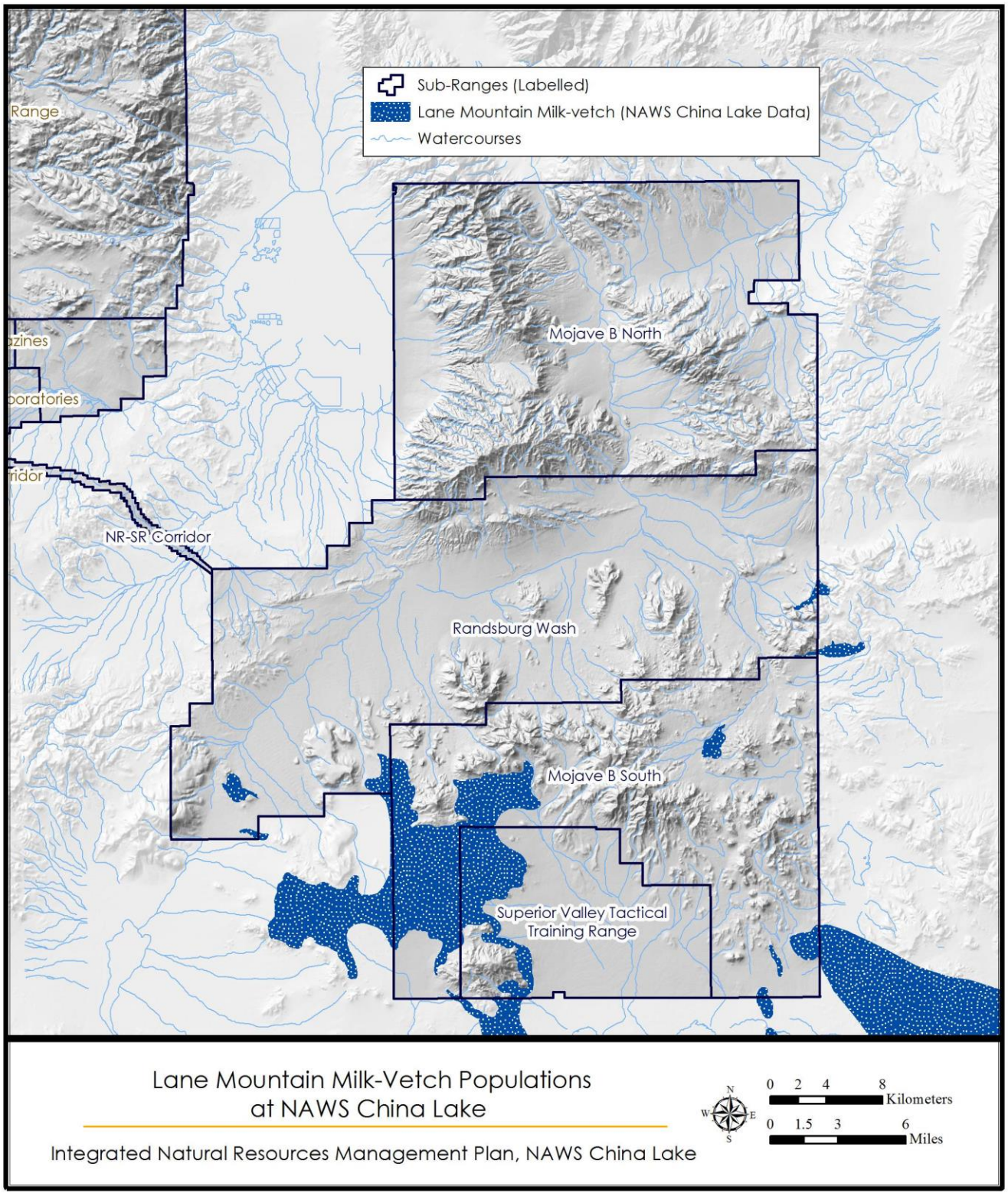
C. Inyo California Towhee. See Section 4.8.1.3.

IV. Persons charged with plan implementation are capable of accomplishing the objectives of the management plan and have adequate funding for the management plan. They have the authority to implement the plan and have obtained all the necessary authorizations or approvals. An implementation schedule, including completion dates, for the conservation effort is provided in the plan.

A. All project proposals are summarized in an implementation table in Appendix N (Table N-1), including completion dates. They are all assigned the highest priority possible for funding, meaning that there is a compliance responsibility that cannot wait another year (DoDI 4715.3).

V. Quantifiable parameters for demonstrating achievement of listed species objectives include, but are not limited to, the number of acres of appropriate habitat managed for species protection and acres of unoccupied but suitable habitat preserved.

A. Monitor condition of habitat that supports or could support the three listed species and Lane Mountain milk-vetch through an updated Range Assessment Program.



Map 4-2. Potential habitat for the Lane Mountain milk-vetch on the South Range.

B. Implementation progress will be documented over time by updated assessment of habitat value, disturbance, disturbance recovery, and species population status. This information will be added to the GIS database for evaluation and inclusion in the subsequent INRMP revision.

4.6.2 Wetland Habitats and Potential Jurisdictional Waters of the U.S.

Related Sections

3.3.5 Jurisdictional Waters of the U.S. and Wetlands

Management Issues for Wetland Habitats and Potential Jurisdictional Waters

NAWS-CL may not have jurisdictional wetlands as defined by the U.S. Army Corps of Engineers under Section 404 of the CWA; however, a jurisdictional determination has not been completed. In particular, portions of the upper watershed of three recognized waters of the U.S. are present on NAWS-CL: Amargosa River, Owens River, and Mojave River.

Wetlands that are not jurisdictional waters of the U.S. occur on NAWS-CL land mostly in the form of springs and seeps. EO 11990, the Protection of Wetlands, directs all federal agencies to "take action to minimize the destruction, loss, or degradation of wetlands, and to preserve and enhance the natural and beneficial values of wetlands." Under this EO, agencies are also required to consider "factors relevant to a proposal's effect on the survival and quality of the wetlands." One such factor is the "...maintenance of natural systems, including conservation and long term productivity of existing flora and fauna, species and habitat diversity and stability, hydrologic utility, fish, wildlife, timber, and food and fiber resources."

EO 11990, the Protection of Wetlands, directs all federal agencies to "take action to minimize the destruction, loss, or degradation of wetlands, and to preserve and enhance the natural and beneficial values of wetlands."

Management Strategy for Wetland Habitats and Potential Jurisdictional Waters of the U.S.

Project Summary	Legal Driver
Continue to assess the applicability of Section 404 of the CWA by establishing the jurisdictional status of all water features on NAWS-CL.	CWA

Objective and Guidelines for Wetland Habitats and Potential Jurisdictional Waters of the U.S.

Objective: *Determine and map the presence or absence of waters of the U.S.*

Objective: *Consistent with EO 11990, take action to minimize destruction, loss, or degradation of wetlands and to preserve and enhance the natural and beneficial values of wetlands.*

Metric: *Support efforts to delineate potential Jurisdictional Waters of the U.S. BMPs are used to protect or enhance wetland habitats that support native species.*

Commanders shall ensure that boundaries of legally defined wetlands on all Navy lands are identified and mapped with sufficient accuracy to protect them from potential unplanned impacts, and that the maps are distributed to all potential users, including facilities planners, operational units, and tenant commands (OPNAVINST 5090.1C CH-1).

I. Verify the presence or absence of U.S. Army Corps of Engineers jurisdictional waters on NAWS-CL.

II. Maintain and enhance open waters as rest areas for migratory birds and for Mohave tui chub, including the evaporation and percolation ponds of the wastewater treatment facility.

III. Continue to inventory, protect, and enhance springs, seeps, other water sources, and associated adjacent habitats.

A. Conduct flora and fauna surveys to develop habitat objectives at natural perennial and ephemeral water sources. Establish a baseline for any work conducted under EO 11990 or EO 13186.

B. Continue to enhance wetland vegetation at springs and seeps through fencing or other means.

4.7 Plant, Fish, and Wildlife Populations

4.7.1 General Management of Plant, Fish, and Wildlife Populations

Related Sections

3.5 Plant, Fish and Wildlife Populations
3.5.1 Flora
3.5.3 Invertebrates
3.5.4 Fish
3.5.5 Reptiles and Amphibians
3.5.6 Birds
3.5.7 Mammals
3.5.7.4 Feral Horses and Burros
3.5.8 Federally Listed Species

Management Issues for Plant, Fish, and Wildlife Populations

In this ecosystem-based INRMP (see Section 1.7 and Section 4.1), a habitat-first approach is used to manage plant and wildlife populations. Continuation of habitat conservation efforts, particularly in areas supporting listed or sensitive species, is a key element of the natural resources management program. Impact avoidance or minimization measures are enacted, whenever practicable.

Biologically or geographically significant or sensitive natural resources, such as ecosystems or species, shall be monitored and managed for their protection and long-term sustainability. Each installation shall maintain a relevant and updated baseline list of its plant and animal species for all pertinent taxonomic and regionally important groups (DoDI 4715.03).

The discovery of species previously unknown to NAWS-CL, including some potentially endemic or new species of plants and animals, is a regular occurrence when specialists conduct surveys. Management of such data would provide EMD with useful information for management decisions and impact assessment.

Special status species are discussed in subsequent sections specific to these resources (see Section 4.7.2 and Section 4.8.1 for special status plant species and threatened and endangered species, respectively).

Management Strategy for Plant, Fish, and Wildlife Populations

Project Summary	Legal Driver
Continue to conduct baseline inventories and map high-value habitat for management focus species to conserve, avoid, and minimize impacts to resources and reduce potential conflict with the military mission.	Sikes Act (as amended), DoD partnership
Continue to encourage research partnerships with other agencies, organizations, and researchers to refine baseline data on the plants and animals at NAWS-CL.	Sikes Act (as amended), DoD partnership

Objective and Guidelines for Plant, Fish, and Wildlife Populations

Objective: *Conserve populations of plants, fish, and wildlife through habitat conservation.*

Objective: *Conduct baseline and management focused species inventories.*

Metric: *Occurrence, status, distribution and population data collection (with confidence limits, were appropriate) for plant, fish and wildlife populations will continue at NAWS-CL through monitoring and collaboration with researchers; and funding will be sought to address data gaps. Datasets are developed that can be used to build maps of high value habitats and sensitive species occurrence.*

Biodiversity conservation on DoD lands and waters should be followed whenever practicable to: 1) Maintain or restore remaining native ecosystem types across their natural range of variation; 2) Maintain or reestablish viable populations of native species on an installation, when practical; 3) Maintain ecological processes, such as disturbance regimes, hydrological processes, and nutrient cycles to the extent practicable; 4) Manage and monitor resources over sufficiently long time periods to allow for adaptive management and assessment of changing ecosystem dynamics (i.e. incorporate a monitoring component to management plans) (DoDI 4715.03).

I. Identify and map high-value habitats.

- **A.** Use vegetation classification and mapping protocols that meet national Federal Geographic Data Committee and DoD standards (see Section 4.5) and Ecological Site Description approximations (see Section 4.1).
- **B.** Make avoidance and minimization recommendations for mission activities and development based on this information.

II. Ensure conservation of species of special management concern.

III. Acquire, maintain and update baseline data for protected and sensitive species.

- **A.** Track the status of species proposed for listing under the federal ESA.
- **B.** Create, update, and maintain a GIS database of known observations of all federally listed species, species of special management concern, and Critical Habitat (see Appendix J).
- **C.** Supply accurate species status information to national, state, and regional heritage databases (DoDI 4715.03).

IV. Allow harvesting of pinyon pine and other plant material if it is consistent with sustaining both healthy, vigorous plant communities and viable wildlife populations.

V. Construct and maintain upland game guzzlers (watering systems for wildlife) as needed, where determined to be benefical.

VI. Identify and protect wildlife habitat through mitigation during the NEPA compliance process. Important habitats include nesting areas, migration routes and stopover sites, important prey base areas, and Critical Habitat features such as springs, seeps, riparian areas, or mines and caves. Also give consideration to geological and vegetation features such as the Coso Peak Lava Flow, Coso Known Geothermal Resource Area, creosote clonal rings, riparian trees, and plants that are essential for special status wildlife.

- **A.** Minimize habitat fragmentation by concentrating development.
- **B.** Delineate and maintain connectivity between habitat patches to link foraging and nesting areas, and foster population dispersion and recolonization potential.

VII. Identify habitat management and enhancement options for management focus species.

- **A.** Encourage landscaping with native plants.
- **B.** Improve bird habitat at key water sources, including the sewer ponds.
- **C.** Protect phreatophytic vegetation in washes, springs and seeps.

D. Maintain databases for all management focus species that includes regarding taxonomic and legal status, range-wide and NAWS-CL distribution, and inventory techniques and time frames for monitoring methods.

VIII. Cooperate with state and federal wildlife agencies in implementing reintroduction and augmentation releases of native species (such as desert bighorn sheep).

A. Develop Memoranda of Agreement (MOAs) or Memoranda of Understanding (MOUs) to clarify goals and methods for each relevant species.

4.7.2 Special Status Plants

Related Sections

3.5.1.3 NAWS-CL Special Status Plant Species
Appendix I: Species List
Appendix J: Profiles of Management Focus Species
Appendix L: Plant Community Descriptions and Habitat Functions

Management Issues Summary for Special Status Plants

Current management of special status plant species on NAWS-CL is accomplished primarily through the protection of their potential habitats. There are no federal or state listed plant species at NAWS-CL that warrant any special protection efforts.

Management Strategy for Special Status Plants

Project Summary	Legal Driver
Continue to conduct rare plant searches, prioritizing search locations based on potential for endemics, under-surveyed areas, and areas with higher habitat suitability, threats, or vulnerabilities.	Sikes Act (as amended), ESA

Objectives for Special Status Plants

Objective: *Evaluate, protect, and enhance special status plant populations while maintaining compatible land use and flexibility to fulfill mission requirements.*

Metric: *Known special status plant populations are protected and efforts continue to identify areas of undocumented occurrence or high habitat value.*

I. Conduct rare plant searches. Prioritize search locations, based on habitat threats and vulnerabilities. Surveys will be conducted during appropriate seasons and climate conditions.

II. Identify threats and vulnerabilities for known locations of special status and management focus plants or plant assemblages.

III. Improve the NAWS-CL herbarium so it can be utilized by natural resources staff to learn and verify plant identifications.

4.7.3 Invasive Species

Related Sections

Map 3-10. Known locations of sensitive plant species at Naval Air Weapons Station China Lake and the immediate vicinity (5-mile radius). Data sources: California Natural Diversity Database 2010 records, INRMP 2000.

Summary of Management Issues for Invasive Species

The Range Assessment reported low levels of invasive species outside of burn or other disturbed areas. A weed control program is successfully addressing tamarisk in habitat for the Inyo California Towhee and the Mohave tui chub, as well as other riparian areas. In contrast, the status of invasive species is not documented for areas managed for the Mohave Desert Tortoise, nor in high risk areas adjacent to off-road vehicle use areas, at construction sites and target areas, along roads, and other areas where the surface soil is disturbed.

Ensure invasive species management measures are consistent with DoDI 4150.07 (DoD Pest Management Program 29 May 29 2008); EO 13112 (Invasive Species 03 February 1999, as amended); and sections 7701-7772 of title 4, U.S. Code (Plant Protection Act). These management measures shall be addressed in the INRMP (DoDI 4715.03).

EO 13112 (February 1999) defines invasive species as "alien species whose introduction does or is likely to cause economic or environmental harm or harm to human health". It directs all federal agencies to consider the environmental effects of their actions through NEPA and refrain from actions likely to increase invasive species problems. The Federal Plant Protection Act 2000 (Title IV of Public Law 106-224) prohibits introducing any animal, plant, or material considered harmful to this country's agriculture. The DoD is required to comply with this law and prevent introductions from overseas movement of military equipment.

Management Strategy for Invasive Species

Project Summary	Legal Driver
Continue to monitor for invasive species, document new occurrences, and develop a strategy for early detection and control. For already established invasive species, continue control efforts. Assess the need to update the Weed Management Plan.	ESA, Sikes Act (as amended), EO 13112

Objective and Guidelines for Invasive Plants

Objective: *Control the spread and introduction of invasive plants with priority on those with the greatest potential to affect a sensitive species or habitat.*

Metric: *Tamarisk occurrence in habitats that support Inyo California Towhee, Mohave tui chub, or other sensitive species is eliminated. Installation-wide invasive plant occurrence is reduced by focusing efforts on areas where treatment is likely to have the greatest benefit. Partnerships with other regional agencies allow NAWS-CL to leverage additional resources and address region-wide concerns.*

I. Comply with EO 13112 on Invasive Species. Use early detection and rapid response as the first order of business. Prevent and control new introductions rapidly.

- **A.** Use regular monitoring practices at strategic locations to detect new pest plant introductions.
- **B.** Enforce invasive species control measures at construction sites or sites of routine ground disturbance. Restoration, construction, and mitigation plans should include contingencies for removing invasives as they appear and for implementing new control measures as they become available.

II. Prevent new pest species from becoming established. Identify pests that can be lived with, such as infestations that cannot reasonably be controlled but may be tackled with an ecosystem based approach (see IV below on Ecologically-Based Integrated Pest Management).

- **A.** Appendix I contains the list of Invasive Pest Plants of Greatest Ecological Concern in California produced by the California Invasive Plant Council. If any of these species are discovered on NAWS-CL, they should immediately be removed.

With respect to a particular ecosystem, any species, including its seeds, eggs, spores, or other biological material, whose introduction or presence may cause environmental or economic harm or harm to human health is defined as an invasive species (DoDI 4715.03).

B. The following describes useful criteria to prioritize pest plant problems. (In addition to this guidance, weeds of California are assigned a priority level by the California Invasive Plant Council, and these may be obtained from their website.)

1. Prioritize particular species or infestations as follows:
   a. Pest species with the ability to alter ecosystem functions;
   b. Pest species that move into and dominate undisturbed native communities;
   c. Pest species that overtake and exclude natives following natural disturbances;
   d. Pest species that prevent or depress regeneration by natives. This includes understory species that suppress seedling establishment and growth of overstory species, thereby, causing long-term changes in species composition;
   e. Small or otherwise easily eliminated pest populations. Avoid major problems by early detection and elimination;
   f. Pest species that are increasing in number or extending their ranges, unless these changes are thought to be part of a well-known cycle, or temporary, and due to unusual conditions;
   g. Pest species for which long-term control or elimination can be accomplished at reasonable expense; and
   h. Pest species that are problems in nearby natural areas, but are not thus far problematic (on the present site).
2. The following factors recommend against control:
   a. Species whose numbers are stable or decreasing;
   b. Non-natives that colonize only disturbed areas and do not move into undisturbed habitats;
   c. Pest species that will be pushed out by natives with succession or with the re-establishment of natural processes (e.g., fires, flooding); and
   d. Pest species for which long-term control or elimination cannot be accomplished at reasonable expense.

III. Identify, map and monitor invasive plant introductions and landscape-level problems (EO 13112).

IV. Implement strategic management of landscape-level invasion problems using Ecologically-Based Integrated Pest Management.[1]

A. Consider updating the existing Weed Management Plan.

B. Prioritize treatment areas, based on known aggressiveness of the invasive species, extent of infestation, and threat to native plants and animals.

C. Initially target the following species for control: tamarisk, star-thistle, pampas grass, cattail, rue, and giant reed. Efforts to control invasive weeds should begin in the fall/winter outside of the bird breeding season or at a time when the weed species are in phases more susceptible to herbicide application.

Navy installations will prevent the introduction of invasive species and provide for their control per EO 13112. The Navy will identify actions that affect the introduction of invasive species, prevent their introduction, respond rapidly to their control, monitor populations, restore affected native species and their habitat, conduct research and develop technologies to prevent further introductions, and promote public education of the issue.

V. Work with partners, such as the BLM and National Park Service. Coordinate timing of control of invasives near the property boundary with adjacent landowners and managers to achieve maximum control and minimize cross-boundary re-invasions.

VI. Control measures must comply with the NAWS-CL Integrated Pest Management Plan (DoDI 4150.7).

[1] See U.S. Geological Survey, USDA Agricultural Research Service publications on this such as Shelley et al. 2010; http://greatbasin.wr.usgs.gov/GBRMP/bwg.html. Choose "Project Narrative" for more information.

A. Adhere to Federal Insecticide, Fungicide, and Rodenticide Act mandates regarding pesticide applicator certification, record keeping and reporting requirements.

B. Coordinate pest management activities with the NAWS-CL Integrated Pest Management Coordinator.

C. Remove high priority invasive species, such as tamarisk and star thistle, and monitor and evaluate the necessity for removal of other species.

1. Develop a landscape plan to remove invasive weeds and poisonous plants around housing and other facilities (see Appendix G).

D. Ensure that invasive plant control does not affect federally listed plants or animals.

E. Document removal and monitor the area to ensure re-growth does not occur.

4.7.4 Invertebrates

Related Sections

3.5.3 Invertebrates
Appendix I: Species List
Appendix J: Profiles of Management Focus Species
Appendix L: Plant Community Descriptions and Habitat Functions

Summary of Management Issues for Invertebrates at NAWS-CL

Current management of invertebrate species at NAWS-CL is accomplished primarily through the conservation of their habitat. The list of documented species is extraordinarily long.

Management Strategy for Invertebrates

Project Summary	Legal Driver
Continue to support invertebrate studies through cooperative agreements, contracts, and other means.	Sikes Act (as amended)

Objectives and Guidelines for Invertebrates

Objective: *Identify and protect the abundance, biomass, and diversity of invertebrate functional groups that reflect the health of each habitat and the ecosystem as a whole, as compatible with mission requirements.*

Metric: *Current management practices continue to provide conservation for invertebrate species. Invertebrate occurrence, habitat use, and population status and trend are better defined through funding and support of research and surveys.*

I. Continue to support research investigations of invertebrate species, their habitat, and host interactions at NAWS-CL.

II. Conserve giant fairy shrimp (*Branchinecta gigas*) and their potential habitat. Continue to research shrimp species of conservation interest.

A. When possible, direct activities away from playas occupied by giant fairy shrimp. If possible, use dry playas or other unoccupied playas, such as Mirror Lake playa and its adjacent uplands, as an alternate activity location.

B. Encourage research on the population status at selected occupied playas.

III. Continue to support investigations of butterfly species and identification and distribution of host plant species.

A. Conduct investigations in conjunction with botanical surveys.

B. Surveys should be conducted during years when plant species are in good condition and should be conducted over multiple years to avoid problems with some species exhibiting an extended superdiapause pupal stage.

IV. Manage for beneficial pollinators in collaboration with DoD and other partner agencies.

A. DoD is a member of the Pollinator Partnership and the North American Pollinator Protection Campaign (see http://www.dodpollinatorworkshop.com/ and www.pollinator.org).

