DRAFT FINAL
INTEGRATED NATURAL RESOURCES MANAGEMENT PLAN FOR MARINE CORPS BASE CAMP PENDLETON, CALIFORNIA

Revision

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LIST OF ACRONYMS AND ABBREVIATIONS

ºC	degrees Centigrade
ºF	degrees Fahrenheit
1st MLG	First Marine Logistics Group
AC/S	Assistant Chief of Staff
ACP	Area Contingency Plan
ACOE	Army Corps of Engineers
AFA	Artillery Firing Area
AGL	Above Ground Level
BA	Biological Assessment
BASH	Bird/Wildlife Aircraft Strike Hazard
BEAP	Base Exterior Architectural Plan
BGEPA	Bald and Golden Eagle Protection Act
BNSF	Burlington-Northern Santa Fe
BO	Biological Opinion
BRAC	Base Realignment and Closure
BRFI	Brodiaea filifolia
C4	Composition C-4
C.F.R.	Code of Federal Regulations
CA	California
CAL	Confined Area Landing
CAGN	California gnatcatcher
Cal-IPC	California Invasive Plant Council
CamPen	Camp Pendleton
CAS	Close Air Support
CAP	Climate Adaptation Plan
CBT	Combat Town
CCA	Candidate Conservation Agreement
CDFW	California Department of Fish and Wildlife
CESA	California Endangered Species Act
CESU	Cooperative Ecosystem Studies Unit
CETEP	Comprehensive Environmental Training and Education Program
cfs	cubic feet per second
CMAGR	Chocolate Mountain Aerial Gunnery Range
CMC	Commandant of the Marine Corps
CMP	Conservation Metrics Portal
CNDDB	California Natural Diversity Database
CNO	Chief of Naval Operations

CNPS	California Native Plant Society
COLS	Common Output Levels of Service
CP	Camp Pendleton
CPAAA	Camp Pendleton Amphibious Assault Area
CPAVTA	Camp Pendleton Amphibious Vehicle Training Area
CPFD	Camp Pendleton Fire Department
CPX	Command Post Exercise
CRAM	California Rapid Assessment Methodology
CRPR	California Rare Plant Ranks
CRS	Cultural Resources Section
CSS	Coastal Sage Scrub
CST	Consultation Section
CUP	Conjunctive Use Project
CWA	Clean Water Act
DoD	Department of Defense
DODD	Department of Defense Directive
DoDI	Department of Defense Instruction
DoDM	Department of Defense Manual
DoI	Department of Interior
DoN	Department of the Navy
DPS	Distinct Population Segment
ECE	Environmental Compliance Evaluation
ECMS	Environmental Compliance Management System
eDNA	Environmental Deoxyribonucleic Acid
EDRR	Early Detection and Rapid Response
EFH	Essential Fish Habitat
EHV	Ecosystem Health Value
EIRS	Environmental Incident Reporting System
EO	Executive Order
EOD	Explosive Ordnance Disposal
EOM	Environmental Operations Map
EPA	U.S. Environmental Protection Agency
ES	Environmental Security
ESA	Endangered Species Act
ESRI	Environmental Systems Research Institute
FAA	Federal Aviation Administration
FS	Fairy Shrimp
FLETC	Federal Law Enforcement Training Centers
FMF	Fleet Marine Force

FSSG	First Force Service Support Group
FY	Fiscal Year
GCE	Ground Combat Element
GIS	Geographic Information System
GPS	Global Positioning System
GSOB	Goldspotted Oak Borer
GTF	Grow the Force
HA	Hydrologic Area
HCP	Habitat Conservation Plan
HEAT	High Explosive Anti-Tank
HHIA	High Hazard Impact Area
HMP	Habitat Monitoring Program
HOLF	Helicopter Outlying Landing Field
HQMC	Headquarters, U.S. Marine Corps
HU	Hydrologic Unit
HW	Hazardous Waste
I5	Interstate 5
ICM	Improved Conventional Munitions
ICRMP	Integrated Cultural Resources Management Plan
IED	Improvised Explosive Device
IGI&S	Installation Geospatial Information and Services
IIT	Infantry Immersion Trainer
IMEF	First Marine Expeditionary Force
INRMP	Integrated Natural Resources Management Plan
IPMP	Integrated Pest Management Plan
IR	Installation Restoration
ISFI	Independent Spent Fuel Storage Installation
JIEDDO	Joint Improvised Explosive Device Defeat Organization
KSHB	Kuroshio Shot Hole Borer
LAAD	Low Altitude Anti-aircraft Defense
LBVI	Least Bell's vireo
LCAC	Landing Craft Air Cushion
LMPT	Land Management Police Training
LFAM	Live Fire and Maneuver
LZ	Landing Zone