4.7.5 Reptiles and Amphibians

Related Sections

3.5.5 Reptiles and Amphibians
3.5.8.2 Mojave Desert Tortoise
4.8.1.2 Mojave Desert Tortoise
Appendix I: Species List
Appendix J: Profiles of Management Focus Species
Appendix L: Plant Community Descriptions and Habitat Functions

Management Issues Summary for Reptiles and Amphibians

For the current status and management of reptiles and amphibians, see Section 3.5.5.

Reptiles and amphibians are managed at NAWS-CL primarily by the avoidance of impacts to their habitat, particularly around key seeps and springs. Conservation of Haiwee Springs is especially important since it is the sole known location of Pacific Treefrogs (*Pseudacris regilla*) on the Station. Conservation of additional springs is important for the Panamint Alligator Lizard and Gilbert's Skink (*Plestiodon gilberti*). Any future management of raven populations for Mojave Desert Tortoise would also benefit other reptiles by removing a source of predation. Baseline data are still lacking for many of the reptile and amphibian species on the Station, including presence, taxonomy, distribution, and habitat associations. Filling in data gaps should be a priority.

Management Strategy for Reptiles and Amphibians

Project Summary	Legal Driver
Prepare a map of potential habitat for focus species, emphasizing geomorphic substrates combined with the vegetation-based wildlife-habitat relationship models in the California Gap Analysis Program.	Sikes Act (as amended), PARC
Conduct surveys to determine the status and distribution of Common Chuckwalla, Panamint Alligator Lizard, Gilbert's Skink, Red-spotted Toad, Slender Salamander, and other reptiles and amphibians at NAWS-CL.	Sikes Act (as amended), PARC
Extirpate non-native amphibians from water sources.	National Aquatic Invasive Species Act, Sikes Act (as amended), PARC
Participate in DoD Partners in Amphibian and Reptile Conservation (PARC).	Sikes Act (as amended), PARC

Objectives and Guidelines for Reptiles and Amphibians

Objective: *Inventory and determine the distribution and relative abundance of amphibian and reptile populations.*

Objective: *Determine if Slender Salamanders and other rare amphibians are present.*

Metric: *Current management practices continue to provide protection for reptiles and amphibians. Occurrence and population status of rare or sensitive status reptile and amphibian species are better defined through funding*

and support of research and surveys. NAWS-CL develops projects that improve understanding of Slender Salamander, Panamint Lizard, and Common Chuckwalla (Sauromalus ater) status and distribution.

I. Map potential habitat for focus species, using vegetation-based wildlife-habitat relationship models in the California Gap Analysis Program (Heaton et al. 2006).

II. Conserve reptile and amphibian habitat to the extent practicable to prevent species listing under the ESA.

III. Conduct surveys to determine the status and distribution of Common Chuckwalla, Panamint Alligator Lizard, Gilbert's Skink, Red-spotted Toad (*Anaxyrus punctatus*), Slender Salamander, and other reptiles and amphibians.

IV. As much as possible, minimize unnatural predation levels on reptiles and amphibians.

A. Use the NEPA process to control factors (i.e., food, water, and perches) that can lead to increases in Common Raven populations.

B. Develop measures to prevent the spread of invasive ants that could affect native lizard populations. Determine the extent of the problem near irrigated areas and water sources.

Support the MOU among federal agencies for Achieving Objectives of the PARC (March 2007).

C. Extirpate non-native amphibians, such as Bullfrogs (*Rana catesbeiana*), from water sources.

D. Per DoDI 5100.2f, ensure that free-roaming pets, including cats, are not allowed in the natural areas on NAWS-CL.

V. Participate in DoD Partners in Amphibian and Reptile Conservation (PARC).

4.7.6 Birds

Related Sections

3.4 Vegetation Communities and Wildlife Habitat
3.4.3 Vegetation Communities at NAWS-CL
3.5.6 Birds
3.5.8.3 Inyo California Towhee
5.3.1 Bird/Wildlife Aircraft Strike Hazard Prevention
5.5 Outdoor (Wildlife-Oriented) Recreation and Environmental Awareness
5.5.1 Upland Game Hunting
5.6 Landscaping and Grounds
Appendix I: Species List
Appendix J: Profiles of Management Focus Species
Appendix O: Reporting on Benefits for Endangered Species and Critical Habitat Concerns
Appendix P: Reporting on Migratory Bird Management

Summary of Management Issues for Birds

The variety of ecosystems at NAWS-CL support many resident and migrant bird species that are characteristic of the Mojave and Great Basin desert ecosystems. The management program for avian species is primarily implemented through habitat conservation and avoidance measures associated with the project review and site approval process. Protecting wetland habitats at seeps and springs through fencing and invasive species control has been a key management practice in abating threats to the Inyo California towhee, which has resulted in a recent MOA with the USFWS for de-listing. Additionally, NAWS-CL complies with the interagency MOU on preventing the take of Mohave Desert Tortoises by ravens. A BASH Plan has been developed and is being implemented.

NAWS-CL has over 70 special status bird species documented or expected to occur within the Installation boundary, including several that are the focus of regional desert and Great Basin sagebrush habitat conservation plans. While a number of these Special Status species are afforded protection under the Migratory Bird Treaty Act (MBTA), migratory bird species are subject to the DOD military readiness exemption and are not expected to be affected by military operations at the population level at NAWS-CL. However, both Federal and Navy guidance instruct the DoD to minimize impacts to migratory birds when possible. Potential impacts to MBTA or NAWS Special Status species are reduced through the voluntary application of mission compatible avoidance or minimization measures.

DoD Components shall, where appropriate, protect migratory bird species pursuant to the MBTA; EO 13186; and the MOU between DoD and USFWS (DoDI 4715.03).

Implementation of focused avian sensitive species surveys would provide baseline information for the development of habitat value maps which would improve the Station's ability to analyze potential mission related effects. Furthermore, habitat value maps could be translated into BMPs to support new or refined and avoidance/minimization measures and contribute to the Under Secretary of Defense's objective (Memorandum of 03 April 2007) for implementing EO 13186 and promoting conservation of migratory birds.

Management Strategy for Birds

Project Summary	Legal Driver
Monitor bird population levels to facilitate the assessment of effects of military operations. Continue to develop and refine minimization and avoidance measures.	EO 13186, Sikes Act (as amended), Bald and Golden Eagle Protection Act, MBTA and Military Readiness Waiver
Continue to collect baseline data on migratory bird presence, activity, and locations. Include a monitoring program for bird use and recovery in areas impacted by wildfires. Incorporate requirements from the Raven MOU.	Sikes Act (as amended), MBTA, EO 13186, Bald and Golden Eagle Protection Act
Develop a habitat protection, enhancement and management plan for focus species, building on habitat value and use area maps for birds.	MBTA, EO 13186, Bald and Golden Eagle Protection Act
Continue to implement the NAWS-CL and USFWS Inyo California Towhee MOA intended to facilitate delisting.	ESA
Continue bird census, survey, trapping, banding, and translocation efforts in cooperation with other agencies.	Sikes Act (as amended), EO 13186, Bald and Golden Eagle Protection Act

Objectives and Guidelines for Birds

Objective: *Maintain, restore, and enhance habitats that resident and migratory populations of birds depend on, emphasizing special status birds that may be affected by military activities, and in compliance with EO 13186, the related USDI-DoD MOU, and Under Secretary of Defense guidance memorandum.*

Objective: *Comply with the military readiness waiver under the MBTA.*

Metric: *NAWS-CL complies with all applicable laws and regulations, including the MBTA Readiness Waiver. Current management practices continue to provide protection for birds. Population status and habitat use of avian species at NAWS-CL continue to be studied with particular emphasis on sensitive species or species with limited distribution. Continued research support, surveys, and agency partnerships enhance knowledge and protection of avian populations.*

See also Section 4.8.1.3 for details on Inyo California Towhee management and the NAWS-CL /USFWS MOA on this species for its potential delisting.

I. Implement habitat-based strategies for conservation of migratory birds (EO 13186).

A. Continue implementing the NAWS-CL/USFWS Inyo California Towhee MOA, intended to facilitate the delisting of this species.

B. Identify high-value habitats for management-focus birds at NAWS-CL to facilitate development of avoidance and minimization measures during site approvals and to support conservation objectives and mission execution requirements.

DoD components shall protect bald eagles pursuant to the ESA where appropriate. DoD shall continue to implement military readiness activities in accordance with part 15 of Title 50, Code of Federal Regulations (DoDI 4715.03).

C. Conserve and manage priority habitats for migratory birds.

1. Develop and implement a habitat conservation, enhancement, and management plan for management focus species, building on habitat value and use area maps (EO 13186; Sikes Act (as amended); USDI-DoD MOU).
2. Develop and implement a restoration plan to benefit management focus birds.
    a. Establish and prioritize specific habitat restoration and enhancement objectives. Where practicable, conserve habitats in the target conditions identified in the California Desert Bird Conservation Plan (CalPIF 2009) and the Sagebrush Bird Conservation Plan (CalPIF 2005).
    b. Implement improvements to existing habitat to include wetland protection, maintenance, and enhancement of buffers, and control of invasive plant and animal species that crowd out other species necessary to migratory bird survival.

DoD shall protect the Bald Eagle pursuant to sections 668-668d of the "Bald and Golden Eagle Protection Act, as amended," and MBTA in accordance with parts 13 and 22, regardless of Federal listing status (DoDI 4715.03).

3. Implement site-specific restoration projects using best practices.
    a. Restore uplands in conjunction with riparian/spring/seep restoration. Projects that involve fencing riparian areas should consider including substantial areas of adjacent upland habitat.
    b. Example projects include:
        i. Installation of fences and exclusion panels around seeps and springs and towhee habitat;
        ii. Removal of tamarisk; and
        iii. Investigation of potential enhancement of sewage treatment ponds for wildlife benefit in conjunction with NAWS-CL partners such as the City of Ridgecrest, PIF, CDFW, and USFWS.

II. Comply with conservation targets for special status bird populations as described in EO 13186, the DoD-USFWS MOU to Promote the Conservation of Migratory Birds, and the Under Secretary of Defense Memorandum of 03 April 2007, on implementing the MOU.

A. Identify priority species for focused management (see Table 3-14) that could be affected by Station activities.

B. Continue to maintain and update a seasonally accurate bird checklist for the Station (Under Secretary of Defense Memorandum of 03 April 2007).

C. Report to the national DoD Bird Conservation Database the results of bird surveys, research and monitoring, and species accounts (Under Secretary of Defense Memorandum of 03 April 2007).

D. Continue Mountain Quail management efforts.

1. Continue conservation of Mountain Quail using habitat enhancement efforts (reducing horse impacts), construction of new guzzlers, and trapping and relocating to assist in re-establishing populations in other locations.
2. Continue to support removal of Chukar from Mountain Quail habitat and support outside agency translocation efforts.

III. Protect migratory bird populations by avoiding and minimizing impacts to birds as compatible with mission requirements (EO 13186).

A. Implement Station-level BMPs based on the resources and data available.

1. Evaluate the effect of actions on migratory birds through the NEPA review process, with emphasis on species of concern (EO 13186).
2. Identify and minimize unintentional take of species of concern (EO 13186).
    a. Ensure take of migratory birds at communications towers is avoided to the extent practicable. Consider USFWS and PIF guidance for their construction (see Chapter 5) (DoD-USFWS MOU).
    b. Identify power lines and poles known to electrocute raptors and correct design deficiencies.
    c. Promote conservation awareness to avoid impacts to bird species particularly during the breeding season (1 March through 30 August).
    d. Prevent or abate effects on migratory bird populations caused by pollution.
    e. Reduce pesticide use (see also 5.6 Landscaping and Grounds Maintenance).
    f. Consider use of artificial habitat features, such as nest boxes and guzzlers, to benefit bird populations. Avoid areas managed for Mohave Desert Tortoise.
    g. Whenever possible and as compatible with mission requirements, redirect construction and military operations away from cliffs, Burrowing Owl colonies, and other high-value areas, during the breeding season.
3. Ensure compliance with the BASH Plan (see Chapter 5).

IV. Develop and enhance conservation partnerships to further the work of bird conservation (EO 13186, DoD-USDI MOU, and Under Secretary of Defense Memorandum 2007, Sikes Act (as amended)).

EO 13186 requires that federal agency management plans promote programs and recommendations of comprehensive migratory bird planning efforts such as PIF, U.S. National Shorebird Plan, North American Waterfowl Management Plan, North American Colonial Waterbird Plan, and other national and international planning efforts.

A. Continue to support the Kerncrest chapter of the Audubon Society in conducting bird surveys at NAWS-CL, including the annual Audubon Christmas Bird Count.

B. Coordinate and collaborate with conservation partners focusing on key issues, coordinated monitoring, and institutional support in state and federal agencies for bird conservation (North American Bird Conservation Initiative, EO 13186, DoD-USFWS MOU, and Under Secretary of Defense Memorandum 2007).

C. Ensure that plans and actions promote comprehensive migratory bird planning efforts such as the West Mojave Plan; CalPIF Desert Bird Conservation Plan and other California and national PIF plans; U.S. National Shorebird Plan; North American Waterfowl Management Plan; Ducks Unlimited Conservation Plan for North American Waterfowl; as well as guidance from other sources.

1. Participate in the avian conservation community through attendance at PIF meetings and other professional conferences. Use information collected from partnership programs to better support DoD mission requirements.

V. Conduct inventory and monitoring that will provide data for adaptive management.

A. Conduct baseline and long-term monitoring of key avian species and populations at NAWS-CL (MBTA, EO 13186, Under Secretary of Defense Memorandum 2007).

1. Use a survey design that accounts for seasonal change in avian distribution and that seeks to represent all key habitat types.

2. Integrate methods and coordinate with the DoD Coordinated Bird Monitoring Plan through an approach that (a) Is driven by Station issues; (b) Considers quantitative methods; (c) Coordinates with other initiatives and with natural resource managers; (d) Is consistent with the DoD plan for monitoring species of concern on DoD lands; and (e) Considers the DoD role in continental bird monitoring programs (EO 13186, DoD-USDI MOU, and Under Secretary of Defense Memorandum 2007).

VI. Improve awareness of migratory bird stewardship through education, outreach, and public access to bird locations.

A. Provide training and information to employees on legal compliance to avoid and minimize take and conserve and restore habitat (EO 13186).

1. Continue to conduct briefings and biological monitoring of construction and maintenance work to ensure compliance with the MBTA.

VII. Support research that provides a benefit to conservation of migratory birds (Under Secretary of Defense Memorandum 2007).

A. Support research that demonstrates stewardship, leadership, and partnership through the DoD Legacy Program (http://www.dodlegacy.org) and through DoD's Strategic Environmental Research and Development Program.

VIII. Comply with the take avoidance and reporting requirements that relate to the MBTA, Bald and Gold Eagle Protection Act, and ESA.

The MOU between the DoD and USFWS to Promote the Conservation of Migratory Birds outlines a collaborative approach to promote the conservation of bird populations. It was developed to support the EO 13186 "Responsibilities of Federal Agencies to Protect Migratory Birds" rather than the MBTA. It addresses procedures for addressing incidental take of migratory birds during non-readiness activities under the MBTA.

A. Comply with the military readiness MBTA-Migratory Bird Rule.

1. Develop and implement conservation measures for the effects of military readiness activities on migratory birds, if an action may have a significant adverse effect on a migratory bird population.
   a. Identify species that may be impacted and the military readiness activities that may affect them.
      i. Determine if the identified impacts are significant (as defined in the Migratory Bird Rule).
2. Consider effects of any wildfires caused by military readiness activities on bird populations. Manage fire to reduce effects on bird populations (see Section 4.4).

B. Comply with the MBTA for non-readiness activities.

1. Incidental Take. Informal consultation will be used to minimize incidental take from non-readiness activities on the species listed under the MBTA (in 50 Code of Federal Regulations 10.13).
2. Intentional Take. Formal notification of intentional take will be provided to the USFWS in advance of the activity (DoD-USFWS MOU). Disputes regarding compliance with migratory bird laws will be handled according to a process described in the MOU.
   a. Update and acquire new MBTA depredation permits, especially for concerns at the airfield (BASH).

Implement actions related to the interagency MOU and Environmental Assessment on managing the Common Raven in the Mojave Desert for its effect on threatened and endangered species.

C. Comply with the ESA, MBTA, and NEPA with regard to take of Common Ravens, which are predators of the federally threatened Mohave Desert Tortoise.

1. Operate in compliance with the Raven Management MOU and Environmental Assessment (Appendix B).

2. Breeding bird surveys conducted in Mohave Desert Tortoise habitat should include raven survey protocols to address the requirements in the Raven MOU.

4.7.7 Mammals

Related Sections

3.5.7 Mammals
3.5.7.4 Feral Horses and Burros
3.5.8 Federally Listed Species
4.7.7.1 Feral Horses and Burros
4.8.1.4 Mohave Ground Squirrel
Appendix I: Species List

Summary of Management Issues for Mammals

Management of mammals consists primarily of maintaining current population levels through habitat protection and conducting surveys to determine species distribution and abundance. Comprehensive surveys and taxonomic clarification are needed for many mammal species at NAWS-CL.

For the current status and management of mammals, see Section 3.5.7.

Protection of key roosting and foraging sites, water sources, and food supply are keys to the management of healthy bat populations (Brown-Berry 1996). Any activity near mines should be avoided when possible. Known roosting or breeding sites should be adequately signed or gated to prevent entry.

NAWS-CL has conducted a cooperative bighorn sheep reintroduction and herd maintenance program with CDFW since the early 1980s. Ground-based surveys and helicopter surveys using CDFW methodology are completed approximately every two years.

Management Strategy for Mammals

Project Summary	Legal Driver
Conduct genetic and taxonomic studies on the vole and shrew populations. Consider conducting additional surveys to determine the range of these animals.	Sikes Act (as amended)
Consider installing bat gates at mines with roost or maternity colonies.	Sikes Act (as amended), DoD-Bat Conservation International MOU on bat conservation
Continue to monitor bighorn sheep.	Sikes Act (as amended), National Park Service Cooperative Agreement
Conduct additional mammal surveys, particularly for bats.	Sikes Act (as amended)

Objective and Guidelines for Mammals in General

Objective: *Manage a diversity of native habitats and conditions for native mammals with small to large ranges. Ensure military and natural resource project planning takes into consideration potential effects to native mammals, especially those with special status.*

Metric: *Mammal occurrence, habitat use, and population status are better described through funding research and implementing surveys. Continue to conduct surveys, fund research efforts, and develop partnerships that enhance desert bighorn sheep and Mohave ground squirrel conservation.*

I. Monitor known species and document their occurrence.

A. Monitor bat maternity and hibernation colonies to determine population trends. These colonies should be entered only every other year to reduce disturbance to bats.

B. Bighorn sheep should be monitored every one to two years using helicopter surveys.

C. Conduct additional mammal surveys for long-term trend study efforts and other projects.

II. Support research investigating mammal populations, distributions, and habitat requirements.

A. Conduct genetic and taxonomic studies on voles and desert shrews to determine status.

B. Support investigation of presence of white nose syndrome in local bats.

Support the 2006 MOU for bat conservation on military lands to "develop a policy of cooperation and coordination between the DoD and Bat Conservation International."

III. Consider placing bat gates at Redwing Mine, lower Star of the West Mine, and the Josephine Mine, as well as other important roosting and maternity colonies in mines (Brown-Berry Biological Consulting 1996).

A. Gates should be placed during winter after inspection of the mine to determine that individuals are inactive.

B. Open and gate the lower adit to the Argus Sterling Mine to increase air flow to improve the hibernation site, which may then support a maternity colony.

IV. Place signs at important mine entrances stating that EMD must be contacted to determine compatibility prior to use of mines.

V. Maintain open water areas to ensure availability for bats.

VI. Maintain and improve bighorn sheep and Mohave ground squirrel habitat.

A. Maintain existing water developments, construct additional water developments, and protect/improve springs, seeps and riparian habitat, consistent with the military mission.

B. Consider the Range-wide Plan for Managing Desert Bighorn Sheep Habitat on Public Lands (BLM 1988b) and other applicable regional approaches.

4.7.7.1 Feral Horses and Burros

Related Sections

3.5.7.4 Feral Horses and Burros
4.2.1 Surface Water Resources, Springs, and Seeps
4.5 Vegetation and Habitats
Appendix M: Wild Horse and Burro Management Plan

Summary of Management Issues for Wild Horses and Burros

For the current status and management of wild horses and burros, see Section 3.5.7.4.

A draft of a NAWS-CL Wild Horse and Burro Management Plan (WHBMP) was completed in 2011. The BLM and NAWS-CL jointly conduct horse and burro roundups for the Wild Horse and Burro Adoption Program in order to reach maximum herd management population levels of 168 horses and zero burros. Currently, both the horse and burro numbers exceed the recommended herd size, and thus, need to be intensively managed. Burro roundups are conducted on a roughly annual basis in accordance with the 2010 MOA between the BLM and NAWS-CL.

Additional goals of the plan are to maintain a healthy and viable self-sustaining horse population, increase adoptability of horses by taking young animals, minimize management costs, and minimize damage to sensitive natural and cultural resources.

Management Strategy for Wild Horses and Burros

Project Summary	Legal Driver
Continue implementation of wild horse and burro management efforts to reach population levels of 168 horses and zero burros.	ESA (towhee protection), Sikes Act (as amended), WHBMP, California Desert Protection Act, EO 11990 Protection of Wetlands, BLM Interagency Agreement (03-1535-003)

Objective and Guidelines for Wild Horse and Burro Management

Objective: *Achieve a burro population of zero animals. Maintain the Centennial Horse Herd within a range of 100 to 168 animals, consistent with the appropriate management level identified in the California Desert Protection Act Plan. Keep the herd healthy, genetically viable, and self-sustaining. Minimize the cost of reducing and maintaining desired population levels. Minimize damage to water resources, riparian areas, uplands, and cultural resources through herd reduction, and thereby facilitate and increase the rate of native plant and animal population recovery.*

Metric: *Wild horse and burro herd sizes are reduced to levels outlined in the WHBMP. Damage from wild horses and burros is minimized. Wild horse and burro surveys are continued.*

I. Comply with the BLM Interagency Agreement (03-1535-003), the California Desert Protection Act (1994), the WHBMP, and the Wild Free-Roaming Horses and Burros Act (16 U.S. Code §§ 1331-1340, 15 December 1971, as amended 1978).

- **A.** Continue roundups with cooperation with the BLM in order to reach and maintain herd management levels of zero burros and 100 to 168 horses.
- **B.** Assess range habitat and vegetation health every three to five years. Use range habitat monitoring data, herd assessment numbers, and range habitat condition trends to determine where to focus roundup efforts.

II. Monitor the herds and provide information to the BLM.

- **A.** Conduct population surveys every year, if possible.

4.8 Federally Listed and Candidate Species

4.8.1 Threatened and Endangered Species

Related Sections

3.5.8 Federally Listed Species
3.5.8.1 Mohave Tui Chub
3.5.8.2 Mohave Desert Tortoise
3.5.8.3 Inyo California Towhee

Management Issues for Threatened and Endangered Species

Threatened and endangered species are managed through BOs and MOUs issued by the USFWS. The EMD works closely with range users to manage and protect listed species and their habitats.

The federal ESA, Sikes Act (as amended), applicable DoD and Navy regulations, California Desert Protection Act, Federal Land Policy and Management Act, and OPNAVINST 5090.1C CH-1 all affect management of threatened

and endangered species on NAWS-CL. In addition, all Navy installations with federally listed threatened, endangered, or candidate species must structure the INRMP to avoid the designation of Critical Habitat.

The primary objective of the natural resources program is to ensure continued access to land and air space required to accomplish the Navy mission. Biodiversity conservation supports ecosystem integrity and sustainability, and maintains natural landscapes for realistic military testing, training, and operations.

Federally listed threatened and endangered species management is coordinated with the USFWS and with other appropriate land managers. At this time, listed species continually occurring at NAWS-CL and presenting management issues include the Mohave tui chub, the Mohave Desert Tortoise, and the Inyo California Towhee. Lane Mountain milk-vetch, which was listed as endangered by the USFWS in 1998, occurs south and southeast of NAWS-CL; however, it has not been observed on the Station despite several focused survey efforts. The state-listed Mohave ground squirrel is also known to occur on Station. Special Status Species are managed primarily by minimizing impacts to the species or its habitat.

The CDFW has designated certain species found within California as either endangered or threatened. These species have specific state driven legal protection as described in the California Endangered Species Act (as amended in 1984). The official California listing of endangered and threatened animals is contained in the California Code of Regulations, Title 14, Section 670.5. These species are managed on-Station as NAWS-CL Special Status Species.

Objective and Guidelines for Threatened and Endangered Species

Objective: *Maintain viable populations and facilitate the recovery of threatened and endangered species on NAWS-CL.*

Metric: *Management practices protect and enhance endangered species populations. All relevant BOs are implemented. NAWS-CL participates in regional conservation efforts that support the delisting or downlisting process.*

I. Implement ESA and Section 7 BO requirements.

II. Develop or maintain long-term programmatic agreements and conduct formal and informal consultations with the USFWS early in the project planning process for all actions that may affect listed species.

III. Develop a GIS database detailing the locations of individuals, populations habitats, population survey results and breeding sites of all federally listed species and species of concern.

4.8.1.1 Mohave Tui Chub

Related Sections

3.5.8.1 Mohave Tui Chub

Summary of Management Issues for the Mohave Tui Chub

For the current status and management of Mohave tui chub, see Section 3.5.8.1.

Currently, the Mohave tui chub is managed through implementation of USFWS BOs and tasks identified in the Recovery Plan. The most recent are two issued in 1997, with amendments issued in 2002 and 2003. Management is accomplished primarily through the maintenance and improvement of the Mohave tui chub habitat in the Lark Seep system by removal of invasive aquatic vegetation, such as cattails, to maintain open water habitat; mark-recapture studies to monitor population levels in the system; and water quality monitoring.

Management Strategy for Mohave Tui Chub

Project Summary	Legal Driver
Continue to maintain and enhance habitat. Plant non-invasive species, such as bulrush, in Mojave tui chub habitat to prevent cattail reinvasion. Continue water quality monitoring.	ESA
Continue mark-recapture studies to examine population dynamics and distribution.	ESA
Continue to work with CDFW, USFWS, and other organizations to facilitate establishment of populations in other refugia.	ESA

Objectives and Guidelines for the Mohave Tui Chub

Objective: *Maintain a viable Mohave tui chub population in the Lark Seep system.*

Objective: *Provide support and take actions favoring Mohave tui chub recovery and/or downlisting by the USFWS.*

Metric: *The Mohave tui chub population at NAWS-CL remains healthy and genetically viable. Management efforts continue to reduce cattail extent. Transplantation of three-square bulrush continues where practical. Long-term habitat enhancement efforts provide a more stable environment. Continue monitoring efforts, partnerships, and the implementation of the BO to enhance Mohave tui chub conservation and eventual downlisting.*

I. Continue to establish diverse pond and channel characteristics to provide the water quality and quantity necessary for Mohave tui chub recruitment.

- **A.** Develop an emergency plan and be prepared to implement it if the survival of the chub population is threatened.
- **B.** Develop and implement a long-term, low maintenance plan to improve and maintain Mohave tui chub habitat. Conduct a prescribed burn to control cattail growth in the east end of the Lark Seep System. Subsequently, conduct mapping and hydrologic and topographic surveys of the Lark Seep System. Using the survey data, partner with USFWS and CDFW to design and implement an effective plan.

II. Continue long-term habitat monitoring.

- **A.** Regularly monitor water quality of the Lark Seep system within the channels, including dissolved oxygen, pH, temperature, toxics, and other parameters.
- **B.** Monitor flow rates in Lark Seep channels.
- **C.** Support Mohave tui chub research leading to a better understanding of habitat requirements with the goal of founding new refugia (ideally returning them to their native Mojave River), which would reduce the critical importance of the Lark Seep population.

III. Conduct chub population censuses, preferably annually, but not less than every three years, with confirmation of chub presence at regular intervals between major census efforts.

IV. Implement actions to maintain genetic diversity within the Lark Seep populations and among the other populations of Mohave tui chubs. Species-specific stocking techniques should be developed, and differences

in water chemistry between refugia should be considered. Some evidence suggest that Mohave tui chub at NAWS-CL persist in habitats that have lower dissolved oxygen than of content that other refugia.

A. Conduct research to identify factors to ensure successful transplants into other aquatic systems with the goal of recovery and eventual delisting of the species. The Mohave Tui Chub Recovery Plan identifies the need for a minimum of six populations of at least 500 fish that are sustained, with two of the refugia located adjacent to their native Mojave River habitat, before reclassifying the species as threatened.

4.8.1.2 Mohave Desert Tortoise

Related Sections

3.5.5 Reptiles and Amphibians
3.5.8.2 Mohave Desert Tortoise

Summary of Management Issues for the Mohave Desert Tortoise

For the current status and management of Mohave Desert Tortoises, see Section 3.5.8.2.

Management of the Mohave Desert Tortoise at NAWS-CL is driven by the most recent programmatic BO issued by the USFWS and the Mohave Desert Tortoise Recovery Plan. This document contains guidelines for project review and standard mitigation measures for all tortoise habitat on NAWS-CL. An annual report is submitted to the USFWS with information on all surveys of new projects completed by NAWS-CL and the resultant impacts to Mohave Desert Tortoise. In addition, the report includes all mitigation actions and their effectiveness. The 2013 BO also stipulated specific avoidance measures that deal with the minimization of threat of fire to Mohave Desert Tortoise.

An Environmental Assessment proposing methods to reduce raven predation on the Mohave Desert Tortoise and other reptiles and mammals throughout the deserts of southern California was published in 2008 by the USFWS. The proposed action involves a combination of a reduction in the human subsidies to the raven population (in the form of food, water, and nest sites) and removal of individual ravens that are known predators of Mohave Desert Tortoises (USFWS 2008). Coordination of raven management with the USFWS, USDA Animal and Plant Health Inspection Service, and BLM should be a key component of Mohave Desert Tortoise management on NAWS-CL.

Management Strategy for Mohave Desert Tortoise

Project Summary	Legal Driver
Continue to monitor Mohave Desert Tortoise abundance and trend, avoidance and minimization measures specific to fire threat management, and other elements of the 2013 BO.	ESA, Sikes Act (as amended)
Periodically evaluate range operations and potential impacts to ensure compliance and applicability of the current BO.	ESA
Continue to support monitoring and research on Mohave Desert Tortoise by outside agencies.	ESA

Objectives and Guidelines for Mohave Desert Tortoise

Objective: *Minimize take of the Mohave Desert Tortoise on NAWS-CL through compliance with the current BOs issued to NAWS-CL for this species.*

Objective: *Implement Recovery Plan actions to improve and maintain stable Mohave Desert Tortoise populations and improve and maintain designated Critical Habitat to contribute to eventual delisting.*

Metric: *Continue implementation of recovery actions, monitoring efforts, and partnerships to enhance Mohave Desert Tortoise conservation. Continue implementation of the BO to minimize the adverse effects to and take of the Mohave Desert Tortoise.*

I. Continue to monitor Mohave Desert Tortoise abundance and trend.

- **A.** Methods will be in compliance with range-wide monitoring plan and conducted in a way to ensure statistical validity.

II. Implement avoidance and impact minimization measures to reduce conflicts with the Mohave Desert Tortoise and its habitat, as compatible with mission requirements.

- **A.** Maintain corridors to adjacent populations (to allow genetic flow) by avoiding habitat fragmenting construction activities or operations whenever possible.
- **B.** Periodically evaluate range operations, and potential impacts to ensure compliance and applicability of the existing BO.

III. Maintain habitat quality and integrity.

- **A.** Implementation of procedures to minimize the occurrence and severity of wildland fires in the Superior Valley as described in the Final Environmental Impact Statement (Section 4.4.3.3, p. 4.4-7).

IV. Continue surveys to refine knowledge and monitor tortoise distribution, density, and population health at NAWS-CL.

- **A.** Conduct surveys to assess population health during the spring and fall activity periods so that some live animals can be checked for symptoms of upper respiratory tract disease, herpesvirus and shell diseases.
- **B.** Consider establishment of at least two long-term trend study plots (or hectare plots) to look at fertility, fecundity, and other demographic parameters.

V. Develop a database of locations of incidental sightings and survey results.

VI. Participate in regional planning initiatives to help establish stable tortoise populations.

- **A.** Coordinate management of Mohave Desert Tortoise Critical Habitat at NAWS-CL to ensure compatibility with the Superior-Cronese Management Unit and designated Critical Habitat in Superior Valley.

4.8.1.3 Inyo California Towhee

Related Sections

3.5.6 Birds
3.5.8.3 Inyo California Towhee

Summary of Management Issues for the Inyo California Towhee

For the current status and management of Inyo California Towhee, see Section 3.5.8.3.

In the most recent five-year review (USFWS 2008b), the USFWS recommended Inyo California Towhee delisting, due to a stable population across its range in the mountains of the northern Mojave. However, the towhee is not currently in the process of being delisted. Management of the Inyo California Towhee on NAWS-CL is now guided by the Cooperative Management Agreement that the Station entered into in 2010 with the USFWS, CDFW, and BLM (USFWS 2010). Under the guidance of this document, NAWS-CL has five general topics of management to help preserve this species long-term. These are: planning

consideration, conducting long-term monitoring, feral horse and burro removal, fencing of riparian areas, and invasive plant removal (USFWS 2010).

Management Strategy for Inyo California Towhee

Project Summary	Legal Driver
Continue to conduct surveys and population assessments in the known range of the towhee and continue to investigate other potential habitat in the North Range.	ESA, DoD Partnership
Continue habitat protection and enhancements, such as controlling horse and burro numbers and access in riparian areas and controlling invasive plants. Consider initiating habitat recovery monitoring in habitat impacted by wildfires.	ESA, EO 13186

Objectives and Guidelines for Inyo California Towhee

Objective: *Ensure long-term population viability of the Inyo California Towhee.*

Objective: *Continue long-term monitoring in conjunction with the BLM and CDFW.*

Objective: *Continue habitat enhancement.*

Metric: *Continue monitoring efforts, partnerships, and implementation of the conservation management area to enhance Inyo California Towhee conservation and support eventual delisting. Ongoing riparian protection efforts provide long-term habitat viability and increase potential habitable areas. Habitats at NAWS-CL sustain an Inyo California Towhee population that is stable and robust.*

I. Continue to participate in the implementation of the recovery plan and other regional planning initiatives to help establish and maintain stable towhee populations.

- **A.** Continue to encourage redirection of new surface-disturbing activities away from areas within known or potential towhee habitat.
- **B.** Follow the existing CMA to conduct routine maintenance and other activities within towhee habitat.
- **C.** Coordinate with BLM and the CDFW to manage NAWS-CL towhee habitats in a manner that is compatible with the designated Critical Habitat in adjacent BLM and State lands.
- **D.** Continue to follow conservation measures outlined in the 2010 Cooperative Agreement.

The Commanding Officers of shore activities holding Class 1 plant accounts shall conduct surveys and other appropriate actions as necessary to document the presence of threatened or endangered species, identify currently used and periodically/indirectly used habitat for these species and assist in the determination of whether any such habitats should be designated as "Critical Habitats" (OPNAVINST 5090.1C CH-1).

II. Conduct range-wide surveys for towhees to determine population status.

- **A.** Survey all known and potential towhee habitat at least every four years.
- **B.** Surveys should cover all towhee habitats simultaneously.
- **C.** Funding and research design will require coordination with the BLM and CDFW.
- **D.** Concurrent surveys for brown-headed cowbirds should be conducted alongside towhee surveys.
- **E.** Continue to fund and support research efforts to determine towhee distribution, habitat requirements, and other population characteristics and establish and implement protocol to monitor population size, population trends, juvenile dispersal, and use of marginal habitats.

III. Continue reducing horse and burro populations to designated management levels.

IV. Fence springs to prevent negative impacts by horses and burros. Maintain adjacent upland habitat in good condition for towhee foraging and nesting.

V. Remove invasive plant species (e.g., tamarisk) from towhee habitat.

4.8.1.4 Mohave Ground Squirrel

Related Sections
3.5.7 Mammals

Summary of Management Issues for Mohave Ground Squirrel

For the current status and management of Mohave ground squirrel, see Section 3.5.7.

With no federal status, the Mohave ground squirrel has not been a primary focus of specific management efforts at NAWS-CL. Surveys and habitat mapping are needed to more accurately determine the size and distribution of the population across the Station to ensure that this species does not become federally listed. Management of the Mohave ground squirrel has been conducted primarily by outside researchers, especially in the geothermal area. Mojave ground squirrel habitat is protected by default by Mohave Desert Tortoise Critical Habitat and management. Additionally, the Common Raven has been suggested as a potential predator of this species, so any future raven removal efforts in conjunction with Mohave Desert Tortoise protection would also benefit the squirrel.

Management Strategy for Mohave Ground Squirrel

Project Summary	Legal Driver
Continue to support efforts to study and monitor the Mohave ground squirrel.	Sikes Act (as amended)

Objectives and Guidelines for Mohave Ground Squirrel Management

Objective: *Maintain a large and healthy Mohave ground squirrel population to assist in avoiding federal listing of the species.*

Metric: *The Mohave ground squirrel maintains its current range and abundance on NAWS-CL.*

I. Continue to support population monitoring of the Mohave ground squirrel population by outside researchers.

II. Continue habitat management in conjunction with Mohave Desert Tortoise management.

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5.0 Sustainability and Compatible Use at NAWS-CL

This chapter summarizes the compatibility and sustainability of natural resources management strategies and establishes a tangible link to sustaining the military mission. This chapter considers how to sustain natural resources through planning, regulatory compliance, public outreach, and linking to other programs and partners both internal and external to Naval Air Weapons Station China Lake.

5.1 Supporting Sustainability of the Military Mission in the Natural Environment

Related Sections

1.4.2 Mission Sustainability and the INRMP "No Net Loss" Requirement
3.1 Ecoregional Setting

The Sikes Act (as amended) stipulates that this Integrated Natural Resources Management Plan (INRMP) provides for "no net loss in the capability of the military installation lands to support the military mission of the installation."

All DoD natural resources conservation program activities shall work to guarantee DoD continued access to its land, air, and water resources for realistic military training and testing and to sustain the long-term ecological integrity of the resource base and the ecosystem services it provides, in accordance with Sections 670a-670o of Title 16 U.S. Code (Sikes Act [as amended]) (DoD Instruction 4715.03).

The purpose of this section is to address U.S. Department of Defense (DoD) and U.S. Department of the Navy (Navy) guidance that directs that the INRMP describe the natural resources that make training and operational requirements possible, and how mission requirements are met while meeting natural resource compliance responsibilities. "Appropriate management objectives to protect mission capabilities of installation lands (from which annual projects are developed) should be clearly articulated and should be high in INRMP funding priorities" (Navy 2006a).

Broadly speaking, sustainability takes a long-term view of natural resources stewardship, Navy mission accomplishment, compliance responsibility, and regional economic prosperity and encompasses:

- Sustainability of the Navy mission at Naval Air Weapons Station China Lake (NAWS-CL) with respect to how natural resources support this mission and how natural resources constraints and conflicts are managed;
- Compliance practices that facilitate Navy mission accomplishment, especially time-critical military actions;
- Best management practices (BMPs) for the use of renewable and non-renewable resources and how pollution and wastes are prevented and processed (see Section 1.7.2);
- Resource use in the built environment (see Section 1.7.2);
- Preparing for climate change and regional growth;
- Using regional partnerships to manage encroachment concerns.

The DoD Template requires that the INRMP contain a section titled "Supporting Sustainability of the Military Mission and the Natural Environment" in order to: 1) Integrate Military Mission and Sustainable Land Use 2) Define Impact to the Military Mission 3) Describe to Range Complex Management Plan or other operational area plans.

Map 5-1 shows the local planning area sustainability or "Opportunities Map." The DoD Template indicates that this map should show potential buffer areas and corridors, areas where there are little to no restrictions on training, and potential encroachment partnering areas. Map 5-2 and Map 5-3 are "Constraints Maps." According to the DoD Template, the Constraints Map should show all the areas on the installation where restrictions on training or mission occur due to natural resources related issues, including listed species, soil erosion, invasive species, etc.

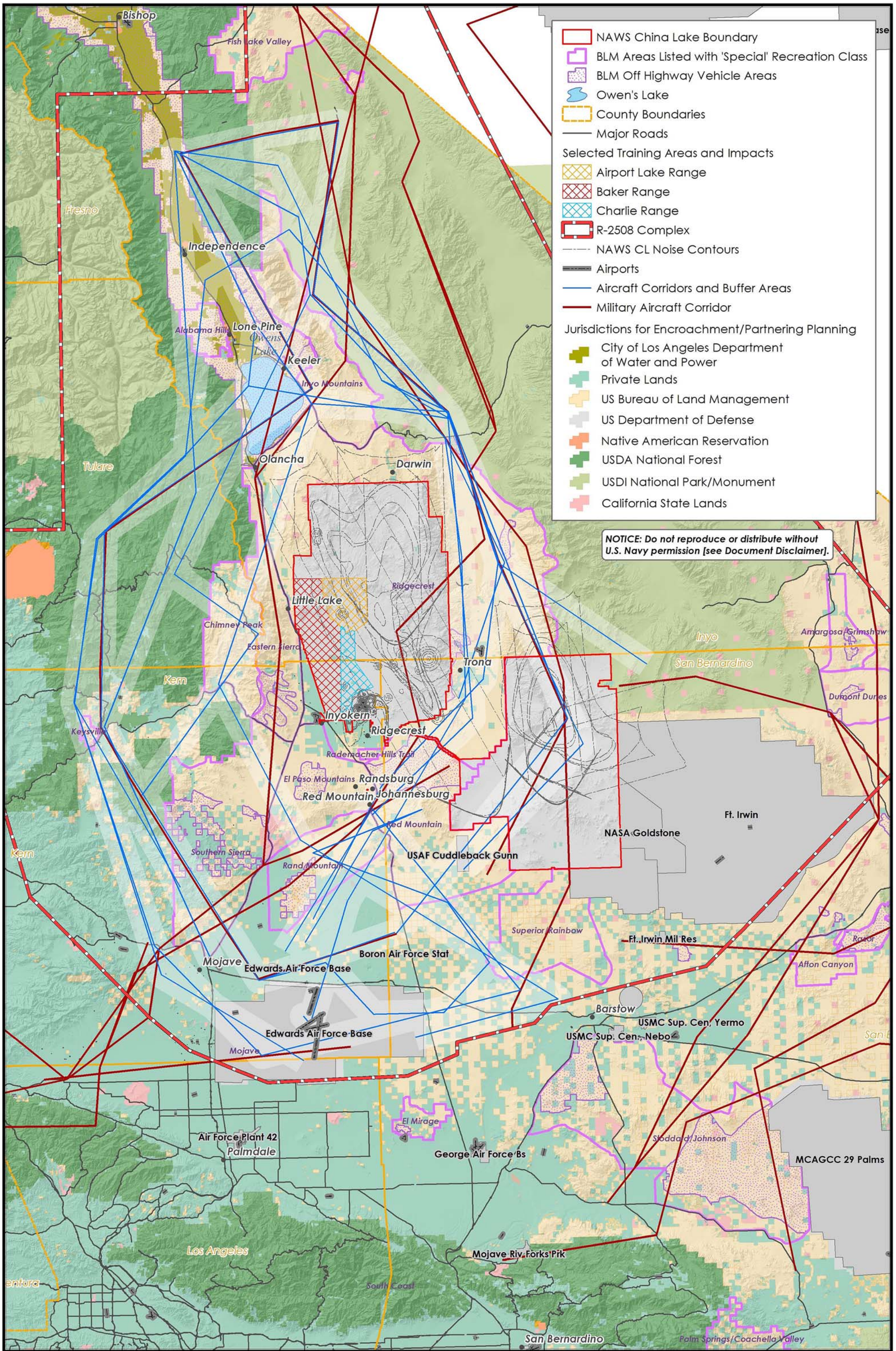
5.1.1 Integrated Military Mission and Sustainable Land Use Decisions

A successfully implemented INRMP will support the sustainability of natural resources and will ensure no net loss of the capability of installation lands to support the DoD mission. These two purposes are closely related and not mutually exclusive. Healthy ecosystems support realistic military training and testing needs by providing large open space, buffers, stable soils, clear air, clean water, and a range of natural conditions that are available for the indefinite future.

Current uses and operations create clear patterns on the landscape particularly in Baker, Charlie, and the Airport Lake ranges, where the greatest number of Testing and Evaluation operations occur. Numerous other uses are distributed throughout the installation. Ground-disturbing land uses tend to be limited because target areas are well defined, confined in footprint, and managed to avoid unnecessary peripheral disturbance. Disturbance that characterizes the Station includes: facilities; target areas; special use sites; test facilities; instrumentation sites; and roads.

Important to the military mission is unencumbered access to flight corridors that extend far off Station lands. This requires coordination and partnership with neighboring jurisdictions. The Station has successfully worked within the purview of the General Plans of the City of Ridgecrest, and the three counties that contain Station lands, to coordinate review of development concerns near Station borders. In the case of the San Bernardino General Plan, a 1-mile Safety Area outside the 65 Ldn noise contour from Armitage Field (see Map 5-1) is defined where there are certain development restrictions or a referral for military review.

Map 5-1. Opportunities map for Naval Air Weapons Station China Lake.