MAG-39	Marine Aircraft Group 39
MAGTF	Marine Air and Ground Task Force
MarDiv	Marine Division
MASS	Marine Air Support Squadron
MAW	Marine Aircraft Wing
MBTA	Migratory Bird Treaty Act
MCAS	Marine Corps Air Station
MCB	Marine Corps Base
MCBCP	Marine Corps Base Camp Pendleton
MCCS	Marine Corps Community Services
MCI-COM	Marine Corps Installations Command
MCIWEST	Marine Corps Installations West
MCO	Marine Corps Order
MCTSSA	Marine Corps Tactical Systems Support Activity
MEB	Marine Expeditionary Brigade
MEU	Marine Expeditionary Unit
MFA	Mortar Firing Area
MGRS	Military Grid Reference System
MHCP	Multiple Habitat Conservation Plan
mm	millimeter
MMPA	Marine Mammal Protection Act
MOA	Memorandum of Agreement
MOU	Memorandum of Understanding
MOUT	Military Operations in Urban Terrain
MP	Mortar Position
MPMG	Multipurpose Machine Gun
MSCP	Multiple Species Conservation Plan
MSL	Mean Sea Level
NAVFAC	Naval Facilities Engineering Command
NBC	Nuclear, Biological, and Chemical
NCCP	Natural Community Conservation Planning
NCTD	North County Transit District
NEPA	National Environmental Policy Act
NIWC Pac	Naval Information Warfare Center Pacific
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
NOTAM	Notice to Airmen
NPA	NEPA Section
NPS	National Park Service
NVCS	National Vegetation Classification System
NWCF	Naval Working Capital Fund

O&M, MC	Operations and Maintenance, Marine Corps
OCTA	Orange County Transportation Authority
PARC	Partners in Amphibian and Reptile Conservation
PIF	Partners in Flight
PLN	Environmental Planning Branch
PRJ	Project Management Section
POA	Proportion of Area Occupied
PPM	Pacific Pocket Mouse
PSHB	Polyphagous Shot Hole Borer
RAWS	Remote Automatic Weather Stations
RCMP	Range Complex Management Plan
REPI	Readiness and Environmental Protection Integration
RMB	Resources Management Branch
RSOP	Reconnaissance, Selection, Occupation of Position
RSU	Reserve Support Unit
RUF	Regimental Urban Facilities
RWQCB	Regional Water Quality Control Board
SAPW	South American Palm Weevil
SAIA	Sikes Act Improvement Amendments
SDG&E Plan	SDG&E Subregional NCCP
SDG&E	San Diego Gas and Electric Company
SDMMP	San Diego Management and Monitoring Program
SECNAV	U.S. Secretary of the Navy
SECNAVINST	Secretary of the Navy Instructions
SKR	Stephens' Kangaroo Rat
SME	Subject Matter Expert
SMIRNIG	Santa Margarita River Nutrient Initiative Group
SMR	Santa Margarita River
SOCTIIP	Southern Orange County Transportation Infrastructure Improvement Program
SOMA	San Onofre Management Area
SONGS	San Onofre Nuclear Generating Station
SOTG	Special Operations Training Group
SPS	Strategic Planning Section
State Parks	California Department of Parks and Recreation, Orange County District
SWAP	State Wildlife Action Plan
SWFL	Southwestern willow flycatcher