Partnering Opportunities Map for NAWS China Lake

Integrated Natural Resources Management Plan, NAWS China Lake

N W E S

Miles
0 5 10 15 20

Kilometers
0 10 20 30 40

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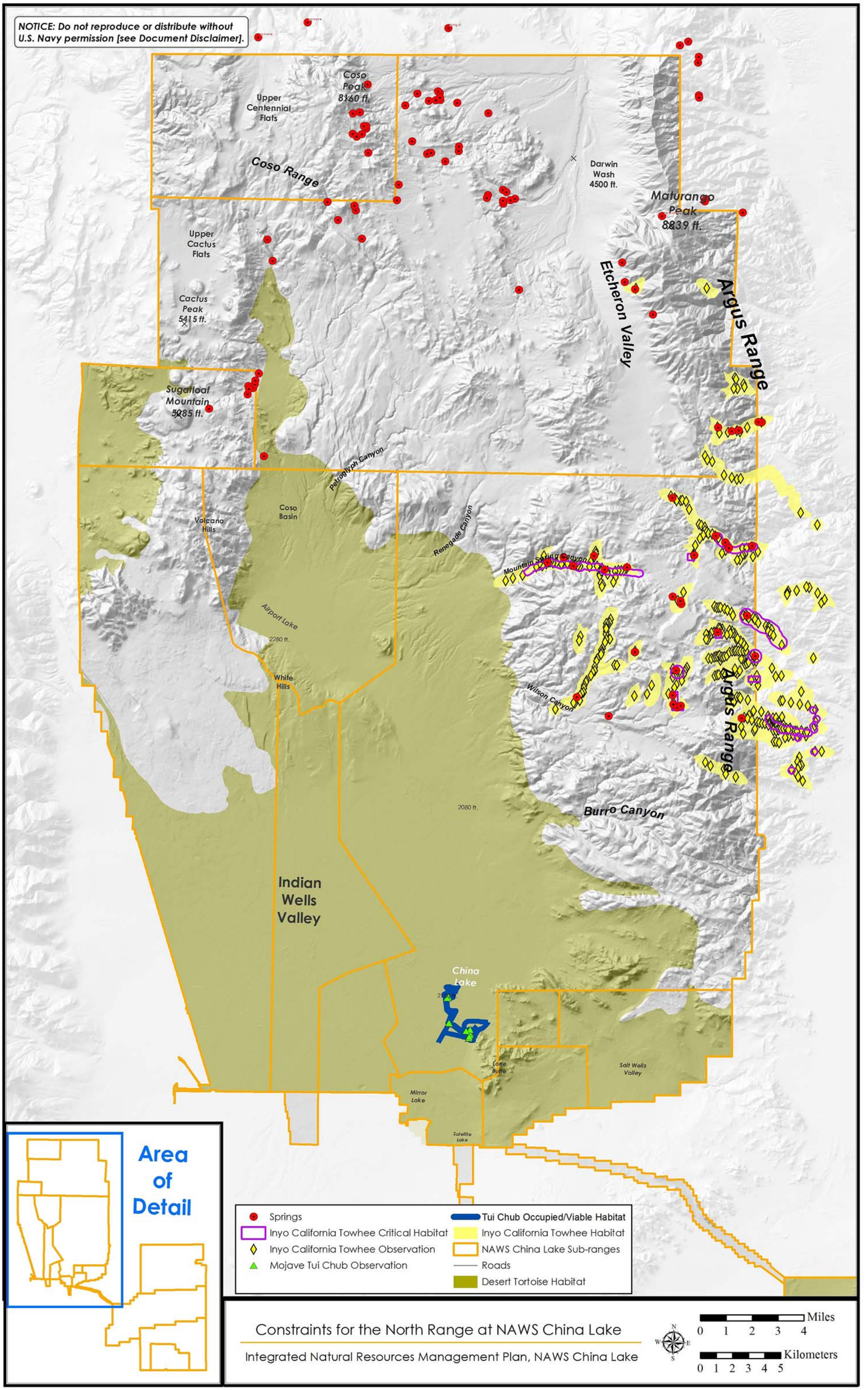
Map 5-2. Constraints for Naval Air Weapons Station China Lake's North Range.



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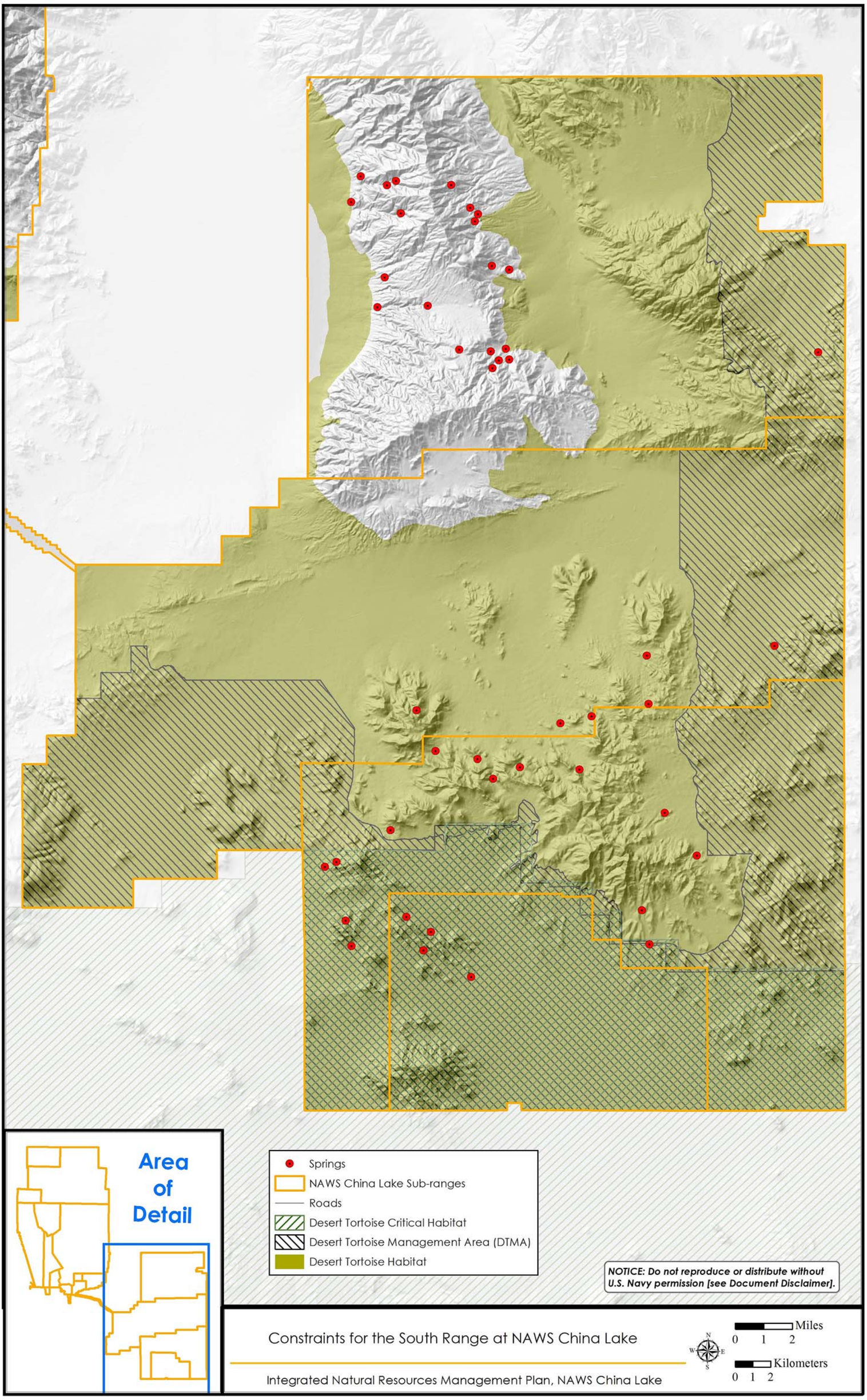
Map 5-3. Constraints for Naval Air Weapons Station China Lake's South Range.



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NAWS-CL facilitates the conduct of a broad range of air and surface tests and training activities that provide data to support the acquisition of weapons systems. To respond to theater requirements and complete test or training events in a reasonable timeframe, there must be flexibility to conduct the following:

- Pre-event/set-up activities. Involves the installation/placement of portable/stationary instrumentation or equipment for event monitoring and data acquisition near target and test sites and at other remote locations. Also, entails shallow trenching to cover cables and instrumentation, and burying certain targets up to 3 meters to simulate theater conditions.
- Target-related activities. Includes target construction, placement/installation, maintenance, recovery, removal, clean up (including remediation of any released hazardous substances), and disposal.
- Launch activities. Involves the air or ground launch of a test article or target.
- Post-event/teardown activities. Involves test article recovery, instrumentation/equipment teardown, removal of buried targets and instrumentation, and clean-up of the test site, including remediation of any released hazardous substances.
- Off-road activities. These ground-disturbing activities will only be performed in areas where resources issues (primarily natural and cultural) have been assessed and resolved (Navy 2011).
  - Use of vehicles or mechanical equipment in support of any above mentioned activity.
  - Operation of mobile targets to simulate theater relevant threats.
  - Operation/access of personnel, vehicles, and unmanned systems to unique terrain such as mines, caves, tunnels, sloped areas, and vegetated areas to satisfy unique test/training requirements.
  - Removal of used targets, recovery of crashed vehicles and remediation of any released hazardous substances.

Summary of Issues for Sustaining the Military Mission in the Natural Environment at NAWS-CL

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 pursuant to DoD Directive 3200.15, "Sustainment of Ranges and Operating Areas" 21 November 2003.

- The Sikes Act (as amended) requires that ties between natural resources management and military readiness are fully analyzed. The "no net loss" policy is broadly accomplished by the Comprehensive Land Use Management Plan (CLUMP) goals cited above.
- Each year the Commanding Officer of NAWS-CL must answer, as part of the INRMP metrics review, questions (see the outline below) regarding coordination between Environmental Management Division (EMD) and operations for INRMP updates; environmental compliance and its effect on the military mission; integration between EMD and mission requirements; and whether there has been any net loss of training lands due to implementation of the INRMP. Benchmarks specific to NAWS-CL should aid natural resources managers in evaluating compatibility. Examples of mission-natural resource metrics are:
  - No delay in military work due to natural resource compliance;
  - Adequate land and air space unencumbered by competing uses, including safety and security buffers, and noise buffers;
  - Clean air with visibility for flying (low levels of dust and other suspended particulates, dark skies);
  - Sufficient groundwater resources into the future;
  - Access to terrain that varies in topography and cover condition;
  - Land disturbance that is confined in footprint or otherwise managed to the extent practicable.

- The Navy "shall restore or rehabilitate altered or degraded landscapes and associated habitats to promote native ecosystems and land sustainability when such action is practicable and does not conflict with military mission or capabilities consistent with Executive Order (EO) 13514" (DoD Instruction [DoDI] 4715.03).
- Wildland fires caused by mission-related activities have resulted in altered and possibly long-term degraded landscapes.
- Direct soil disturbing activities to the most tolerant soils when practicable.
- Encroachment issues with indirect to natural resources include development and other land uses under flight corridors, frequency spectrum incompatibilities, trespass, and cultural resource compliance issues.

Management Strategy for Sustaining the Military Mission in the Natural Environment at NAWS-CL

Project	Legal Driver
Continue to expedite and refine the project review and approval process.	National Environmental Policy Act, Sikes Act (as amended)
Periodically review suitability of existing terms and conditions of Biological Opinions and resolve uncertainties with applicability of the Migratory Bird Treaty Act military readiness waiver.	Endangered Species Act, Migratory Bird Treaty Act, Sikes Act (as amended)
Implement military readiness waiver as applicable.	Migratory Bird Treaty Act
Maintain adequate natural resources staff to support ongoing mission requirements.	Sikes Act (as amended)

Since most of the Station's land areas function as safety and security buffer zones, sustainable land use is relatively compatible with mission requirements. Most day-to-day activities at NAWS-CL have little potential to impact natural resources. Existing test sites are routinely re-used, taking advantage of existing instrumentation and infrastructure and avoiding environmental costs associated with establishing new areas.

The National Environmental Policy Act (NEPA) site approval process is used to manage environmental compatibility with the military mission. Additionally, the CLUMP and draft Encroachment Action Plan (Navy 2008b) established the following goals for managing lands under its jurisdiction.

All DoD natural resources conservation programs shall be integrated with mission activities, installation planning and programming, and other activities as appropriate (DoDI 4715.03).

1. Core Military Capabilities. Maintain and enhance training, and mission-support capabilities.
2. Efficient Land Use. Improve land use management practices to more efficiently accommodate the ongoing mission.
3. Resource Compliance, Environmental Quality, and Stewardship. Ensure compliance with statutes and regulations to maintain environmental quality and to exercise responsible stewardship of public lands.
4. Safety and Security. Ensure public health and safety by maintaining a secure military operating environment on Station-administered lands.
5. Coordination and Cooperation. Maintain and enhance coordination and cooperation with neighboring communities, agencies, and organizations to ensure compatibility of off-Station land uses with the Navy's mission.
6. Compatible Nonmilitary Land Use. Provide reasonable accommodation of nonmilitary land use to the extent practicable.

Objectives and Guidelines for Sustaining the Military Mission in the Natural Environment

Objective: *Achieve the mission of the Navy without decline to the land, air, and water assets that support this mission and enhance mission sustainability and contribute to the further conservation of a viable regional ecosystem.*

Objective: *Achieve no net loss of military value and minimize the cost of environmental compliance, and provide high-quality information to support science-based decisions.*

I. Ensure the Commanding Officer's preparedness to answer INRMP metrics review questions (Deputy Assistant Secretary of the Navy Installations and Environments 22 August 2006; DoDI 4715.03) including:

- Does the natural resources team consult with operators when making changes to the INRMP to keep it current?
- To what degree is the INRMP and its associated actions supporting sustainment of the current and future mission?
- Has there been a net loss of training lands?
- Does the INRMP process effectively consider current mission requirements?

The DoD Components shall use Natural Resources Conservation metrics to assess INRMP implementation, measure conservation efforts, ensure no net loss of military testing and training lands across the various installations, understand the conservation program's installation mission support, and indicate the success of partnerships with the U.S. Fish and Wildlife Service, and state fish and wildlife agencies (DoDI 4715.03).

II. Protect unique characteristics of the range (CLUMP 2005).

A. Maintain land and airspace control to ensure safety, security, and operational readiness.

B. Promote policies and practices that enhance and conserve the environmental quality of range lands.

C. Maintain and enhance liaison with off-Station land management agencies to avoid mission encroachment from incompatible land uses.

1. Establish partnerships related to future groundwater security.
2. Support regional science partnerships related to evaluating threats and vulnerabilities of climate change and the future of natural resources, including air quality.

The prevention of encroachment should be a major issue detailed in the INRMP. Areas suitable for encroachment partnering agreements should be identified during the development and revision of INRMPs, mapped as a Geographic Information System theme and reported up the chain to program needed funding. It is important to work with your installation planners to identify natural areas adjacent to your installation, that if set aside through these agreements, can protect current and future mission requirements. Commander Navy Installations Command N46 is the resource sponsor for encroachment partnering projects (INRMP Guidance for Navy Installations 18 April 2006).

D. Conduct operations on previously disturbed land areas to the extent possible.

E. Conduct surveys prior to new land disturbance activities.

F. Develop a wildland fire management plan to reduce the frequency and severity of wildland fires.

G. Conduct awareness briefings for personnel working in endangered species and sensitive habitat areas.

H. Ensure that safety and security requirements are incorporated into decisions relating to nonmilitary use of lands.

III. Comply with CLUMP objectives identified under the respective topic areas of the INRMP regarding groundwater; seeps and springs; habitat conservation; special status species; wild horses and burros; cultural resources; and hazardous materials.

IV. Secure the future of groundwater resources to support the military presence in the desert (see Section 2.3.10.2 and Section 5.1.2).

V. Define natural resources support benefits to the military mission.

- **A.** Safety and security, including safety and security buffers, for Navy property and operations are maintained or improved.
- **B.** There is improved certainty about environmental documentation timeframes and Navy project delays are minimized.
- **C.** There may be improved partnerships, including access to funds for projects from non-Navy sources.

VI. Address long-term threats to the stability of the natural environment (see Section 4.1 for details).

VII. Continue NEPA cumulative effects analysis, to guide specific projects, document choices, and guide long-term conservation efforts.

VIII. Maintain healthy habitats and restore degraded habitats to balance short-term projects with long-term goals.

- **A.** Identify and use fine-scale management units to analyze mission needs, compatibility with natural resources, and conservation of high-value habitats and species.
- **B.** Consider soil/vegetation resiliency in disturbance recovery planning.

5.1.2 Sustainable Water Resource Management

Groundwater use, water use efficiency, and surface waters developed for use at NAWS-CL are addressed here, and in Chapter 2. Water as a natural resource, including groundwater that comes to the surface at seeps and springs, is addressed in Chapters 3 and 4 (see also Appendix F for a summary of documentation on individual springs).

Summary of Management Issues for Water Resource Management

NAWS-CL realized a 23% reduction in water use from Fiscal Year 2008 to Fiscal Year 2010. NAWS-CL has continued to conduct groundwater investigations and aquifer tests to improve the Indian Wells Valley (IWV) groundwater model as well as to understand and locate additional groundwater resources within the IWV.

NAWS-CL has been continuing to use its groundwater even though it is not precisely known how much is in storage and may be available to meet demand in the long-term. Groundwater levels in the IWV continue to decrease at a rate of about 1 foot per year. As depth to groundwater increases, production and distribution costs increase and the potential exists for poorer quality water to mix with and degrade the higher quality water. Groundwater recharge and discharge characteristics of the aquifer are not fully understood to assess the adequacy of groundwater reserves to meet future demand (M. Stoner, pers. com. 2011).

Two recent (December 2013) groundwater model simulations completed by the Navy predict groundwater levels (through 2057) using 2012 water production numbers including 13,500 acre feet of new agricultural water consumption. The model simulations predict water levels decreasing to over four feet per year in the areas adjacent to the agricultural water production which will impact many domestic wells in the area. The model results also show coalescing cones of depression and groundwater gradient changes within the next fifteen years. The nearest Navy groundwater production wells are located approximately 2 miles southeast from the nearest new agricultural water well and the simulations exhibit increased water level declines of an additional 1-2 feet per year. The recent active agricultural development includes almost 3,000 acres of land planted with mostly pistachios and limited alfalfa. The recently developed land includes scattered plots bounded by Highway 395 to

the south, the lnyo County line to and adjacent to Brown Road along the eastern perimeter. All the recently developed land is located within Kern County.

Hydrogeologic impacts from the recent agricultural developments are expected to have immediate affects to water levels (water levels decreasing 100-200 feet by 2057) and possibly water quality degradation in the immediate areas near the agricultural production wells. Station wells are expected to experience slightly accelerated water level declines and possibly water quality degradation as time progresses. Per Navy groundwater model predictions, groundwater gradient changes near the Station groundwater wells will begin to occur around 2025. Also, desaturation of the upper part of the aquifer is expected to continue at a moderate pace, reaching about 20% of the aerial extent of the unit by 2057.

The Kern County Planning Department finished their Water Availability and Conservation Report in January 2014. The report compiled information from existing publications and formulated hydrogeologic concepts as well as future planning options for the Indian Wells Valley. NAWSCL has reviewed the report and concurs with the hydrogeologic conceptual model of the Valley as being a "closed" basin and that the groundwater basin has experienced a groundwater deficit (discharge exceeds recharge) since 1959. NAWSCL also supports the need for an immediate urgency well ordinance and that land use be commensurate with the water resources required to support its development until such time that a supplemental water source can be found with terms agreeable to all stakeholders in the Valley. NAWSCL is working with the other Stakeholders, including the County of Kern, to implement a plan for maximizing/enhancing the regional aquifer within the Indian Wells Valley. That cooperative plan should be finalized in the Spring/Summer 2014.

The key to confronting the groundwater supply challenge at NAWS-CL lies in a multi-pronged approach that includes efforts to better understand and characterize existing groundwater resources; to diversify current groundwater sources while identifying new ones in partnership with neighboring water users; and to continue to implement innovative water conservation strategies to reduce current use.

Management Strategy for Groundwater and Surface Water Use

Project	Legal Driver
Characterize groundwater storage in IWV to develop a plan to manage its use.	Senate Bill 1938 (groundwater management plan development)
Determine location and extent of brackish groundwater.	Senate Bill 1938 (addresses water quality issues)
Conduct additional aquifer testing to address data gaps in IWV groundwater model.	Senate Bill 1938 (addresses hydrogeologic data collection efforts)

Objectives and Guidelines for Groundwater and Surface Water Use Management

Objective: *Continue the management of groundwater resources through the implementation of the goals and guidelines contained in the IWV Cooperative Groundwater Management Plan to ensure the availability of high-quality potable water to meet the Station's long-term needs.*

DoD components shall use a watershed-based approach to manage operations, activities, and lands to avoid or minimize impacts to wetlands, groundwater, and surface waters on or adjacent to installations in accordance with the guidelines and goals established in the Unified Federal Policy for a Watershed Approach to Federal Land and Resource Management (pages 62565 through 62572 of Volume 65 of the Federal Register) (DoDI 4715.03).

I. Continue to implement the objectives of the IWV Cooperative Groundwater Management Plan in the interests of NAWS-CL, and as carried forward in the CLUMP. These objectives are:

A. Limit additional large-scale pumping in areas that appear to be adversely impacted and which are delineated in the IWV Cooperative Groundwater Management Plan.

B. Explore opportunities to distribute new groundwater extraction within the IWV in a manner that will minimize adverse effects to existing groundwater conditions (levels and quality), and maximize the long-term supply within the IWV.

C. Aggressively pursue the development and implementation of water conservation policy and education programs.

D. Continue to encourage the use of treated water, reclaimed water, recycled, gray, and lower quality water where appropriate and economically feasible (such as the golf course).

E. As part of the IWV Cooperative Management Group and in other partnerships, continue to explore the utility of and potential for other groundwater management methods beneficial to the IWV (such as water transfer, banking, imports, and replenishment).

F. Continue cooperative efforts to develop information and data which contributes to further defining and better understanding the groundwater resources in the IWV.

1. Continue to develop and implement a Water Sampling Plan, Water Level Measurement Protocol, and a Monitor Well Selection Protocol.

II. Work with Kern County and other stakeholders to develop an interagency management framework to implement and enforce the objectives of the Plan.

5.2 Adapting to Regional Growth and Climate Change

Related Sections

3.1 Ecoregional Setting
3.2.4 Climate Change in the Mojave

Summary of Management Issues for Adapting to Climate Change and Regional Growth

- Climate change is predicted to result in long-term changes to natural resources. The first communities affected at NAWS-CL may be pinyon pine and Joshua Tree Woodlands, which thrive in a limited ecological zone.
- The California Wildlife Action Plan (WAP) identifies climate change as one of four primary stressors affecting wildlife (along with growth and development, water management conflicts, and invasive species) and makes recommendations to include climate change science in restoration work (Bunn et al. 2007).
- Models are the only way to project future changes for the NAWS-CL region and to evaluate needed research, data collection, and management strategies. A range of scenarios is possible, using currently accepted models.
- Developing mitigation measures for climate change is an emerging issue for NEPA analysis.
- Specific natural resources concerns may become more pervasive in habitats due to their interconnectedness, such as the spread of invasive species and unsustainability of water use (Webb et al. 2009b; Bunn et al. 2007).

Management Strategy for Adapting to the Effects of Climate Change and Regional Growth

Project	Legal Driver
Develop a natural resources program framework for adapting to climate change. Develop vulnerability assessments and keep them updated. These may be done in partnership or in conjunction with regional Landscape Conservation Cooperatives or California Species of Special Concern with other DoD installations or agencies in the region.	DoDI 4715.03, EO 13514

Navy guidance for Navy INRMPs states that "the evidence for climate change is extensive and has generated consensus in the scientific community" (Naval Operation Instruction [OPNAVINST] 5090.1C CH-1, 30 October 2007). Natural resources managers need to be aware of anticipated changes in ecosystem structure and function that may result from climate change. The proposed framework for addressing climate change issues is incorporated in the strategy outline below.

All DoD Components shall, in a regionally consistent manner, and to the extent practicable and using the best science available, utilize existing tools to assess the potential impacts of climate change to natural resources on DoD installations, identify significant natural resources that are likely to remain on DoD lands or that may in the future occur on DoD lands and, when not in conflict with mission objectives, take steps to implement adaptive management to ensure the long-term sustainability of those resources (DoDI 4715.03).

NEPA court challenges have resulted in a legal requirement to analyze climate change and mitigate change in certain cases. As a result, analysis of climate change should be incorporated into NEPA documents. Proposed actions need to be analyzed for potential climate change related cumulative and incremental impacts in light of present and reasonably foreseeable future actions. NAWS-CL may increasingly expect to evaluate climate change impacts for projects requiring federal approvals or permits. Many projects undergoing NEPA analysis will either directly or indirectly cause greenhouse gas emissions. Strategies and techniques for analyzing these emissions are needed. Other projects may need to address climate change impacts to resources a project may impact (such as shifting habitat or species distributions, due to increases in temperature).

Objective and Guidelines for Adapting to Effects of Climate Change and Regional Growth

Objective: *Develop procedures for adapting to climate change on a local basis. Adapt and mitigate the adverse impacts of climate change through collaboration with other regional land managers.*

I. Consider developing graphical depictions of the potential impacts of climate change scenarios. Analysis should be on science-based models and the best available data sets in collaboration with other regional land managers (Intergovernmental Panel on Climate Change 2007; Scripps, Delta Vision Blue Ribbon Force 2008).

II. Develop a mitigation strategy to mitigate the consequences of climate change, including flooding, erosion, and loss of aquatic habitats to the extent practicable.

Navy guidance (2006) requires use of an ecosystem based, adaptive management approach and encourages partnerships. Climate change adaptation is most effectively undertaken with regional partnerships in mind.

- **A.** Conservation priorities and expenditures should reflect the resources most vulnerable to climate change, such as springs, seeps, Pinyon Woodland, and Joshua Tree Woodland.
- **B.** Identify restoration work that benefits specific species and for which success may be altered by climate change.
- **C.** Identify changes in distribution and abundance of threatened, endangered, and other Species at Risk in the context of climate change.
- **D.** Coordinate with energy and environmental managers to support the President's objectives for energy sustainability (EOs such as 13423 and 13514). Assist with application of the Leadership in Energy and Environmental Design (LEED) and Low Impact Development (LID) guidelines.

III. Monitor species most at risk for adverse shifts in range or population abundance.

- **A.** Participate in regional monitoring programs as practicable.
- **B.** Consider development of vulnerability assessments in partnership with regional Landscape Conservation Cooperatives or California Species of Special Concern. Coordinate with other DoD installations or agencies in the region.

C. Continue efforts to lessen the impacts of climate change by maintaining a healthy, stable ecosystem, and maintaining the resiliency of the ecosystem and ability to resist or recover from disturbance, such as non-native invasions (Grimsditch and Salm 2005).

1. To the extent practicable monitor plant community composition and productivity, soil health, and health of springs and seeps.

IV. Improve coordination and collaboration that responds to the consequences and costs of climate change.

A. Identify and implement regionally developed conservation designs.

B. Participate in climate change reviews for Navy Encroachment Action planning.

C. Participate in the development of science-based efforts to protect, maintain, and restore at-risk habitats.

D. Collaborate with other federal agencies and installations in development of vulnerability assessments and climate change adaptation strategies.

E. Support water resources planning and improve water conservation.

To the extent practicable, all DoD Components shall establish policy and procedures for the management of Species at Risk to prioritize proactive management of those species that, if listed, could adversely impact military readiness. Program objectives shall focus on efforts that have the greatest potential to prevent the listing of Species at Risk (e.g., habitat conservation, planning level surveys, monitoring). Protecting these species is critical; therefore, the installation INRMP should consider funding for Species at Risk protection a high priority.

V. When possible, identify data and research needs for ensuring an effective response to the consequences of climate change.

A. Identify species and communities vulnerable to climate change.

B. Improve the local relevance of models through data collection and validation (as feasible and needed) for use in NEPA analysis and natural resource management.

VI. Analyze project impacts and cumulative effects through NEPA in a consistent way.

VII. Consider incorporation of climate change topics in public education and outreach materials.

5.3 Animal Damage Control

Related Sections

4.7.6 Birds
4.8.1.2 Mohave Desert Tortoise
5.10 Integrating Other Internal Plans
5.3.1 Bird/Wildlife Aircraft Strike Hazard Prevention

Summary of Management Issues for Animal Pest Management

Animal damage control is also addressed in the Integrated Pest Management Plan (IPMP) (Navy 2008a), the Bird/Wildlife Aircraft Strike Hazard Prevention (BASH) Plan, and in the Raven Management Memorandum of Understanding (MOU) for protecting the Mohave Desert Tortoise (*Gopherus agassizii*) (Appendix B). The U.S. Fish and Wildlife Service (USFWS) defines pests as "those organisms (vertebrates, invertebrates, plants, and microorganisms and their vectors, etc.) which are detrimental to fish, wildlife, human health, fish and wildlife habitat, or to established management goals."

The pest rodents at NAWS-CL are reported in the IPMP as deer mice (*Peromyscus maniculatus*) and wood rats (*Neotoma* spp.). Deer mice are carriers of hantaviruses that can cause serious human disease. Rodents around

buildings will also attract snakes and predatory birds. If they enter buildings they can cause substantial damage to structures and equipment and can consume and contaminate food.

Birds are pests in industrial buildings and hangars, where damaged windows or open doors and windows allow access. Birds will nest and roost in false ceilings, leaving droppings and damaging walls and ceiling tiles. Bird droppings can be a source of pathogens that may cause human disease. Methods to control pests in these buildings include exclusion, pesticide applications, bait applications, and traps. In administrative and industrial buildings, exclusion and sanitation are the primary means of pest prevention. Plastic curtains over doors at Michelson Laboratory are used to prevent the entry of birds. They will also reduce the entry of some insect pests (Navy 2008a).

During winter months (November–March), snow geese (*Chen caerulescens*) forage at the golf course, causing turf damage from feeding and droppings. Flocks of geese and other birds can present aerial hazards to aircraft. Common Ravens (*Corvus corax*), while a native species, occur at unnaturally high levels around areas of human occupation, and have been recorded to prey on Mohave Desert Tortoise-eggs and young and observed preying on adult Mohave Desert Tortoises. Management of ravens would be accomplished through protocols established in an interagency MOU on raven depredation of the Mohave Desert Tortoise (see Section 4.8.1.2).

Bats have been known to roost in buildings. Bats are known carriers of rabies. Bat droppings can cause health issues and can be a source of damage to buildings. Bats can be controlled by sealing up entry ways to potential roost or breeding sites.

The NAWS-CL implements guidelines of the Chief of Naval Operations (CNO) Policy Letter Preventing Feral Cat and Dog Populations on Navy Property (10 January 2002) to eliminate adverse effects to native wildlife, as well as prevent injury or disease to Navy personnel. This policy ensures the humane capture and removal of free roaming cats and dogs, while prohibiting the use of trap/neuter/release methods. Other requirements for pet owners are in the outline below.

Management Strategy for Animal Pest Management

Objectives and Guidelines for Animal Pest Management

Objective: *Develop safe and efficient procedures for preventing and controlling animal pests that affect human health and safety and to avoid negative impacts to native wildlife and habitats.*

I. Comply with CNO policy, which requires that residents keep and feed pet animals indoors or under close supervision when outdoors, encourages neutering or spaying of cats and dogs, requires routine vaccinations and microchip registration, and prohibits feeding of feral animals.

II. Work with housing officials to provide educational materials to pet owners regarding installation regulations and general pet management.

III. Educate the public on issues such as not feeding wildlife and properly disposing of all trash.

IV. Ensure that key staff members are trained in proper wildlife handling protocols and procedures.

V. Comply with depredation permit requirements and the Migratory Bird Treaty Act with regard to controlling avian pests. Maintain a permit for removal of birds/nests from hangars and facilities at the airfield. The permit does not cover other facilities. At these facilities bird nests can only be removed when unoccupied or before the construction of the nest is completed.

- **A.** Work with the Public Works Department to obtain pest nuisance call logs to determine problem buildings and facilities elsewhere than the airfield. Obtain permit coverage for these areas.

VI. Comply with the Endangered Species Act (ESA) when conducting pest control activities.

A. Take precautions to prevent drift of pesticides to non-target areas, particularly when conducting pest management near endangered and threatened species, their habitats or near riparian areas and open water. See IPMP Chapter 4 for information on preventing herbicide/pesticide drift into non-target areas. Rodenticides are not target specific and can kill desirable animal species. Non-chemical control methods can also have an adverse effect. Rodent traps can catch and kill non-target rodents.

VII. Protect environmentally sensitive resources from the effects of pest management practices. Rodenticides are not target specific and can kill desirable animal species. Non-chemical control methods can also have an adverse impact. Rodent traps can catch and kill non-target rodents. As described in IPMP Chapter 5, riparian and aquatic habitats are the most sensitive habitats that require protection from the misuse of pest management practices.

5.3.1 Bird/Wildlife Aircraft Strike Hazard Prevention

Related Sections

1.9 Integrating Other Plans
4.7.6 Birds
5.10.4 Integrated Pest Management Plan

BASH plans are required by the DoD for military installations where there is a potential for a conflict between military activity and wildlife. Accordingly, the BASH program is designed to control birds, alert aircrew and operations personnel, and provide increased levels of flight safety especially during the critical phases of flight.

A main objective of the BASH program is to reduce bird aircraft strike hazards by identifying high hazard situations and to aid supervisors and aircrews in altering/discontinuing flying operations, when warranted. Potential BASH locations were identified during an avian use survey, which took place weekly from November 2004 to November 2005 (Epsilon Systems Solutions 2007).

A Bird Deterrent Unit has not been established due to the low strike hazard potential at Armitage Airfield. Higher BASH potentials occur outside of the airfield, on test ranges and off-Station locations. Copies of bird strike records sent to the Navy Safety Center are retained at NAWS-CL.

In September 2002, NAWS-CL developed and formally implemented a BASH plan for air operations at NAWS-CL. The plan complies with DoD and Navy directives, and is implemented through a NAWS-CL Instruction (NAWS Instruction 3750.2). A Bird Hazard Working Group was established to monitor and implement the BASH program. An updated BASH plan is in development.

Summary of Management Issues for BASH

Each year the Navy experiences hundreds of collisions between birds and aircraft causing millions of dollars in damage, several injuries, and hundreds of aborted or delayed missions (P-73 Real Estate Manual). The objective of the BASH program is to reduce the potential for collisions between aircraft and wildlife, thus minimizing damage and injuries due to collisions. No single solution exists to the BASH problem; a variety of techniques and organizations must be involved to ensure success of this program. The program encompasses all actions that may identify, reduce, or eliminate bird or other animal hazards to aviation, specifically, bird avoidance and bird control (including harassment, grounds maintenance, habitat modification, and depredation).

BASH is viewed as a significant problem by NAWS-CL aircraft safety personnel. Birds, coyotes, and other animals pose a strike hazard to aircraft on the airfield. Aircraft strikes can cause serious and costly damage to aircraft and can result in injury or fatalities to personnel. Armitage Airfield lacks habitats and features that attract large numbers of birds. NAWS-CL maintains a USFWS depredation permit for nuisance birds at the airfield and renews the permit every April.

BASH program requirements are not eligible for conservation resources (OPNAVINST 5090.1C CH-1). Naval air installations Safety and Air Operations Offices shall ensure BASH plans are prepared and implemented. Personnel responsible for BASH programs should ensure that bird strike reporting and information exchange is closely coordinated with the Naval Safety Center. The Naval Facilities Engineering Command (NAVFAC) BASH Program Lead is available to assist with the development of BASH Plans, Implementation of BIRDRAD (avian radar), and other BASH related requirements. The Naval Safety Center has a website with additional BASH information.

According to the avian hazard study (Epsilon Systems Solutions 2007) relatively high BASH potential should be taken into consideration when planning flight operations in the following months and locations:

- January. High In-air hazards are found at NAWS-CL Golf Course and Soccer Field. High On-ground hazards can be found at China Flats, G-1 Seep, Golf Course, Little Lake, South Haiwee, and Tinemaha.
- February. High In-air hazards are found at NAWS-CL Golf Course, Soccer Field, Ball Field, and Medical Center. High On-ground hazards can be found at G-1 Seeps, Golf Course, Little Lake, South Haiwee, and Tinemaha.
- March. High In-air hazards are found at G-1 Seep. High On-ground hazards can be found at Little Lake and Tinemaha.
- August. High On-ground hazards can be found at NAWS-CL Sewage Lagoon, Owens Lake, and Tinemaha.
- September. High In-air hazards are found at Tinemaha Reservoir. High On-ground hazards can be found at NAWS-CL Sewage Lagoon, Diaz Lake, Owens Lake, and North Haiwee Reservoir.
- October. High In-air hazards are found at Little Lake. High On-ground hazards can be found at NAWS-CL Sewage Lagoon, Owens Lake, and North Haiwee Reservoir.
- November. High In-air hazards are found at NAWS-CL Golf Course and Ball Field. High On-ground hazards can be found at G-1 Seep, Medical Center and the NAWS-CL Sewage Lagoon, Little Lake, North Haiwee, South Haiwee, and Tinemaha Reservoirs.

Management Strategy for BASH

Project Summary	Legal Driver
Provide BASH Support Program in concert with Airfield Operations. Support recommendations from the avian use survey (Epsilon Systems Solutions 2007). Work with the Los Angeles Department of Water and Power Owens Lake Re-watering Program to monitor for bird activity at Owens Lake. Perform more focused avian surveys at sites deemed to be the most hazardous to aircraft operations.	Navy Mission, Sikes Act (as amended), NAWS Instruction 3750.2

Objective and Guidelines for BASH

Objective: *Promote safe aircraft operations on the NAWS-CL by reducing and controlling bird/wildlife aircraft strike hazards.*

I. Assist Naval air installations Safety and Air Operations personnel with updates to the 2002 BASH Plan, using available avian use survey data.

A. Maintain a communication program between the natural resources manager, airfield operations personnel, and the aircrews themselves (P-73 Real Estate Manual). Continue to maintain a USFWS depredation permit for nuisance birds at the airfield. Ensure that non-lethal methods (harassing and hazing) are attempted before lethal action is taken (Depredation Permit, 50 CFR 21.41).

B. Participate in the Bird Hazard Working Group (NAWS Instruction 3750.2).

II. A critical part of the BASH Program involves disciplined reporting of bird strikes (OPNAVINST 5090.1C CH-1).

A. Establish procedures for identifying and reporting local hazardous bird activity and maintain records of BASH incidents, including time of day, date, species involved, and location.

B. Assist with the collection and reporting of damaging and non-damaging bird strikes and maintenance of a database to track local BASH incidents.

C. Continue to request squadron safety officers to report BASH incidents for inclusion into a local database.

III. Support recommendations from the avian use survey (Epsilon Systems Solutions 2007).

A. Work with the Los Angeles Department of Water and Power Owens Lake Re-watering Program to continue monitoring bird activity at Owens Lake and in other areas known to have high seasonal bird use (e.g., Sewage Lagoon, G-1 Seep, Golf Course).

B. Continue focused avian surveys at sites deemed to be the most hazardous to aircraft operations.

C. Assist with implementation of active and static procedures for dispersing/hazing birds when they are present on the airfield.

IV. Work with Air Operations to promote land management practices that minimize bird attractants, and safety procedures to recognize, control, and avoid hazardous bird concentrations.

V. Assist with programs that minimize the attractiveness of problem areas to birds.

5.4 Management of Other Uses and Real Estate Outgrants

Related Sections

2.4.6 Public Access
5.5 Outdoor (Wildlife-Oriented) Recreation and Environmental Awareness

Management Strategy for Other Real Estate Outgrants

The Military Construction Authorization Act provides for the use of DoD lands under a lease to an agency, organization, or person for commercial uses. Because the determining factors regarding resources usage are compatibility with the military mission, safety issues, and protection of cultural sites, sensitive environmental habitats and managed species, the Navy has no plans to initiate commercial use, such as grazing, agricultural outleasing, sale of forest products, or oil exploration.

Objectives and Guidelines for Other Real Estate Outgrants

Objective: *Ensure the long-term viability, land use compatibility, and fair-market value of all leases and outgrants, in conjunction with the military mission, and natural resource compliance and best practices.*

Objective: *Adopt wildlife-compatible practices where economically feasible, while complying with regulatory requirements and providing for management focus species.*

The Heads of the Office of the Secretary of Defense and DoD Components with natural resources management responsibilities shall ensure compliance and coordination by tenant activities, lessees, contractors, and operators on lands for which the DoD Component has a direct real estate interest (DoDI 4715.03).

I. Maintain the primary role of border lands as a buffer against encroachment.

II. Maximize the use of existing communication sites and corridors, and prevent the proliferation of scattered single user corridors.

III. Evaluate all real estate leases through the NEPA process and ensure incorporation and implementation of BMPs and conservation measures.

- **A.** Regarding decisions about non-agency land uses, proponents should provide funding for project review and documentation.

IV. Oversee, inspect and monitor outgrants for compliance with environmental protection laws, compliance with Biological Opinions, refuse control, and other requirements.

- **A.** Implement policies to Include specific environmental compliance actions, adoption of BMPs, and inspection procedures in all outgrants.
- **B.** Ensure that Instructions cover appropriate activities of outgrantees.
- **C.** Ensure compliance with DoD pest management regulations.

5.4.1 Construction and Facility Maintenance

Related Sections

3.1 Ecoregional Setting
5.8 NEPA Compliance

Management Strategy for Construction and Facility Maintenance

- Construction and maintenance activities may be located in sensitive environmental and cultural areas. These activities may be hampered by the need to protect sensitive resources. Delays and impacts can be avoided or minimized with proper planning.
- Site lighting may have environmental effects.
- Federal agencies promote construction practices that minimize adverse effects on the natural habitat, where cost-effective and to the extent practicable (EO 13112). Several other laws are pertinent: Clean Water Act, Clean Air Act, ESA, NEPA, and Soil Conservation Act. In particular, Section 319 of the Clean Water Act describes guidelines for the control of nonpoint source pollution.

Objectives and Guidelines for Construction and Facility Maintenance

Objective: *Conduct construction and facility maintenance in a way that allows for protection of sensitive environmental resources and the timely, cost-effective completion of environmental documentation.*

I. Fish and wildlife conservation shall be considered in all site feasibility studies and project planning, design, and construction. Appropriate conservation work and associated funding shall be included in project proposals and

construction contracts and specifications (Code of Federal Regulations 2002 Title 32 Office of the Secretary of Defense Part 190, Natural Resources Management Program), consistent with military readiness.

II. Congress directs all federal agencies, to the maximum extent practicable and consistent with each agency's responsibilities, to conserve and to promote conservation of non-game fish and wildlife and their habitats (OPNAVINST 5090.1C CH-1).

A. The focus of natural resources conservation are those considered significant or Species at Risk. They are defined in DoD 4715.03. EMD should also:

1. Monitor and manage sensitive natural resources;
2. Utilize available resources databases; and
3. Conserve and manage state listed species as appropriate.

Commanding Officers of shore activities holding Class I plant accounts [land and water in contrast to structures] shall ensure incorporation of soil and water conservation measures and landscaping in the preliminary engineering, design, and construction of facilities involving ground disturbance in coordination with Engineering Field Activities. Ensure that state-approved erosion prevention/control measures are included as requirements in the specifications for all ground disturbing construction projects. Include these costs as a specific item in new project investigations and preliminary engineering reports (OPNAVINST 5090.1C CH-1).

III. Ensure incorporation of BMPs in the preliminary engineering, design, and construction of facilities involving ground disturbance (OPNAVINST 5090.1C CH-1).

A. Implement BMPs for controlling soil erosion and protecting sensitive species. Monitor and ensure compliance as warranted. These BMPs include both pre-construction and final site clearance surveys. These are required to satisfy Section 7(a)(1) of the ESA and prevent unnecessary project delays.

B. Establish protocols for emergency repair of infrastructure. Develop a clear understanding with USFWS about the extent of temporary environmental damage that may be expected from disturbances such as emergency repairs, spills, and fire control.

5.4.2 Communications Towers, Wind Farms, and Power Lines

Related Sections

3.1 Ecoregional Setting
3.5.6 Birds
4.7.6 Birds
5.8 NEPA Compliance

Summary of Management Issues for Communications Towers, Wind Farms, and Power Lines

The construction/installation of towers, power lines and wind farms creates a potentially significant impact on migratory birds, especially some 350 species of night-migrating birds. Millions of birds are killed each year by these structures (Manville 2005). Some of the species affected are also protected under the ESA and Bald and Golden Eagle Act (USFWS 2010).

Management Strategy for Communications Towers, Wind Farms, and Power Lines

Objective and Guidelines for Communications Towers, Power Lines and Wind Farms

Objective: *Safeguard military readiness by maintaining communications towers and wind farms while avoiding and minimizing impacts to native wildlife and plants.*

I. Ensure project criteria are addressed through the Project Review Board.

II. Proposed towers need to comply with USFWS (2010) to the greatest extent practicable. Short towers without guy wires or lighting are recommended.

5.4.3 Road and Utility Corridors

Related Sections

2.3.11 Transportation, Circulation, and Utilities
5.8 NEPA Compliance

Summary of Management Issues for Roads and Utility Corridors

Roads can become sources of erosion and altered hydrology in habitat areas; and also sources of wildlife road kill.

Management Strategy for Roads and Utility Corridors

Objective and Guidelines for Road and Utility Corridors

Objective: *Improve procedures used for locating any new roads and the soundness of road maintenance practices to avoid and minimize environmental impacts.*

I. Develop a five- to ten-year Long-Term Maintenance Plan with BMPs and improvements defined. Avoid building in floodplains, especially any development that may obstruct, divert, or retard flood flows, or which may affect flood elevations and flood protection.