TCA	Transportation Corridor Agencies
TERF	Terrain Flight
TMDL	Total Maximum Daily Load
TNT	Trinitrotoluene
UAS	Unmanned Aircraft Systems
UAV	Unmanned Aerial Vehicles
U.S.C.	United States Code
USACE	U.S. Army Corps of Engineers
USDA	U.S. Department of Agriculture
USFS	U.S. Forest Service
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
USMC	U.S. Marine Corps
USNVC	U.S. National Vegetation Classification
UXO	Unexploded Ordnance
VP	Vernal Pool
V/STOL	Vertical/Short Takeoff and Landing
WACO	Western Area Counsel Office
WMI	Watershed Management Initiative

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EXECUTIVE SUMMARY

The Department of Defense (DoD) utilizes and manages approximately 30 million acres (12 million hectares) of land. Each military base that has suitable habitat for conserving and managing natural ecosystems is required to prepare, maintain, and implement an Integrated Natural Resources Management Plan (INRMP). This INRMP was prepared by Marine Corps Installations West-Marine Corps Base Camp Pendleton (referred to as Camp Pendleton or "the Base") in accordance with 16 United States Code (U.S.C.) §670a et seq. – Sikes Act, DoD Instruction 4715.03 – Environmental Conservation Program (DoD 2018a); Marine Corps Order P5090.2A Ch. 4 (USMC 2018); and 32 Code of Federal Regulations Part 190 – DoD Natural Resources Management Program.

The purpose of this INRMP is to assist the installation Commanders in their efforts to conserve and rehabilitate natural resources while ensuring the preparedness of the Armed Forces. This INRMP is a long-term planning document that guides implementation of the natural resources program to ensure consistency with Camp Pendleton's military mission, while providing for the conservation and rehabilitation and the sustainable multipurpose use of natural resources on Camp Pendleton. Camp Pendleton is currently the Marine Corps' premier amphibious training base and supports approximately 50,000 annual training events. The installation has simultaneously provided for the conservation of 19 species listed as threatened or endangered under the Federal Endangered Species Act; the protection of waters of the U.S., including wetlands; migratory bird management; game management; and a host of other natural resources successes. Marine Corps lands must be sustainable so the Marine Corps may use its land repeatedly, must comply with legal mandates and must be appropriately managed as land entrusted to us by the American people, providing a framework for ensuring continued success (USMC 2018).

This INRMP revision is necessary to address the recent occurrence of one species listed under the Endangered Species Act and to follow updated Climate Change Adaptation guidance provided by the Marine Corps (USMC 2018) and Department of Defense (DoD 2019). California Orcutt Grass (*Orcuttia californica*), a federally listed endangered plant species, was documented on the Base in June 2020. In June 2018, an updated Environmental Compliance and Protection Program Marine Corps Order (MCO 5090.2; USMC 2018) highlighted that Installations shall incorporate information related to climate change predictions and identify vulnerabilities in the INRMP, with updated instruction provided in the Climate Adaptation for DoD Natural Resource Managers guide (DoD 2019). In addition, the separation of Marine Corps Air Station Camp Pendleton's (MCAS CamPen) natural resources management from this INRMP also represents a significant change to the Base's INRMP. Natural resources management on MCAS CamPen was previously guided by a separate INRMP (MCAS CamPen 2013), but then was combined with the Base in 2018. Once

again, since the programs of the two installations are separate, two distinct INRMPs are being prepared – this INRMP for Camp Pendleton and a standalone INRMP for MCAS CamPen.

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

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

Additionally, the following on-Base directorates participated in an Internal Working Group, with key representatives from the following:

- Camp Pendleton Environmental Security Department
- Public Works Department, including Real Estate
- Range and Training Area Management Division
- Government and External Affairs

Resource-specific programs have been developed and described to address relevant natural resources issues at Camp Pendleton. The primary drivers for each program are summarized in this INRMP, as well as other background information applicable to the program (e.g., responsible entities, relevant ecosystems, and program background). Each program presented in this INRMP includes one or more elements that address specific management components of the program. Each program and element has a goal, and each element includes one or more objectives intended to meet program and element goals. Goals are visionary, ideal, and general in character, and provide long-term guidance in defining direction and purpose of the program. Objectives provide a more concise statement of what must be achieved to meet program and element goals. Finally, specific actions were developed to support each objective identified in the INRMP. Actions represent specific efforts that are implemented by the Base to support each natural resources management program. Refer to Appendix M of this INRMP for a complete list of actions planned for the current INRMP term (i.e., 2023-2028).