5.4.4 Fence Maintenance and Buffer Zones

Related Sections

2.3.8.1 Range Safety Zones, Ordnance Facility Management Areas, Explosive Safety Quantity Distance Arcs
5.8 NEPA Compliance

Management Strategy for Maintaining Fence and Buffer Zones

Objective and Guidelines for Fence Maintenance and Buffers

Objective: *Use fences and buffer zones to provide security and safety for operations, personnel, and the public, while avoiding and minimizing environmental impacts.*

I. Integrate fencing, clear zones, safety requirements, and encroachment control into designated, multi-purpose buffer zones.

II. Use wildlife compatible fencing, when possible, to protect movement of wildlife.

III. Consider the feasibility of replacing (some) fences that could impact wildlife with virtual fencing, such as a microwave-type of identification and camera, which would substitute for a fence.

5.4.5 Harvesting of Native Plant Material

Management Issues for Harvesting of Native Plant Material

Commercially viable forestry is not realistic due to limited commercial timber, water, conflicting land uses, and incompatibility with the Station's mission. Pinyon pine nut collecting is allowed since it is a traditional Native American activity. Pinyon pine nut management is coordinated by the NAWS-CL Cultural Resources managers.

Management Strategy for Harvesting of Native Plant Material

Objective and Guidelines for Harvesting of Native Plant Material

Objective: *Maintain conifer woodlands for all-aged stands, and healthy understory vegetation.*

5.5 Outdoor (Wildlife-Oriented) Recreation and Environmental Awareness

Related Sections

2.4.5 Recreation
5.5.2 Public Access and Outreach

Management Issues for Outdoor (Wildlife-Orientated) Recreation and Environmental Awareness

For the purposes of this section, outdoor (wildlife-oriented) recreation is the active use of the installation's natural resources for recreation and physical exercise. The following factors influence the amount and type of recreational activities allowed on the ranges:

- NAWS-CL security requirements due to its Research, Development, Acquisition, Testing and Evaluation mission. In many areas visitors must either have permanent or interim security clearance or remain under escort by Station personnel.
- Physical safety of NAWS-CL visitors. Much of the NAWS-CL has been used for over 50 years for testing of Navy weapons, including bombs, rockets, and other ordnance.
- Capability of resources to withstand user impacts.

Navy guidance (OPNAVINST 5090.1C CH-1) provides for coordination with the National Park Service on recreational opportunities on Navy lands. Consistent with the Sikes Act (as amended), a signed MOU between the U.S. Department of the Interior and DoD requires all military installations to develop outdoor recreation plans where there are suitable resources for such a program consistent with national security (see Appendix B). The Navy Instruction requires a detailed map of current and potential outdoor recreation areas; public access locations for hunting, fishing, and trapping; and future demands for outdoor recreation, and off-road vehicles. The interface between the natural resources program and the program for Morale, Welfare and Recreation (MWR) is also described.

Certain outdoor recreation activities have been ongoing and compatible with the NAWS-CL missions. For example, petroglyph tours are led by trained tour guides and allowed on a non-interference basis. Participants are briefed on procedures and proper behavior regarding prevention of damage to petroglyphs. Photography is permitted only within Little Petroglyph Canyon.

The public is allowed access to the golf course at Mainsite and a 15-stable facility (Building 01390) is available for resident horse owners. The users are responsible for maintaining the facility and ensuring sanitation. Windsailing occurs on the Mirror Lake dry lake playa.

Management Strategy for Outdoor Recreation and Environmental Awareness

Objectives and Guidelines for Outdoor Recreation and Environmental Awareness

Objective: *Promote outdoor recreation opportunities that enhance quality of life, conserve natural resources, and that do not conflict with the military mission.*

I. Assist MWR with the preparation of a recreational plan for NAWS-CL. Maintain recreation opportunities that do not impact operations, such as petroglyph tours, birdwatching at the Waste Water Treatment Facility ponds, and other activities.

II. Periodically review ongoing and proposed recreational activities.

III. Support MWR's development of an outdoor recreation plan that includes both military personnel and the public, as appropriate. Seek opportunities for natural resources-based outdoor recreation and consider partnerships with the local community.

- **A.** Identify and evaluate suitable outdoor recreation opportunities for installation personnel.
- **B.** Include maps, access permissions and prohibitions.
- **C.** Consider cooperating with other groups in programs such as Watchable Wildlife.
- **D.** When feasible, develop and enhance outdoor recreation opportunities for the disabled.

IV. Recreational off-road vehicle use is not currently allowed at NAWS-CL, for reasons of security, safety, fire, and the presence of federally listed species.

5.5.1 Upland Game Hunting

Related Sections

2.4.6 Public Access

Management Strategy for Game Hunting

DoD installations shall be available to the public for hunting... when not in conflict with mission or environmental and natural resources conservation program goals (DoDI 4715.03).

I. Continue to utilize the substantive provisions of the California Upland Game Bird regulations and mitigation measures from the Chukar (*Alectoris chukar*) hunting Environmental Assessment.

II. Provide annual Chukar hunt guidance and support to MWR.

III. Ensure hunting events do not conflict with mission activities and schedules.

5.5.2 Public Access and Outreach

Related Sections

2.4.6 Public Access

Management Strategy for Public Access and Outreach

Military lands will be available to the public and DoD employees for enjoyment and use of natural resources, except when a specific determination has been made that a military mission prevents such access for safety or security reasons, or that the natural resources will not support such usage (OPNAVINST 5090.1C CH-1).

I. The following are conditions appropriate for public access (DoDI 4715.03).

A. Where practicable and not in conflict with mission objectives or the INRMP, active and retired military service members, disabled veterans, and other individuals may have access to an installation's lands and waters for hunting, fishing, and non-consumptive use of wildlife.

B. Members of Native American bands, nations, pueblos, villages, or communities may have access to DoD sites and resources that are of religious or cultural importance consistent with the military mission, EO 13007, appropriate laws and regulations, and safety and security. Members of federally recognized Tribes shall also have access to non-commercially gather botanical and mineral resources for traditional cultural use.

C. Opportunities for public access shall be equitably and impartially allocated (DoDI 4715.03).

II. Continue to review public access and outdoor recreation requests for compliance with safety, security, environmental concerns and liability considerations. Support a public website to explain public access opportunities and events in collaboration with MWR and other programs.

III. Continue to allow Native American Tribes access on a not-to-interfere basis. Allow members of local Tribes to access the Coso Hot Springs three to four times a year for traditional and religious ceremonies (1979 Coso Hot Springs Access Memorandum of Agreement), the Coso Peak Pinyon area for traditional pine nut gathering, Sugarloaf Mountain for the collection of obsidian, and to Little Petroglyph Canyon, and ancestral homesteads located on the North Range.

IV. Installations shall ensure that documents and other data provided to the public do not disclose natural resources information that may: 1) Create substantial risk of harm, theft, or destruction of such resources. 2) Invade privacy. 3) Trespass on Government property. 4) Violate federal law or regulation. 5) Interfere with or disclose sensitive information regarding the installation's mission. 6) Interfere with the rights guaranteed to Native American groups covered under Sections 470w-3(a), 470w-3,470hh(a), and 470hh of the National Historic Preservation Act.

5.6 Landscaping and Grounds

Related Sections

2.4.2 Landscaping
Map 3-10 Known locations of sensitive plant species at Naval Air Weapons Station China Lake and the immediate vicinity (5-mile radius). Data sources: California Natural Diversity Database 2010 records, INRMP 2000.
5.10.4 Integrated Pest Management Plan

Summary of Management Issues for Landscaping and Grounds

Legal drivers for landscape and grounds maintenance include the Sikes Act (as amended), OPNAVINST 5090.1C CH-1, NAVFAC P-73 Vol. II, EO 13112, EO 13514, EO 13423, and the Presidential Memorandum of 26 April 1994 Environmentally and Economically Beneficial Practices on Federal Landscaped Grounds. These requirements cover both maintenance of the existing landscape and development of new landscapes. To the extent practicable, NAWS-CL landscaping should use water efficiently, use native plants, and minimize pesticide use.

The following are major landscaping practices:

- Semi-developed and developed grounds are maintained according to guidelines in the 1986 Naval Weapons Center Grounds Maintenance Standards, Public Works Publication 2637-L-OO1. Xeriscaping, an important aspect of the NAWS-CL water conservation program, is based on the use of native or drought-resistant plants and efficient irrigation practices that require less water, which also reduces the risk of pest infestation. Traditional landscaping has been replaced with xeriscaping at many high traffic areas since 1986.

In accordance with the Presidential Memorandum "Environmentally and Economically Beneficial Practices on Federal Landscaped Grounds," 26 April 1994, each installation shall, to the extent practicable, conserve and protect water resources, use locally adapted native plants, avoid using invasive species, and minimize the use of pesticides and supplemental watering.

- Using the IPMP, the Integrated Pest Management Coordinator works closely with grounds maintenance to ensure that invasive plants are not used in landscaping. Plants susceptible to pest infestation are also avoided. EMD will coordinate with the Integrated Pest Management Coordinator when developing landscaping plans.
- The NAWS-CL Base Exterior Architecture Plan (Navy 2004a) guidelines provide a theme for NAWS-CL buildings and associated landscaping.
- A landscaping plant list with many native species suggestions is in Appendix G, along with a "Do Not Plant" list for invasive horticultural plants.

Management Strategy for Landscaping and Grounds

Project Summary	Legal Driver
Assist in the development of an updated Landscaping Plan that outlines an appropriate landscaping and ground maintenance program.	Sikes Act (as amended), EO 13123 and EO 13112, Presidential Memorandum April 1994

Objectives and Guidelines for Landscaping and Grounds Maintenance

Objective: *Improve aesthetics for personnel living, working, or visiting NAWS-CL, while avoiding the introduction of invasive species, decreasing water use, and improving drought tolerance of plant communities.*

Objective: *Implement LID where feasible and use landscaping to reduce energy use and enhance wildlife habitat where possible.*

I. Comply with laws, EOs, and Navy policies regarding landscaping.

A. Assist with development of an updated Landscaping Plan and Instruction that outlines a program consistent with EO 13123 and EO 13112.

1. Landscaping practices should use native plants to provide wildlife habitat, and to reduce fertilizer and pesticide use, as well as irrigation demands and their associated costs.
2. Low maintenance plants should be used whenever possible and should conform to the Base Exterior Architecture Plan.

B. Implement construction practices that minimize erosion, runoff, and impacts to natural areas.

C. Comply with the IPMP.

1. Review the Grounds Maintenance Contract for consistency with recent EOs or Navy policy in regard to:

To promote the President's April 26, 1994 Memorandum, and to comply with EO 13148, it is Navy policy to: Use regionally native plants for landscaping; Design, use and promote construction practices that minimize adverse effects on natural habitat; Prevent pollution by reducing fertilizer and pesticide use, implementing integrated pest management practices, recycling green waste (composting) and minimizing runoff; Implement water-efficient practices by using, efficient irrigation systems and recycled water, and using landscaping to conserve energy; and Create demonstration projects to promote awareness of environmental and economic benefits of these practices.

In keeping with federal standards, Navy policy requires minimizing disturbance to native habitats and using integrated pest management practices, xeriscape landscaping, and recycled water in arid environments.

a. Animal damage control.
b. Invasive plant control, including using only pesticides approved for use on the installation and reporting all pesticide applications.
c. Removal of pest plants.

2. Ensure that requirements are communicated to grounds keeping staff.

II. Xeriscape to the maximum extent possible, and create aesthetic, functional, and shaded areas for recreation and relaxation.

A. Include sustainable water use and regionally native plants. Use recycled water where feasible.

B. Use landscaping design to benefit the human working environment by moderating environmental influences, conserving energy, protecting water quality, preventing soil erosion, reducing glare, buffering noise, improving aesthetics, and providing wildlife habitat.

1. Plant windbreaks for wind deflection, dust control and noise suppression. Plant native shade trees to reduce air conditioning demands and reduce energy consumption in accordance with EO 13123.
2. Discourage the establishment of new lawn areas, except where functionally essential in areas used for ceremonies, family housing, recreation fields, and children's playgrounds.

III. Use regionally native plants whenever possible in accordance with EO 13112.

A. Use plant selection criteria (see Appendix G) to integrate appropriate, acclimated plants, considering:

1. Native plants and those with local cultural/historic significance.
2. Plants that fit into the Base Exterior Architecture Plan, provide coordinated landscape color, and enhance the existing architecture.

B. Eliminate the use of invasive exotic plants in landscaping. Provide weed control.

1. Use mulches to reduce evapotranspiration and control weeds.
2. Apply herbicides only as needed.

IV. Avoid groundskeeping practices that may adversely affect sensitive species. When possible, avoid mowing natural areas where sensitive species occur.

A. Comply with the Migratory Bird Treaty Act for migratory and resident birds during tree trimming, pruning, or removal.

1. Projects should be phased to avoid disturbing nesting birds. Most birds typically nest between mid-March through September.
    a. All projects, scopes of works, contracts, and agreements associated with construction and/or vegetation manipulations or removal should have the following language: "If a contractor identifies any bird within the contract area that appears to be attempting to build or use a nest, the contractor must immediately notify the natural resources manager. The contractor cannot take action to remove the bird or the nest from the area which is being used."

V. Prioritize landscape improvement projects using the following guidelines.

A. Consider reducing water usage to help meet water conservation goals. Capture rainwater runoff to the extent practicable.

1. Pruning of trees and shrubs should enhance the natural growth form of each species. Uniform shearing should be avoided except where a formal hedge is the maintenance objective. Avoid pruning healthy parts of the plant. Maintenance personnel should be trained in and comply with all

applicable standards (California Landscape Contractors Association and American National Standards Institute).

B. Substitute plantings with non-vegetative ground covers, where suitable. Encourage use of mulches, decomposed granites, and other high quality paving materials in high use or prominent areas.

C. When practicable, amend the soil to improve water retention, drainage, and aeration, especially for compacted, heavy, saline, or sodic soils.

VI. Consider enhancing and maintaining golf course habitats to benefit wildlife.

A. Identify wildlife habitat, natural plant communities, sensitive species locations, water sources, and areas that could potentially be managed differently to benefit natural resources.

B. Provide maintenance staff with a means to report nesting activity or unusual wildlife sightings.

C. Do not use secondary poisoning agents. Avoid over-fertilizing landscape plants and use herbicides only as needed. Avoid pesticide application near sensitive habitats.

D. Consider landscape plants that attract wildlife (see Appendix G).

5.7 Beneficial Partnerships and Collaborative Planning

Related Sections

1.4.2 Mission Sustainability and the INRMP "No Net Loss" Requirement
1.4.5.2 External Stakeholders
1.9 Integrating Other Plans

Management Strategy for Beneficial Partnerships and Collaborative Planning

The DoD is a signatory to a number of agreements for active conservation and management initiatives. These conservation efforts involve the four Military Services, the DoD Legacy Management Program, the DoD Readiness and Environmental Protection Initiative Program, the DoD Partners in Flight Program, the National Military Fish and Wildlife Association, and the Association of Fish and Wildlife Agencies. These include:

The Tri-Partite MOU Among the DoD, USFWS, and the International Association of Fish and Wildlife Agencies, "Cooperative Integrated Natural Resources Management Program on Military Installations" (31 January 2006) is a key agreement for cooperative conservation on military lands.

- MOU among the DoD, USFWS, and Association of Fish and Wildlife Agencies for a Cooperative Integrated Natural Resource Management Program on Military Installations (01-2006)
- MOU with Watchable Wildlife, Inc. (10-2002)
- MOU for Support of Cooperative Agreement between the DoD and The Nature Conservancy (04-2005)
- MOU for the Continuation of the Cooperative Ecosystem Studies Units Network (05-2005)
- MOU between the DoD and National Biological Information Infrastructure (06-2005)
- MOU for Conservation of Migratory Birds (07-2006)
- MOU for Federal Native Plant Conservation (09-2006)
- MOU between the DoD and Bat Conservation International (10-2006)
- MOU between the Natural Resources Conservation Service and DoD to Promote Cooperative Conservation (11-2006)

- MOU among Federal Agencies for Achieving Objectives of Partners in Amphibian and Reptile Conservation (03-2007)
- MOU among Members of the North American Bird Conservation Initiative Committee (06-2007)
- MOU with North American Pollinator Protection Campaign (06-2007)

Cooperative management is required under the Sikes Act (as amended) and the Fish and Wildlife Coordination Act. Like NEPA, the Fish and Wildlife Coordination Act is essentially procedural. The USFWS and California Department of Fish and Wildlife review and coordinate on INRMPs under the Tripartite Agreement (see Chapter 1).

Navy and DoD policy mandates involvement in regional ecosystem planning, management, and restoration initiatives. These efforts are designed to benefit NAWS-CL and regional natural resources. Cooperative planning can also reduce the costs of actions that require management across boundaries.

Partnerships can also assist with management of encroachment pressures. Encroachment includes actions conducted in the vicinity of an operational area which may inhibit the performance of the mission of the naval activity. Encroachment management requires the Navy to coordinate with local jurisdictions, monitor the development plans of adjacent communities, or adequately manage facilities and real property. Encroachment management is further discussed in OPNAVINST 11010.40

NAWS-CL maintains liaison with off-Station land management agencies to avoid mission encroachment from incompatible land uses. Off-Station land uses are generally monitored by EMD staff and the Naval Air Systems Command Range Sustainability Office working in conjunction with Public Works Planning and airfield/airspace personnel. Interagency coordination is implemented through participation with city, county, state, and federal land management agencies involved in regional land use planning and environmental resource management projects.

The Station utilizes an Interagency Agreement (Agreement No. 03-1535-003) (renewed in 2010) with the Bureau of Land Management for wild horse and burro herd management on both NAWS-CL and Bureau lands. Due to the regular interchange and movement of horses and burros between the NAWS-CL lands and adjacent Bureau of Land Management, Death Valley National Park, and National Training Center Fort Irwin lands, collaborative management efforts have been required.

Other beneficial partnerships include:

- Cooperative partnerships between NAWS-CL and several universities:
  - University of California, Berkeley: mammal, invertebrate, reptile and amphibian research studies
  - University of California, Riverside: invertebrate research studies
  - Upland game bird research studies with the University of Nevada, Reno, Idaho State University, Pocatello, and Tufts University
  - Southern Sierra Research Station
- NAWS-CL participates in species-specific recovery plans, and regional natural resources management and land use efforts. Much of the Mojave Desert bioregion falls within the jurisdiction of the West Mojave Plan; Ecoregion-based Conservation in the Mojave Desert; and Northern and Eastern Mojave Desert Management Plan.
  - The California WAP is a comprehensive state wildlife conservation strategy (Bunn et al. 2007). This plan defines the role of the Desert Managers Group as coordinating desert conservation, visitor services, public outreach, and public safety in the region. Many of the decisions made by the Desert Managers Group are reflected in the INRMP. The WAP discusses programs such as feral horse (*Equus caballus*) and burro (*Equus asinus*) management and Mohave tui chub (*Siphateles bicolor mohavensis*) protection, control of

invasive species, and continuation of collaborative management of Mohave ground squirrels (*Spermophilus mohavensis*).

Objective and Guidelines for Beneficial Partnerships and Collaborative Planning

Objective: *Support planning partnerships to benefit regional conservation, while also protecting the military mission.*

I. Continue to participate in regional conservation and ecosystem planning efforts.

- **A.** Ensure NAWS-CL involvement is coordinated with DoD stakeholders, address potential impacts to military activities, and evaluates benefits to mission accomplishment.
- **B.** Pursue ecosystem management objectives by maintaining and improving sustainability and biological diversity, and promoting acquisition of scientific and field-tested information.

II. Continue to seek partnerships for invasive plant control and feral animal removal.

III. Consult with USFWS and California Department of Fish and Wildlife at least annually to fulfill Sikes Act (as amended) provisions and related inter-agency cooperative agreements.

- **A.** Involve state and federal resources agencies in the implementation of INRMP objectives and policies, when practicable.
- **B.** Promote information sharing and, data collection efforts.
- **C.** Continue to participate in the Desert Managers Group.
- **D.** Support WAP goals and objectives including minimizing groundwater overdraft; protecting spring, seep and riparian habitats; and continuing control of exotic invasive species.
- **E.** Continue the use of Cooperative Agreements to complete specialized projects and to support ongoing management efforts.

5.8 NEPA Compliance

Related Sections

5.9 Natural Resources Consultation
Appendix B: Laws, Guidance and Regulation Effecting Natural and Cultural Resources

Management Strategy for NEPA Compliance

DoD Template for INRMPs: NEPA Compliance - Describe how NEPA is achieved and documented, and how the associated public involvement review process works.

INRMPs are a principal source of baseline information used to develop NEPA documents supporting military readiness activities. Guidance for performing the environmental review process and preparing NEPA documents at China Lake is contained in NAWS Instruction 5090.6. The following description summarizes how the NAWS environmental review process works.

New projects or modification of existing activities with new surface disturbing effects or other sources of environmental impacts are reviewed by the NAWS EMD. The review evaluates potential impacts of the project to environmental resource categories, including natural and cultural resources, air quality, hydrology, hazardous waste, lead paint and asbestos. A Memorandum for the Record (MFR) is prepared for proposed actions associated with previously approved and valid environmental documentation. In cases where no or inadequate environmental

documentation exists for a proposed action or activity, appropriate environmental documents (i.e. Categorical Exclusions, Environmental Assessments, or Environmental Impact Statements) are prepared in accordance with NAWSINST 5090.6 or successor documents.

Objective and Guidelines for NEPA Compliance

Objective: *Apply data driven NEPA analysis procedures to evaluate and document potential effects to natural resources by activities conducted at NAWS-CL.*

Guideline:

I. Use the NAWS Site Approval and NEPA processes to identify projects and activities that have the potential to impact natural resources at NAWS. Work with project proponents to identify and resolve issues early in the project planning to achieve natural resources management goals and facilitate the project approval process.

II. Communicate, coordinate and share applicable natural resources data with appropriate stakeholders for project planning and support purposes.

III. Continue to secure and apply the most current and complete natural resources data to support the preparation of NEPA documents.

IV. Continue to apply standard mitigation measures to avoid, minimize, rectify, reduce, or eliminate potential impacts to natural resources to the extent practicable.

5.9 Natural Resources Consultation

The INRMP is a long-term management and conservation planning document. INRMPs should provide information necessary for ESA consultations, migratory bird permits, natural resources planning, and federal consistency determinations. INRMPs should also provide information for various planning level documentation, master plans, Clean Water Act permits, Clean Air Act permits, Comprehensive Environmental Response, Compensation, and Liability Act and Resource Conservation and Recovery Act related information (CNO 2006 INRMP Guidance for Naval Installations, April 2006).

DoD Template: a. Natural Resources Consultation Requirements - discuss any current or planned consultations (e.g., Section 7).

Section 7(a)(2) of the ESA requires federal agencies to ensure that actions authorized, funded, or carried out by them are not likely to jeopardize the continued existence of a listed species through direct mortality or the destruction or adverse modification of designated Critical Habitat. This is done through consultation with the USFWS (under the auspices of the Secretary of Interior) to emphasize identification and resolution of potential species conflicts in the early stages of project planning. Consultations may be informal or formal, and formal consultations result in a Biological Opinion to guide further efforts.

As per Section 7(a)(1) of the ESA, NAWS-CL will continue to conserve species through implementation and compliance with all current Biological Opinions. Formal and informal consultation (as defined below) will be initiated as needed, during project planning or other actions.

Informal consultation is an optional process between the USFWS and the action agency to determine whether a formal consultation is needed. It provides an opportunity for discussion of ways to modify the action to reduce or remove adverse effects to the species or Critical Habitat. Based on the best scientific and commercial data

available, the agency determines the effects on listed species and Critical Habitat. It concludes when a determination of "no effect" is made, when the USFWS concurs with a "not likely to adversely affect" determination, or when the agency initiates formal consultation.

Formal consultation is generally required whenever an agency determines that its planned action "may affect" listed species or Critical Habitat; however, if an agency utilized informal consultation or a biological assessment, formal consultation will be needed only if the action agency determines—through such informal consultation or biological assessment—that the action will adversely affect the listed species or Critical Habitat. It begins with the federal agency's written request for consultation under Section 7 (a)(2) of the ESA, and concludes with the USFWS issuing a Biological Opinion under Section 7 (b)(3) of the ESA, covered in the implementing regulations published in 50 CFR Part 402.

No consultation is needed when the proposed action falls under an existing Biological Opinion or if there is no listed species or designated Critical Habitat within the proposed action area. All areas to be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action. [50 CFR §402.02].

Consultation strategy should be designed to avoid military mission delay or impairment. For this reason it should be designed as programmatically and as comprehensively as possible.

Management Strategy

Objective and Strategies for Natural Resources Consultation

Objective: *Collaborate with project proponents to plan, implement, and monitor mitigation and conservation measures to avoid or minimize effects. Develop means to rectify, reduce, eliminate, or compensate for unavoidable effects when possible (Council on Environmental Quality 1978). Ensure project proponents understand compliance requirements early in the planning process.*

I. Conduct early review of projects proposed on the installation from both Navy and outside interests. All proposals that are not Categorical Exclusions should provide the following information regarding natural resources:

- **A.** The acres and habitat type currently present on the site.
- **B.** The known locations of special status species on or adjacent to the site which can be obtained from the Geographic Information System database.

II. Mitigation and enhancement projects should use performance work statements (do what, using which standards, by whom and with what money); project lists (one-time projects); and standardized scopes of work for recurring work.

III. Determine if Section 404 compliance is necessary for any projects in the portions of NAWS-CL property with connections to the Owens, Mojave, and Amargosa River watersheds. Investigate applicability of nationwide permits and BMPs so that project work would be facilitated. Determine U.S. Army Corps notification requirements.

IV. Seasonal Avoidance Measures for Facilities Projects. Coordinate with project planners to identify any seasonal work restrictions or considerations in order to phase work, avoid, develop, and facilitate project accomplishment.

V. Standard Mitigation Measures. Design mitigation requirements in concert with project planners to facilitate mission accomplishment.

A. Avoidance and Minimization First. Proposed actions must include impact avoidance and minimization measures to the extent practicable. Possible measures include: worker environmental protection briefings, signs, markers, protective fencing, biological monitoring, erosion and sedimentation prevention, noise baffling, and temporary impact restoration. These should be included as part of the project plans and incorporated into NEPA documentation.

B. Survey Buffers. Consider buffer areas where indirect effects may adversely affect species. Habitats used by a species for an important part of their life cycle should be considered occupied, regardless of the presence of the species at any one time. Corridors for animal movement, such as drainages and roads, may be important considerations.

C. Biological Monitoring. Qualified biological monitors should be retained to educate workers, ensure implementation of impact avoidance and minimization measures, and document impacts on an as-needed basis.

VI. Breeding Season Avoidance. The majority of regularly occurring bird species are protected under the Migratory Bird Treaty Act. Planners should be made aware of possible conflicts and project delays during bird breeding seasons (potentially January - September). Habitat clearing activities should be timed to avoid the breeding season to the maximum extent practicable. Contracts and work orders must include provisions in the Environmental Protection section, which prohibit harming, damage, or destruction of active bird nests.

A. Restoration Planning. Actions that require active habitat restoration or enhancement must have an appropriate plan developed prior to implementation. Such plans must discuss the site conditions, methods to be implemented, monitoring and maintenance (usually three to five years), success criteria, remedial actions if expected success is not being achieved, and reporting requirements.

5.10 Integrating Other Internal Plans

INRMPs are to be prepared in coordination with installation range plans; training plans; Integrated Cultural Resources Management Plans; IPMPs; Installation Restoration (IR) plans that address contaminants covered by the Comprehensive Environmental Response, Compensation, and Liability Act, the Resource Conservation and Recovery Act, and related provisions; and other appropriate plans and offices (OPNAVINST 5090.1C CH-1). Coordination is of particular concern at an installation such as NAWS-CL with associated ranges. The INRMP briefly summarizes the key inters with these plans, and references where detailed information can be found.

5.10.1 Integrated Cultural Resources Management Planning

Related Sections

1.9 Integrating Other Plans
2.2 Past Land Use

Summary of Management Issues for Integrated Cultural Resources Management Planning

According to Navy guidance (Navy 2006a), the Integrated Cultural Resources Management Plan should be referenced in the INRMP, where management issues overlap.

The Integrated Cultural Resources Management Plan (Section 7.5.8) identifies what natural resources activities require project consultation on cultural resource laws, and the required steps for consultation. It also identifies which natural

resource actions will be classified categorically as No Adverse Effect. Such actions will be documented and that documentation provided to the State Historic Preservation Office. Natural resources staff may expect to consult for such projects such as construction of nature trails or wild horse and burro traps, fencing of springs, and ground disturbing activities in general. Cultural staff will help with avoidance, redesign, or mitigation.

Management Strategy for Integrated Cultural Resources Management Planning

Strategy for INRMP Integration with Cultural Resources Planning

Objective: *Conserve and protect significant prehistoric, historic, and Native American resources in concert with natural resources management.*

I. Jointly with the Station Cultural Resources Specialist, the Natural Resources Manager should:

A. Conduct surveys prior to new land disturbance activities.

B. Conduct briefings for personnel (range operations, Public Works Department, customers) working in endangered and sensitive habitat areas, and any cultural areas.

5.10.2 Installation Restoration

Related Sections

2.4.4 Installation Restoration Sites
Appendix H: Installation Restoration Sites and Approved Pesticide List

Summary of Management Issues for Installation Restoration

Navy guidance limits the treatment of IR sites in INRMPs. Information on the IR Program is limited to maps that show the locations of IR sites and a specific citation of, or reference to, the most up-to-date IR Program documents and their location. Appendix H contains a map and table of IR sites and their status.

Management Strategy for INRMP Integration with Installation Restoration Program

Strategy for Integrating the Installation Restoration Program

Objective: *Support the IR Program in reducing the risk to human health and the environment from hazardous substance contamination.*

Appendix H contains a map and table of IR sites and their status.

I. The following language is to be cited in all INRMPs (Navy INRMP Guidance for Navy Installations April 2006):

A. The installation recognizes that adverse impacts to natural resources addressed in the INRMP may result from the release of hazardous substances, pollutants, and contaminants into the environment. The Navy IR Program is responsible for identifying Comprehensive Environmental Response, Compensation, and Liability Act releases, Resource Conservation and Recovery Act releases, and releases under related provisions; considering risks and assessing impacts to human health and the environment, including impacts to endangered species, migratory birds, and biotic communities; and developing and selecting response actions, when a release may result in an unacceptable risk to human health and the environment.

B. When appropriate, the NAWS-CL natural resources management staff will help the IR Program Remedial Project Manager identify potential impacts to natural resources caused by the release of these contaminants.

C. Regional or installation natural resources staff will also participate, as appropriate, in the IR Program decision-making process by communicating natural resources issues on the installation to the Remedial Project Manager; attending Restoration Advisory Board meetings, reviewing and commenting on IR Program documents (e.g., Remedial Investigation, Ecological Risk Assessment); and ensuring that response actions, to the maximum extent practicable, are undertaken in a manner that minimizes impacts to natural resources on the installation.

D. When appropriate, the regional or installation natural resources staff will make recommendations to the IR Program Remedial Project Manager regarding cleanup strategies and site restoration. During initial monitoring protocols, the natural resources manager may suggest sampling and testing so as to not impact sensitive or critical areas. Also during site restoration, the natural resources manager has the opportunity to recommend site restoration practices outlined within the INRMP. Examples include landfill caps restored to grasslands, excavation areas restored to wetland/pond areas, and treated water located to enhance a pond area.

II. Develop and implement stakeholder programs to ensure active participation by all affected parties.

5.10.3 Sustainability in the Interface Between the Built and Natural Environments

Related Sections

1.7.2 Environmental Management System
3.1 Ecoregional Setting
5.2 Adapting to Regional Growth and Climate Change

Summary of Management Issues for Sustainability in the Interface between the Built and Natural Environments

Coordinate the execution of the Environmental Management System with new construction, pollution prevention, and natural resources management activities to provide project personnel different environmental approaches and choices, costs, and technologies.

Management Strategy for Sustainability in the Interface between the Built and Natural Environments

"Sustainable development is required by law and policy" and is the application of sustainable development principles to the planning phase of project (DD Form 1391). The Navy's goal is to exceed the LEED "certified" level where justified by life cycle costs (NAVFAC Instruction 11010.45).

LEED is integrated into agency work due to the application of Executive Order 13423 (January 2007).

The Navy uses LEED as a tool in applying sustainable development principles and as a metric to measure their achievement.

The Navy also uses the National Governors Association Checklist for better land use (National Governors Association 2011). The sustainability evaluation includes one criterion that addresses protection of open space, natural beauty, and critical environmental areas:

1. Does the project avoid fragmenting existing green space, especially natural habitats?
2. Does the project design protect the local watershed? Water runoff and other factors should be examined to determine whether the development is harming the watershed. The fraction of land paved over for streets and parking typically should not exceed 20 to 30%.
3. Does the project location avoid increasing the risk or negative impacts of natural disasters? Consideration should be given to what kinds of periodic natural hazards exist for the site and whether a specific location is vulnerable, for example, to flooding, wildfires, or high winds.

"Sustainability planning recognizes the environmental association of all planning recommendations and providing ecologically sustainable solutions that support and enhance the regional shore establishment" (NAVFAC Instruction 11010.45). LID is a site design strategy which attempts to maintain or replicate the pre-development hydrologic regime. Hydrologic functions include storage, infiltration, and ground water recharge, as well as the volume and frequency of discharges. Retention and detention areas, reduction of impervious surfaces, and the lengthening of flow paths and runoff time can be used to support these functions. Sustainability indicators for the construction of infrastructure that promote the achievement of the Navy's mission in an environmentally integrated way. The following strategies are designed to improve sustainability of both projects and habitat. Many are adapted from EO 13423 (January 2007).

Objectives and Guidelines for Sustainability in the Interface between the Built and Natural Environments

Objective: *Enable innovation in planning, design, project management, and implementation.*

Objective: *Improve the sustainability of water use as part of an Environmental Management System, as required under the EO on Federal Leadership in Environmental, Energy, and Economic Performance [05 October 2009].*

I. Balance short-term mission accomplishments with long-term environmental, social, and economic assets that sustain the mission in the long-term.

II. Use the Regional Shore Infrastructure Plan and Site Approval Process early in the project planning phase that considers water, air quality, engineering, and natural resources.

- **A.** Improve the integration of Navy natural resources professionals into early project reviews for water management and landscaping.
- **B.** Continue to comply with EO 13123 by applying sustainability principles to the management of habitats, species, and ecological functions within NAWS-CL.
  1. Promote sustainable land use while maintaining mission capability. Planners should avoid using undeveloped land, open space, water and soil conservation areas, existing natural ecosystems, endangered species habitats, and floodplains (NAVFAC Instruction 11010.45).
     a. Select a site that preserves natural resources
     b. Clean up and redevelop polluted sites
     c. Choose the project site to protect natural resources (NAVFAC Instruction 11010.45):
        i. Place new site disturbance in currently or previously disturbed areas.

ii. Protect ecologically sensitive areas such as endangered species habitats, woodlands, wetlands, and water sources. Increase urban density rather than developing untouched areas.

iii. Accommodate topographically difficult terrain, avoiding disturbance of steep slopes where development could cause erosion. Accommodate natural watershed drainage patterns and reduce and manage water runoff from the site.

iv. Plan for efficient water use through use of natural drainage, drought tolerant landscaping, and recycling.

v. Implement LID practices for protecting water quality.

vi. Minimize paved areas and maximize use of native vegetation.

vii. Encourage landscape design and maintenance methods that use native vegetation and reduce or eliminate the use of pesticides, and synthetic fertilizers as well as encouraging the use of compost and recycled gray water (NAVFAC Instruction 11010.45).

5.10.4 Integrated Pest Management Plan

Related Sections

Map 3-10 Known locations of sensitive plant species at Naval Air Weapons Station China Lake and the immediate vicinity (5-mile radius). Data sources: California Natural Diversity Database 2010 records, INRMP 2000.
4.7.3 Invasive Species
5.3 Animal Damage Control
5.6 Landscaping and Grounds
Appendix H: Installation Restoration Sites and Approved Pesticide List

Summary of Management Issues for Integrated Pest Planning

The pest management program is summarized below.

- The base operations service contract pest control performance assessment representative is assigned the duty as the installation integrated pest management coordinator. The integrated pest management coordinator coordinates and provides oversight of the installation pest management activities.
- The military family housing is managed by Lincoln Military Housing, a private company. They are responsible for maintenance of the residences and provide pest control and landscape maintenance services.

Management Strategy for Pest Management Plan Integration

Strategy for Integrating Pest Management Planning in the INRMP

Objective: *Support the IPMP's framework to meet the DoD's annual goals or measures of merit. Per DoDI 4150.07, the measures of merit are:*

- 100% of DoD installations will have current pest management plans
- Maintain the 55% pesticide use reduction and provide supporting data per IPMP Section 2.6.4

I. All pesticide applicators will be appropriately certified. The integrated pest management coordinator will maintain copies of certificates and verify current certification of all pesticide applicators.

II. Continue to integrate INRMP activities with guidelines of the IPMP with respect to:

A. Animal damage control

B. Invasive plant control

C. Landscaping and grounds maintenance

III. DoD policy is to ensure pest management programs achieve, maintain, and monitor compliance with all applicable EOs and applicable federal, state, and local statutory and regulatory requirements. When there is a conflict between federal and local regulations, the installation will comply with the more stringent of the two.

5.11 Law Enforcement

Related Sections

2.6 Overview of Government Regulatory Context of Natural Resources Management
Appendix B: Laws, Guidance and Regulation Effecting Natural and Cultural Resources

Summary of Issues for Natural Resource Law Enforcement

Enforcement of laws, primarily aimed at protecting natural resources (and recreation activities that depend on natural resources) shall be an integral part of a natural resources program and shall be coordinated with or under the direction of the natural resources manager for the affected area. Natural resources law enforcement training shall be budgeted for, and each installation with hunting, fishing, or protected species shall ensure trained personnel are available (OPNAVINST 5090.1C CH-1).

DoD Components shall coordinate with appropriate agencies to support conservation law enforcement to enforce federal and applicable state laws and regulations pertaining to the management and use of the natural resources under their jurisdiction (DoDI 4715.03).

DoD Components shall 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. (e.g., DoD Sikes Act (as amended) Training Course).

Management Strategy for Natural Resources Law Enforcement

Objective and Guidelines for Natural Resources Law Enforcement

Objective: *Enforce natural resource laws while taking proper safety and security measures.*

I. Provide Conservation Officers access to enforce natural resources laws as appropriate (OPNAVINST 5090.1C CH-1). Coordinate with agencies to support conservation law enforcement to enforce federal and applicable state laws and regulations pertaining to the management and use of the natural resources under their jurisdiction (DoDI 4715.03).

II. Discourage and minimize the impacts of unauthorized access.

III. Provide and budget for natural resources law enforcement as necessary (OPNAVINST 5090.1C CH-1).

5.12 Natural Resources Information Management and Reporting

5.12.1 Cataloging and Reporting Natural Resources Information

Summary of Management Issues for Cataloging and Reporting Natural Resources Information

The collection of natural resources field data, and development of a computerized retrieval system for this data is an ongoing effort at NAWS-CL. This data mapping effort facilitates mission accomplishment by allowing planners to assess potential impacts during the planning process.

The oldest aerial photographs of NAWS-CL were taken in 1943. In 1989 black and white, ten-meter resolution aerial photographs of the entire Station were taken. The latest series, taken in 1997, covered the entire Station and are digital, ortho-rectified, black and white and color photographs at 2-meter resolution.

Management Strategy for Cataloging and Reporting Natural Resources Information

Project Summary	Legal Driver
Continue to compile and update the natural resource library of research and management digital data	Sikes Act (as amended), DoD guidance on ecosystem approach, Navy guidance on annual INRMP program metrics

Strategy for Cataloging and Reporting Natural Resources Information

Objective: *Support effective integration, analysis, and dissemination of natural resource monitoring and research data. Organize, analyze, and communicate natural resource information to support management decisions.*

I. Continue to develop and update the NAWS-CL's data management systems and capabilities.

II. Establish and maintain an accessible data, report, and publication database. Establish a standardized format for data or report submittals. Ensure data is accessible to a broad audience.

Using best available science and data sources, and adaptive management, are guiding principles of ecosystem management for federal agencies (DoDI 4715.03).

A. Collect and deliver Geographic Information System data in a standard format. Implement geospatial data standards to enable sharing of spatial data and support the National Spatial Data Infrastructure (Office of Management and Budget Circular A-16 [Office of Management and Budget 1990, 2000] and EO 12906 as amended by EO 13286). These Tri-Services compliant standards, also known as the Federal Geographic Data Committee Metadata Standard, and Spatial Data Standard for Facilities, Infrastructure, and Environment.

1. Provide data as an Arc/Info coverage or geodatabase in State Plane NAD83 foot California Zone 6.

III. Establish a data distribution policy.

A. Distribute only finalized data with appropriate confidentiality agreements.

B. Confidentiality agreements should 10(a)(1)(A) permit holder reporting requirements and not impact timely reporting to the USFWS.

C. Plans that are jointly developed with other agencies may be distributed in draft to those agencies.

IV. Establish a standardized template for data resulting from project or research surveys and ensure that data is routinely backed-up.

5.13 Training of Natural Resources Personnel

Summary of Management Issues for Training Natural Resources Personnel

The Sikes Act (as amended) requires that there be "sufficient numbers of professionally trained natural resources personnel assigned responsibility" to implement an INRMP. A professionally managed program is the ultimate goal of an INRMP (NAVFAC P-73 Volume II 1987).

Strategy for Training Natural Resources Personnel

Project Summary	Legal Driver
Ensure environmental staff are provided ongoing training and professional development opportunities.	Sikes Act (as amended), Navy guidance on INRMP program

Objectives and Guidelines for Training of Natural Resources Personnel

Objective: *Continue to improve natural resources managers with professional development and training opportunities.*

I. Allow environmental staff to attend workshops, classes, training, and conferences to the extent practicable.

II. Provide staff with technical support, training, and networking opportunities specific to their job assignment (OPNAVINST 5090.1C Chapter 28).

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6.0 Implementation Strategy

Formal adoption of an Integrated Natural Resources Management Plan (INRMP) constitutes a commitment to seek funding and execute funded projects and activities in accordance with INRMP guidelines. The Sikes Act (as amended) dictates that activities specifically addressed in the INRMP must be implemented (subject to availability of funds). Project priority ranking systems are listed in Table 6-1. Priority projects, showing Office of the Secretary of Defense (OSD), U.S. Department of Defense (DoD) Instruction (DoDI) 4715.03, and the U.S. Department of the Navy (Navy) Environmental Readiness Level (ERL) priority systems are listed in this table. Since the Sikes Act (as amended) requires implementation of the INRMP, it is important that budget personnel participate in the INRMP process. Projects must be implemented within the timeframe indicated in the INRMP. Deviations may require supplementation to the Environmental Assessment or Environmental Impact Statement associated with the INRMP (Secretary of the Navy, 12 August 1998).

The Heads of the OSD and DoD Components shall plan, program, and budget resources to support identified conservation programs consistent with Navy ERLs, other DoD guidance, fiscal policies, and future deadlines (DoDI 4715.3).

Secretary of the Navy Instruction 6240.6E (Navy 2000b) assigns responsibility for managing natural resources programs under the jurisdiction of the Secretary of the Navy to the Commander Navy Installations Command. Regional command and coordination is provided by the major claimant, Commander Navy Region Southwest. Naval Facilities Engineering Command (NAVFAC) Southwest is responsible for providing technical assistance.

The Heads of the OSD and DoD Components with natural resources management responsibilities shall plan, program, and budget resources necessary to establish, execute, monitor, and maintain integrated natural resource conservation programs, consistent with OSD ranking guidelines "Programming and Budgeting Priorities for Natural Resources Programs", other DoD guidance and fiscal policies, and future deadlines (DoDI 4715.03).

The Commanding Officers of shore activities holding Class I property (land and water) suitable for the conservation of natural resources shall request funding sufficient to ensure support of an integrated program as prescribed by Naval Operations Instruction (OPNAVINST) 5090.1C CH-1 and the NAVFAC P-73, Vol. II, including personnel support and training.

Naval Air Weapons Station China Lake (NAWS-CL) intends to implement the INRMP to maintain regulatory compliance and support mission obligations within anti-terrorism and force protection limitations, and funding constraints. All actions contemplated in the INRMP are subject to the availability of funds properly authorized and appropriated under federal law. Nothing in the INRMP is intended to be, nor must be construed to be, a violation of the Anti-Deficiency Act (31 U.S. Code 1341 et seq.).

6.1 Project Prescription Development and Priority Setting

Implementation will depend on the project descriptions and guidelines and how these are translated into performance work statements, and scopes of work. This plan becomes a component of the Station's Environmental Management System. Partnerships with other agencies also become a critical program element, due to the Station's regionally significant natural resources.

Table 6-1. Environmental Conservation Program Requirement Levels, and Environmental Readiness Levels.