Management programs described in this INRMP include:

- Threatened, Endangered, and Rare Species
- Sustainable Ecosystem Management
- Migratory Bird and Raptor Management
- Marine and Fish Management
- Game Management
- Outdoor Recreation
- Human-Wildlife Safety Management
- Incident Management
- Natural Resources Awareness and Education

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

The majority of the actions identified in this revised INRMP (233 of 261) are considered administrative or would have no environmental impact or are continuations of actions that were addressed in the 2001 INRMP Environmental Assessment, or were, or currently are being, analyzed under other National Environmental Policy Act (NEPA) documents. Of the remaining actions, 18 pertain to implementing actions identified in various management plans for listed species, amending two conservation plans, and one habitat suitability assessment and will be analyzed under NEPA at a future time. The other 10 actions are activities authorized in the past via short-term, project-specific Categorical Exclusions and can continue to be authorized via project-specific processing under NEPA. Therefore, the effects of implementing all actions identified in the 2023 Camp Pendleton INRMP will not be assessed together under NEPA. Rather, the 28 actions subject to NEPA will be evaluated in the future through separate and project-specific NEPA analyses to obtain appropriate authorization. The Marine Corps will implement recommendations in the INRMP within the framework of regulatory compliance, Marine Corps mission obligations, and funding constraints. All actions contemplated in the 2023 Camp Pendleton INRMP are subject to the availability of funds properly authorized and appropriated under federal law. Nothing in the 2023 Camp Pendleton INRMP is intended to be, nor must be, construed as a violation of the Anti-Deficiency Act (31 U.S.C. §1341 et seq.).

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CHAPTER 1.0
INTRODUCTION

1.1 PURPOSE AND AUTHORITY

The Sikes Act (16 United States Code [U.S.C.] §670a et seq.), as amended, requires the Secretary of Defense to carry out a program to provide for the conservation and rehabilitation of natural resources on military installations in cooperation with the Secretary of the Interior, acting through the U.S. Fish and Wildlife Service (USFWS), and the head of each appropriate state fish and wildlife agency within the State of the installation. Specifically, the Sikes Act requires that, consistent with the use of military installations to ensure the preparedness of the Armed Forces, the Secretaries of the military departments carry out the program to provide for (1) the conservation and rehabilitation of natural resources on such military installations; (2) the sustainable multipurpose use of the resources, which shall include hunting, fishing, trapping, and non-consumptive uses; and (3) public access to military installations to facilitate the use, subject to safety requirements and military security.

The 1997 amendments to the Sikes Act require the Department of Defense (DoD) to develop and implement an Integrated Natural Resources Management Plan (INRMP) for each military installation with significant natural resources. In accordance with the Sikes Act, INRMPs shall reflect a mutual agreement between military installations, USFWS, and state fish and wildlife agencies concerning conservation, protection, and management of natural resources on military lands. Pursuant with Department of Defense Instruction (DoDI) 4715.03 – Natural Resources Conservation Program (DoD 2018a), Department of Defense Manual (DoDM) 4715.03 – Integrated Natural Resources Management Plan Implementation Manual (DoD 2018b), and Marine Corps Order (MCO) P5090.2A Ch. 4 (USMC 2018) – Environmental Compliance and Protection Manual, INRMPs must provide continued military access to land, air, and water resources for realistic training and testing while sustaining the long-term ecological integrity of natural resources and the ecosystem services they provide.