OSD, DoDI 4715.03 (March 18, 2011) Environmental Conservation Programs	**Navy ERLs to facilitate capability versus cost trade-off decisions for all environmental resources (OPNAVINST 5090.1C CH-1, Chapter 2)**
Compliance Class 0: Recurring Natural Resource Conservation Management Requirements. Administrative, personnel, and other costs associated with managing DoD's Natural Resources Conservation Program that are necessary to meet applicable compliance requirements in federal and state laws, regulations, Executive Orders (EOs), and DoD policies, or in direct support of the military mission. DoD Components shall give priority to recurring requirements associated with the operation of facilities, installations, and deployed weapons systems.	**Environmental Readiness Level 4** ERL4 is considered the absolute minimum level of environmental readiness capability. Supports all actions specifically required by law, regulation, or EO (DoD Class I and II requirements) just in time. Supports all DoD Class 0 requirements as they relate to a specific statute such as hazardous waste disposal, permits, fees, monitoring, sampling and analysis, reporting, and record keeping. Supports recurring administrative, personnel, and other costs associated with managing environmental programs that are necessary to meet applicable compliance requirements (DoD Class 0). Supports minimum feasible Navy executive agent responsibilities, participation in OSD sponsored inter-department and inter-agency efforts, and OSD mandated regional coordination efforts.
Class I: Current Compliance, Non-Recurring. Components shall prioritize non-recurring requirements including 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 nature 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. These activities include: a) Environmental analyses for 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 the incidental take statements of biological opinions, biological assessments, 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 the U.S. Fish and Wildlife Service or National Marine Fisheries Service; e) Mitigation to meet existing regulatory permit conditions or written agreements. 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 the 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. Class II: Maintenance Requirements. Include 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, Geographic Information System mapping, and data management to comply with federal, state, and local regulations, EOs, and DoD policy. 3) Efforts undertaken in accordance with non-deadline specific compliance requirements of leadership initiatives. 4) Wetland enhancement to minimize wetlands loss and enhance existing degraded wetlands. 5) Conservation recommendations in biological opinions issued pursuant to the Endangered Species Act.	**Environmental Readiness Level 3** Supports all capabilities provided by ERL4. Supports existing level of Navy executive agent responsibilities, participation in OSD sponsored inter-department and inter-agency efforts, and OSD mandated regional coordination efforts. Supports proactive involvement in the legislative and regulatory process to identity and mitigate requirements that will impose excessive costs or restrictions on operations and training. Supports proactive initiatives critical to the protection of Navy operational readiness.
Stewardship Class III: 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; (2) Educational and public awareness projects; (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.	**Environmental Readiness Level 2** Supports all capabilities provided under ERL3. Supports enhanced proactive initiatives critical to the protection of Navy operational readiness. Supports all Navy and DoD policy requirements. Supports investments in pollution reduction, compliance enhancement, energy conservation and cost reduction. **Environmental Readiness Level 1** Supports all capabilities provided under ERL2. Supports proactive actions required to ensure compliance with pending/ strong anticipated laws and regulations in a timely manner and/or to prevent adverse impact to Navy mission. Supports investments that demonstrate Navy environmental leadership and proactive environmental stewardship.

Project prescriptions are developed cooperatively with both internal and external stakeholders. Scopes of work are developed by the Environmental Management Division in partnership with NAVFAC Southwest to document the common understanding of work methods and schedule.

The Sikes Act (as amended) specifically requires "sufficient numbers of professionally trained natural resources management and natural resources enforcement personnel to be available and assigned responsibility" to implement an INRMP. NAWS-CL in house staff provides the majority of the natural resources management with contractors supplementing existing staff when necessary. To accomplish this, NAWS-CL will need to take advantage of funding opportunities outside normal program boundaries, consistent with authority to receive and use any such funds (see Section 6.2). Budget priorities are described in the Environmental and Natural Resources Program Manual (OPNAVINST 5090.1C CH-1) and by the Chief of Naval Installations policy (Navy 1994).

All compliance projects are ranked according to Navy ERLs and timeline urgency (Chief of Naval Operations 2004). The highest ERL (4) is considered the absolute minimum level of compliance and supports all actions specifically required by law, regulation or EO. This ERL is equivalent to OSD/DoD Class I and II requirements; see Table 6-1). Subject to the availability of funding, all Navy ERL 4 projects and activities must be programmed in accordance with specific timeframes identified in the INRMP.

Budget priorities for listed species management, especially compliance with Biological Opinions, receive the highest possible budgeting priority. These projects support the need to avoid Critical Habitat designations under Section 4(b)(2) of the Endangered Species Act, or Section 4(a)(3) of the Endangered Species Act (exemption from Critical Habitat designations for national security reasons).

Management Strategy for Project Prescription and Priority Setting

Objective: *Provide the support necessary to ensure compliance with environmental laws, stewardship of natural resources, and continued use of NAWS-CL's land by the Navy.*

Metric: *During annual review with USFWS and state partners, it shall be verified that: a) All ERL 4 projects and activities have been budgeted for and implementation is on schedule. b) All required trained natural resources positions are filled or in the process of being filled. c) 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). d) All required coordination has occurred. e) All significant changes to the installation's mission requirements or its natural resources have been identified (Navy INRMP Guidance April 2006).*

I. Utilize partnerships and other agreements to achieve the goals and objectives of the INRMP, as practicable. Evaluate all compliance projects for compliance urgency and timeline sensitivity.

- **A.** Determine compliance requirement priorities to meet regulatory timelines and to avoid potential enforcement actions. Continue to follow the ERL criteria.

II. Use the Environmental Program Requirements criteria (OPNAVINST 5090.1C CH-1) from Table 6-1 to prioritize projects. Prioritize projects according to:

- **A.** Will the project improve effectiveness for responding to military readiness concerns?
- **B.** Will the project prevent imminent, direct or indirect irreversible harm to a protected natural resource or contribute to adverse cumulative effects? Consider priorities established in the INRMP and other NAWS-CL planning documents.
    1. Priority no. 1 designations are those areas identified as either Critical Habitat for the federally threatened Mohave Desert Tortoise (*Gopherus agassizii*) and Inyo California Towhee (*Pipilo*

crissalis eremophilus), as well as the federally endangered Mohave tui chub (*Siphateles bicolor mohavensis*). These areas include a total of approximately 237,154 acres (21% of total land area). Areas with a management priority no. 1 include the southern portion of the South Ranges, riparian habitat in both the Mountain Springs Canyon and the Birchum Springs area in the east-central portion of George Range, the Lark Seep drainage system at the southeastern edge of George Range, and other surface water features (Navy 2005).

2. Priority no. 2 designations are those portions of the Mohave Desert Tortoise habitat not included in the Critical Habitat designation. This habitat covers approximately 382,487 acres (38% of total land area) at NAWS-CL. Known raptor breeding areas, riparian areas, springs and seeps, bat maternity colonies, and nesting areas are also designated as priority no. 2 management areas. Areas with a management priority no. 2 include much of the lower elevations in Panamint Valley in Mojave B North and the western and middle portions of Randsburg Wash in the South Range. This habitat designation includes most of the Indian Wells Valley, Salt Wells Valley, and Coso Basin in the North Range. This designation is also applied to scattered isolated raptor nesting and breeding sites throughout the North and South Ranges (Navy 2005).
3. Priority no. 3 designations include areas hosting NAWS-CL Special Status (non-listed) Species and most of the remaining open or undisturbed wildlife habitat on-Station (see Chapter 3). These land areas account for approximately 470,170 acres (42% of total land area) and support several plant and animal species identified for special management consideration. These areas are located throughout the Coso and Argus mountain ranges and Coles Flat. On the South Range, management priority no. 3 areas are in the Slate Range in the western portion of Mojave B North, Brown Mountain, and Quail Mountain along the eastern edge of Mojave B North, Robbers Mountain in Randsburg Wash, and the Eagle Crags in Mojave B South (Navy 2005). NAWS-CL Special Status Species are fully described in the INRMP. NAWS-CL recognizes the importance of these species and will manage them in a manner that is consistent with regional considerations in an effort to prevent their becoming listed. These species and their habitats are not federally listed or protected by federal laws. However, NAWS-CL has designated them as Special Status Species (Navy 2005).

   The Comprehensive Land Use Management Plan and previous INRMP (Navy 2000a) indicate that NAWS-CL Special Status Species have been determined based on a comparison of lists from recognized natural resource organizations/agencies. These organizations/agencies employ the best available science in developing their particular sensitive species lists, and may consider factors such as the species rarity, state listing status, endemic status, scientific interest, or proposal for federal listing. Species not found on the California Natural Diversity Database list were added, based on their inclusion on similar lists compiled by agencies, including:

   – California Department of Fish and Wildlife
   – California Natural Diversity Database
   – California Native Plant Society
   – U.S. Fish and Wildlife Service (USFWS) (BCC List, other)
   – Bureau of Land Management (Special Status/Sensitive Species)
   – U. S. Forest Service
   – Park Service
   – Audubon Society (Blue List)

4. Priority no. 4 designations refer to previously disturbed land associated with established land use patterns. Because of their continuing and intensive use as facility locations, roads, target and test sites, and other high-intensity use areas of concentrated activity, these are assigned a resource management priority no. 4. Disturbed areas on North Range are found at Armitage Airfield, Mainsite, Ordnance Test and Evaluation, and Propulsion Laboratory's land use management units. These areas also include the targets, test sites, and infrastructure locations throughout the North and South Ranges (Navy 2005).

The Heads of the OSD and DoD Components with natural resources management responsibilities shall ensure scientifically sound, innovative, and effective stewardship of natural resources under their jurisdictions (DoDI 4715.03).

III. Prioritize and rank stewardship projects according to benefit to natural resources, especially management focus species and habitats.

IV. Establish research or monitoring priorities that may be achieved by partnerships with outside parties. Actively seek and support outside researchers, institutions, and programs to facilitate resource data gathering efforts in addition to maintaining good rapport with the scientific community.

6.2 INRMP Project Summary, Schedule, and Implementation Tables

The projects developed cooperatively with both internal and external stakeholders are summarized in Appendix N, Table N-1. The rationales for these projects have already been presented in Chapter 4 and Chapter 5.

6.3 Effectiveness of INRMP in Providing for No Net Loss

The Sikes Act (as amended) and DoD guidance require that INRMPs ensure that no net loss of available land and operational carrying capacity for military support occurs while pursuing environmental protection needs.

Regional Commanders and Area Coordinators are required to report new conservation regulatory requirements. These may result from proposed listings of threatened and endangered species, proposed Critical Habitat restrictions, biological opinions, and National Environmental Policy Act mitigation measures. Requirements are reported via the chain of command, in coordination with the Engineering Field Divisions /Engineering Field Activities and NAVFAC Headquarters, to N45. Reporting may be accomplished via the Natural Resources Data Call Station or by written notifications. The reports detail particular impacts on readiness, sustainability and training. Reported metrics may include: days of training lost due to Natural Resources Restrictions, endangered species impacts and costs for mitigation and protection, limitations on night operations, limitations on training capability, costs of mitigation related to endangered species, migratory birds, and any other issues or impacts that are important to Navy to support overall readiness and sustainability etc.) (OPNAVINST 5090.1C CH-1).

6.4 Funding Sources

The costs of implementing natural resources management actions may be funded from a variety of sources. However, not all fund sources can be applied to all projects. Environmental Program Requirements exhibits must clearly justify funding requests so that: 1) natural resource funds are distributed widely, and 2) funding is

compliant with funding program rules. Funding allocations must be in accordance with applicable law. Navy policy requires funding of all Class 0 and Class 1 projects and all projects must be addressed in the INRMP.

Table 6-2 depicts NAWS-CL projects that are current Environmental Program Requirements projects.

Table 6-2. Naval Air Weapons Station China Lake current Environmental Program Requirements projects (7/5/2012).

Project Number	Project Title
6893700000	INRMP Wild Horse Plan Modeling
6893701210	1 S SW NAWS-CL California Vole Genetic Study
6893701211	SW NAWS-CL Tamarix Removal and Replacement with Native Vegetation
6893712016	Wild Horse and Burro Management Plan Update
689371201D	Survey for Mojave Ground Squirrel
6893712026	CHS SW NAWS-CL INRMP
689371225A	SW NAWS-CL Invertebrate and Endemic Species Surveys
689371235A	Enhancement and Protection of Native Riparian Habitat
689371235C	SW, NAWS-CL, Monitoring of Native Springs Soil and Water
689371236D	CHS SW NAWS-CL Range Habitat Monitoring
689371236E	1 CP SW NAWS-CL Protection of Towhee Habitat
6893718537	2 BO SW NAWS-CL Desert Tortoise Survey
6893720121	SW NAWS-CL Wild Horse Herd Aerial Census
6893720122	Horse and Burro Management Plan Update
6893720125	Native Spring and Water Source Data Compilation and Management Plan
6893720127	SW, NAWS-CL, Federally-Listed Bird Species Assessment
6893720129	SW NAWS-CL Wild Horse Fertility Control
6893759367	1 S SW NAWS-CL Avian Monitoring for Listed Species
6893762185	SW NAWS-CL Vertebrate Inventory at Springs
6893768214	4 SW NAWS-CL Feral Horse and Burro Removal
68937B0096	2 BO NAWS-CL Tui Chub Management/Protection
68937B0101	Exotic Species Control - Tamarix
68937B0102	SW NAWS-CL Feral Horse and Burro Removal
68937B0105	1 S SW NAWS-CL Inyo Towhee Surveys
68937B0109	1 S SW NAWS-CL Endangered Plant Census
68937B0126	SW NAWS-CL Large Mammal Population Surveys

In addition to the standard Navy operations budget there are several other avenues of funding available to program managers. These additional funding sources can be used for regulatory compliance, mission support-related endeavors, and stewardship programs. These sources are discussed below.

Sikes Act (as amended) Funds

Sikes Act (as amended) funds are collected via sales of hunting and fishing licenses They are authorized by the Sikes Act (as amended) and may be used only for fish and wildlife management on the installation where they are collected. The Chukar (*Alectoris chukar*) hunting program currently does not generate Sikes Act (as amended) funds.

Operations and Maintenance Funds

Navy Operations and Maintenance Environmental Funds fund the majority of natural resources projects. These appropriated funds are the primary source of resources to support environmental compliance, i.e., Navy Level 1 projects. Operations and Maintenance funds are generally not available for Navy Level 2-5 projects.

Management Strategy for Funding

Objective: *Adequately fund natural resources planning initiatives.*

I. Develop prioritized lists of proposed management efforts. Provide documentation to secure appropriate levels of in-house funding and develop plans and supporting documentation to secure off-site funding.

II. Continue to request funding from other agencies for programs of mutual benefit and continue to support scientific, academic, and volunteer efforts to initiate or supplement natural resource management programs.

6.4.1 University Assistance

Universities are an excellent source of research assistance. NAWS-CL has supported several universities in recent years to help with specialized needs, such as the University of California, Riverside (invertebrate surveys); University of Nevada, Reno (Mountain Quail [*Oreortyx pictus*] research); University of Arizona, Tucson (Mohave tui chub research); Idaho State University, Pocatello, and Tufts University (upland game bird research); and University of California, Berkeley (mammal, invertebrate, and herpetology research).

6.4.2 Contractor Support

NAWS-CL may use outside contractors to supplement in-house staff management efforts. Contractors may supply expertise in particular specialties or for large projects not supportable by staff, due to workload issues. Contractors are involved in projects such as National Environmental Policy Act documentation, vegetation surveys, spring and water source surveys and evaluations, species surveys (Mohave Desert Tortoise, Inyo California Towhee, invertebrates, vertebrates, bats, and Slender Salamanders [*Batrachoseps* sp.]), management plans, feral horse (*Equus caballus*) and burro (*Equus asinus*) gathers, riparian area protection efforts (fencing) and other activities. In accordance with Circular No. A-76, the federal government is in many cases directed to use commercial sources to supply the products and services the Government needs. Contractors give the Station access to a wide variety of specialties and fields.

6.4.3 Research Funding Requirements

Environmental program funding within the Navy is primarily based upon federally mandated requirements. Consequently, program managers are encouraged to seek outside funding for projects consistent with the INRMP, such as research and collection of baseline data.

New funding sources may be sought from federal, state, local, and nonprofit organizations. Such funding must be consistent with authorization to receive and use such funds and may require cost-sharing. These funding opportunities should be sought for projects that are not Navy Class 0 or 1 must fund items. Examples are watershed management, habitat enhancement, or wetland restoration projects outside endangered species habitats.

6.4.4 Department of Defense Funding Sources

The costs of executing INRMP actions may be funded from a variety of DoD sources. The primary funding sources include:

1. Operations and Maintenance, Navy Environmental Funds. Environmental funds are a subcategory of Operations and Maintenance funds and are primarily used for compliance-related actions. Most natural resources projects are funded with Operations and Maintenance environmental funds. These appropriated

funds are the primary source of funding for Navy Level 1 projects and are generally not available for Navy Level 2-5 projects.

2. The DoD Legacy Resource Management Program is a special, Congressionally-mandated initiative to fund military conservation projects. Although the Legacy Resource Management Program was originally only funded from 1991 to 1996, funds for new projects have continued to be available through this program. The Legacy Resource Management Program can provide funding for a variety of conservation projects, such as regional ecosystem management initiatives, habitat preservation efforts, archaeological investigations, invasive species control, monitoring and predicting migratory patterns of birds and animals, and national partnerships and initiatives.
3. Forestry Revenues. While not readily available to NAWS-CL, revenues from the sale of forest products on Navy lands are a source of funding for natural resource management programs.
4. Agricultural Outleasing. While not readily available to NAWS-CL, funds accumulated through the outleasing of agricultural lands on many installations are directed back into the natural resources program and reallocated throughout the Navy by NAVFAC Headquarters among requesting installations. These are the broadest use funds available exclusively to natural resource managers.
5. Fish and Wildlife Fees derived from hunting or fishing. Where installations collect fees or proceeds from hunting, fishing, and trapping, they will use the fees only for funding or supplementing wildlife management programs. Uses may include funding of partnerships, cooperative and research agreements with appropriate agencies (OPNAVINST 5090.1C CH-1).
6. Recycling Funds. Installations with a Qualified Recycling Program may use proceeds for some types of natural resource projects.
7. Special Initiatives. DoD or Navy may establish special initiatives to fund natural resource projects. Funding is generally available only for a limited number of projects. There are currently two such initiatives, one for streamside forests and the other for sustaining forests.

6.4.5 Use of Cooperative Agreements

Cooperative agreements establish s between the Navy and a recipient (such as governmental or academic institutions, non-profit organizations or individuals). Cooperative agreements provide a mutually beneficial means of acquiring, analyzing, and interpreting natural resources data, to support natural resources management decisions. Authorization for Cooperative agreements is arranged through NAVFAC.

6.5 Adaptive Management

6.5.1 INRMP Update and Review

INRMPs are to be reviewed “as to operation and effect” by the primary parties “on a regular basis, but not less often than every five years [Section 101(b)(2) of the Sikes Act (as amended)]. The review is intended to ensure that the Plan continues to: meet the requirements of the Act; and contributes to the conservation and rehabilitation of natural resources. INRMPs are reviewed annually with the USFWS and the California Department of Fish and Wildlife. An annual review facilitates adaptive management, establishes a realistic schedule for undertaking proposed actions, and facilitates preparation of the required annual report.

According to the INRMP Guidance for Navy Installations (2006), annual reviews must verify that: conservation metrics are available, that must fund projects are being implemented on schedule, that required training has been completed; and that projects and activities for the upcoming year have been identified and included in the INRMP.

The Annual Review process is guided by OPNAVINST 5090.1C CH-1. Recent guidance indicates that the five-year review would not necessarily constitute a "revision," and that revisions are only initiated if necessary. Each installation must provide a notice of intent to prepare or revise the INRMP. The USFWS field office is the appropriate entry point for military installations, and the USFWS Regional Sikes Act (as amended) Coordinator is the liaison to facilitate INRMP review.

INRMPs typically incorporate by reference the results of Endangered Species Act consultations, including any reasonable and prudent measures identified in an incidental take statement. Neither a separate biological assessment nor a separate formal consultation should be necessary. An informal or formal consultation may be warranted if potentially competing needs of multiple species are identified.

The DoD Components shall report progress toward meeting natural resources conservation program measures of merit to Deputy Under Secretary or Defense for Installations and Environment at each Environmental Management Review, and to Congress in the Defense Environmental Programs Annual Report to Congress (DoDI 4715.03).

There is no legal obligation to invite the public either to review or to comment upon the parties' mutually agreed upon decision to continue implementation of an existing INRMP without revision. If the parties determine that substantial revisions to an INRMP are necessary, public comment shall be invited in conjunction with any required National Environmental Policy Act analysis.

6.5.2 INRMP Metrics

Natural Resources Conservation metrics must be annually reported to Congress as part of a broader national initiative to improve government performance (see Appendix S, Appendix S-1). The metrics are used to assess the overall health and trends of each installation's program and to identify and correct potential funding and other resource shortfalls. A full copy of the most recent Natural Resources Metrics questions is presented in Appendix S.

According to DoDI 4715.03:

> The metrics specifically assess INRMP implementation, measure conservation efforts, ensure no net loss of military testing and training lands, and describe how the INRMP supports the mission. The metrics also discuss success of partnerships with the USFWS and state fish and wildlife agencies.

Management Strategy for INRMP Update, Review, and Metrics Assessment

Management Strategy for INRMP Update, Review, and Metrics Assessment

Objective: *Improve and refine natural resources management, by adjusting success criteria and priorities based on past accomplishments, new risks and threats, new biological information, and changes in policy.*

I. Provide a notice of intent to prepare or revise the INRMP to USFWS Field Office (and Regional Coordinator) and the California Department of Fish and Wildlife if necessary. Comply with recent Chief of Naval Installations draft guidance (January 2005) on INRMPs Sikes Act (as amended) compliance:

- **A.** Complete annual reviews with applicable internal stakeholders agencies to include all tenant commands as identified in Section 1.4.5.1. Annual reviews shall verify that:
  1. Current information on all conservation metrics is available.
  2. All must fund projects and activities have been budgeted for and implementation is on schedule.

3. All required trained natural resources positions are filled or are in the process of being filled.
4. Projects and activities for the upcoming year have been identified and included in the INRMP.
5. All significant changes in the installation's mission requirements or its natural resources have been identified.

B. Establish a mutually agreed-upon, realistic schedule to undertake proposed actions.

C. The outcome of this joint review should be documented in a memorandum or letter summarizing the rationale for the conclusions the parties have mutually reached.

D. Fulfill the reporting requirements of new measures to promote better understanding of the health of Navy conservation programs, using the INRMP Metrics Builder as defined by the Chief of Naval Installations. Conduct an annual internal review based on DoD metrics that are NAWS-CL specific.

1. Ensure long-term threats to the health of habitats, such as climate change and species invasion, are addressed.
2. Develop specific questions to support annual review process from the NAWS-CL perspective.
3. Consider implementing use of a computerized system to track INRMP implementation status and effectiveness. Use of a Geographic Information System database should also be considered to document various implementation activities (such as resource inventory results and locations of restoration projects).

6.5.3 Defense Environmental Program Annual Report to Congress

On an annual basis the Under Secretary of Defense (Installations and Environment) is required to present the Defense Environmental Programs Annual Report to Congress (DoDI 4715.03). In support of this report all installations with significant natural resources shall report:

- The installation name and State.
- If the installation meets Sikes Act requirements.
- If annual feedback has been received from the USFWS or National Marine Fisheries Service.
- If annual feedback has been received from the State fish and wildlife agency.
- Funding requirements in reporting per fiscal year to implement the INRMP.
  - Amount required for recurring projects.
  - Amount required for non-recurring projects.

This annual report shall be provided to the Deputy Under Secretary of Defense (Installations and Environment) or the designated representative.

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