The purpose of this INRMP is to assist the Commander of Marine Corps Installations West-Marine Corps Base MCB Camp Pendleton (Camp Pendleton or "the Base") in the efforts to conserve and rehabilitate natural resources while ensuring the preparedness of the Armed Forces. This INRMP is intended principally to guide the effective management of natural resources within Camp Pendleton, to ensure that lands therein remain available and in good condition to support the military mission of both installations, and with "no net loss" in that capability. To ensure frequent and continued use of land for military training, now and in the future, management programs and actions in INRMPs must ensure natural resource utilization is (1) sustainable; (2) in accordance

with laws and regulations; and (3) optimally integrate with existing military installation plans and mission requirements. During the planning process, natural resources personnel consider appropriate management goals, objectives, and timelines for implementing actions to protect or enhance installation mission capabilities when determining INRMP resourcing priorities (DoD 2018a).

There may be instances in which a "net loss" of training capability may be unavoidable to fulfill legal requirements other than the Sikes Act, such as complying with a biological opinion pursuant to the provisions of sections 1531-1544 of the Endangered Species Act (ESA) or protecting wetlands pursuant to section 1251 of the Clean Water Act (CWA). To the extent practicable, the Base will identify the loss of mission capability in these instances and minimize the effects of any restrictions on training and testing (DoD 2018b).

In addition, pursuant to section 4(a)(3)(B)(i) of the Endangered Species Act, the Secretaries of the Departments of Interior and Commerce are prohibited from designating 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 INRMP prepared pursuant to section 670a of the Sikes Act. The USFWS uses three criteria ("Special Management Criteria") to determine if an INRMP provides adequate special management or protection to obviate the need for critical habitat designation: 1) The INRMP provides a conservation benefit to the listed species; 2) The INRMP provides certainty that relevant agreed-on actions will be implemented; and 3) The INRMP provides certainty that the conservation effort will be effective (DoD 2018b).

To meet these requirements, this INRMP endeavors to:

- Identify and facilitate coordination between the responsible parties and stakeholders concerned with natural resources management at Camp Pendleton;
- Describe the current and future installation mission for Camp Pendleton and its requirements;3
- State the policies, management philosophy, and objectives of natural resources management at Camp Pendleton;
- Provide information regarding the existing biological and physical conditions and the desired future conditions of natural resources for Camp Pendleton;
- Identify key natural resource management issues and concerns at Camp Pendleton and in the surrounding area;
- Identify and describe projects and management actions required to meet the objectives of natural resources management on Camp Pendleton; and
- Identify scheduling priorities and funding opportunities for the implementation of natural resources projects and management actions.

This INRMP provides technical guidance to persons planning and/or preparing installation approvals, management actions, orders, instructions, guidelines, Standard Operating Procedures, and other plans, for integrating natural resources management efforts into the Base's planning and decision-making processes. It is not intended, however, for use by military personnel operating in the field. Field operations and activities are directed to adhere to guidelines, plans, orders, or other approvals that have been developed using this INRMP and have already had environmental compliance review, and, where applicable, regulatory approvals and/or permitting (e.g., Camp Pendleton's Range and Training Area Standard Operating Procedures (CAMPENO 3500.1B, MCBCP 2022)). This INRMP does not dictate land use decisions, but rather provides important information to support sound land use and natural resources management decisions to ensure continued access to areas for military training and improve mission readiness. National Historic Preservation Act requirements are not addressed in this INRMP. Cultural resources management issues (archaeological and historical) are addressed separately within Camp Pendleton's Integrated Cultural Resources Management Plan (MCBCP 2017b).

1.2 SCOPE AND DURATION

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

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

The Base occupies approximately 125,000 acres, in northwestern San Diego County of southern California, with approximately 17 miles of coastline bordering the Pacific Ocean (Figure 1-1). This INRMP addresses natural resources management on the lands and nearshore environments of Camp Pendleton for a period of 5 years from the date of approval.

Real estate agreements (e.g., leases, easements, assignments, licenses) cover approximately 4,571 acres on Base, excluding leased acreage within cantonment areas. All lessees must be consistent with the philosophies, management combability and supportive of the objectives of this INRMP. As needed, the Base's Environmental Security Department may require lessees to prepare a

management plan, such that the management is compatible with the purposes of the [INRMP] plan. The DoD Component permitting authorities may include provisions in leases, permits, or licenses requiring the grantee to perform natural resources conservation duties or generate a natural resources plan as a condition of occupancy or use of the parcel. Installation Commanders still address natural resources management on any of these lands.

1.3 INRMP REVIEW, REVISION, AND COORDINATION

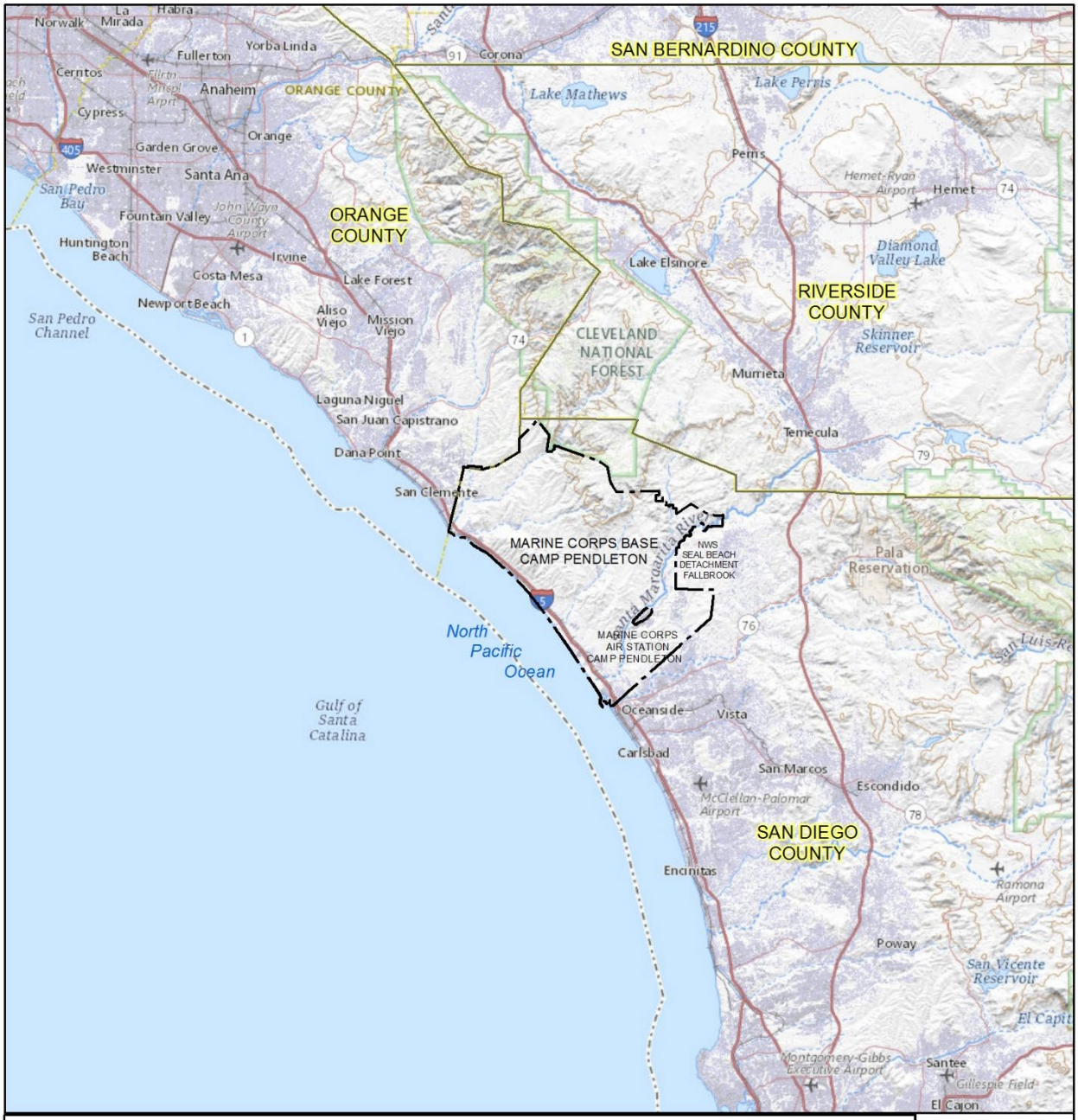
1.3.1 INRMP Review and Revision

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

This INRMP revision is necessary to address the recent change in status and occurrence of one species listed under the Federal Endangered Species Act. California Orcutt grass (*Orcuttia californica*), a federally listed endangered plant species, was documented on the Base in June 2020 (verified by San Diego Natural History Museum). In addition, an INRMP revision is necessary since Marine Corps Air Station Camp Pendleton ("Air Station") will publish an individual INRMP; in 2018, the Camp Pendleton INRMP was combined with the Air Station, but the management of the two installations have now been separated.

1.3.2 INRMP Coordination

The Sikes Act states that the INRMP must reflect the "mutual agreement" of USFWS, the state fish and wildlife agency, and the DoD "concerning conservation, protection, and management of fish and wildlife resources." To fulfill this requirement, any new INRMPs and significant changes to existing INRMPs are required to be developed in cooperation with USFWS, the National Oceanic and Atmospheric Administration National Marine Fisheries Services (NOAA Fisheries), as appropriate, and state fish and wildlife agencies. The USFWS and California Department of Fish and Wildlife (CADFW) are signatories on this agreement (i.e., INRMP) per DoD 2018a.



Camp Pendleton 2023 Integrated Natural Resources Management Plan

FIGURE 1-1
CAMP PENDLETON LOCATION

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

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

Additionally, internal stakeholders represent major operational components present on the installation, major tenants on the installation, and major installation departments. The following on-Base directorates participated in an Internal Working Group, with key representatives from the following:

- Camp Pendleton Environmental Security Department
- Public Works Department, including Real Estate
- Range and Training Area Management Division
- Government and External Affairs

Coordination began in January 2022, when agency representatives and other interested parties were invited to participate. Coordination included collaboration in the development of the goals and objectives for natural resources management and continued until final signature of the INRMP.

1.3.3 Public Review and NEPA Consideration

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

1.3.3.1 INRMP Public Review

The revised INRMP was posted on the Camp Pendleton website (http://www.pendleton.marines.mil/Staff-Agencies/Environmental-Security/Document-Library/) for public review, with an opportunity to provide comments. Over XX agencies and individuals (e.g., state and federal resource agencies; regional and state environmental conservancies or research centers and museums; local Native American tribes; regional utilities; local municipalities; and nongovernment organizations) were also notified that the INRMP was available for comment. The

45-day public review period for the revised INRMP began on 14 July 2023 and ended 31 August 2023. Camp Pendleton considered all comments received prior to finalizing the INRMP (comment letters are included in Appendix A).

1.3.3.2 INRMP NEPA Consideration

Majority of the actions identified in this revised INRMP (233 of 261) are considered administrative or would have no environmental impact or are continuations of actions addressed in the 2001 INRMP Environmental Assessment, or were, or currently are being, analyzed under other NEPA documents. Of the remaining actions, 18 pertain to implementing actions identified in various management plans for listed species or amending or creating three species management conservation plans will be analyzed under NEPA at a future time. The other 10 actions are activities authorized in the past via short-term, project-specific Categorical Exclusions and can continue to be authorized via project-specific processing under NEPA. Therefore, the effects of implementing all actions identified in the 2023 Camp Pendleton INRMP will not be assessed together under NEPA. Rather, the 28 actions subject to NEPA will be evaluated in the future through separate and project-specific NEPA analyses to obtain appropriate authorization.

1.4 STATUTORY REQUIREMENTS PERTINENT TO NATURAL RESOURCES MANAGEMENT

The Sikes Act is the primary federal statute requiring natural resources management on military installations. The Sikes Act requires, to the extent appropriate and applicable, that the INRMP provide for:

- Fish and wildlife management, land management, forest management, and fish- and wildlife-oriented recreation;
- Fish and wildlife habitat enhancement or modifications;
- Wetland protection, enhancement, and restoration, where necessary for support of fish, wildlife, or plants;
- Integration of, and consistency among, the various activities conducted under the plan;
- Establishment of specific natural resources management objectives and time frames for proposed actions;
- Sustained use by the public of natural resources to the extent such use is consistent with the needs of fish and wildlife management and subject to installation safety and security requirements;
- Enforcement of natural resources laws and regulations;
- No net loss in the capability of military lands to support the military mission of the installation; and

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

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

Other key Federal statutes applicable to natural resources management on Camp Pendleton include the following:

- NEPA
- ESA
- Migratory Bird Treaty Act (MBTA)
- Bald and Golden Eagle Protection Act (BGEPA)
- Clean Water Act (CWA)
- Coastal Zone Management Act
- Clean Air Act
- Marine Mammal Protection Act (MMPA)
- Magnuson-Stevens Fisheries Conservation and Management Act
- Military Reservation and Facilities: Hunting, Fishing and Trapping Act
- Federal Noxious Weed Act
- Fish and Wildlife Conservation Act

Environmental mandates also include several Federal Regulations (CFRs), Presidential Executive Orders (EOs), Memoranda of Understanding (MOUs), and Executive Memoranda such as:

- Title 50, Code of Federal Regulations 10.13 (50 CFR 10.13), "List of Migratory Birds"
- 50 CFR 13, "General Permit Process"
- 50 CFR 21, "Migratory Birds Permits"
- 50 CFR 402, "Interagency Cooperation—Endangered Species Act of 1973, as Amended"
- EO 11987 – Exotic Organisms
- EO 11988 – Floodplain Management
- EO 11990 – Protection of Wetlands
- EO 12962 – Recreational Fisheries, as amended by EO 13474, Amendments to Executive Order 12962
- EO 13112 – Invasive Species
- EO 13186 – Responsibilities of Federal Agencies to Protect Migratory Birds
- EO 13443 – Facilitation of Hunting Heritage and Wildlife Conservation
- EO 13751 – Safeguarding the Nation from the Impacts of Invasive Species
- EO 14008 – Tackling the Climate Crisis at Home and Abroad

- MOU between DoD and USFWS and the Association of Fish and Wildlife Agencies for a Cooperative Integrated Natural Resources Management Program on Military Installations
- MOU between DoD and the Pollinator Partnership
- MOU between DoD and USFWS to Promote the Conservation of Migratory Birds
- Guidance to Implement the Memorandum of Understanding to Promote the Conservation of Migratory Birds
- MOU between DoD and Bat Conservation International
- MOU Among the U.S. Department of Agriculture, Forest Service, U.S. Department of the Interior, Bureau of Land Management, Oregon/Washington/California, U.S. Fish and Wildlife Service, National Park Service, U.S. Geological Survey, U.S. Air Force, Army, Marine Corps, Commander Navy Region Southwest, California Department of Fish and Wildlife, Oregon Department of Fish and Wildlife, Washington Department of Fish and Wildlife, Nevada Department of Wildlife and Association of Zoos and Aquariums Concerning Conservation of the Western Pond Turtle
- Executive Memorandum on Incorporating Ecosystem Services into Federal Decision Making

1.5 NATURAL RESOURCES STEWARDSHIP ON MILITARY LANDS

DoD is a major user of land, sea, and air space and invests significant resources in its conservation programs to help sustain our nation's natural ecosystems, species, and habitats. It utilizes and manages approximately 27 million acres of land, air, and water resources for military for testing, training, and operations (DoD 2023a). DoD requires continued access to those lands and the air space above them to maintain mission readiness. Land is needed for deployment of weapon systems and combat training exercises. Marine and estuarine environments are needed to conduct training exercises, test vessels and submarine tracking equipment, evaluate missile weapon systems, and conduct trials on new ships. Airspace is needed to train pilots, test aircraft and air-based weapon systems. The DoD Natural Resources Program supports the military's testing and training mission by ensuring continued access to realistic habitat conditions, while simultaneously working to ensure the long-term sustainability of our nation's priceless natural heritage.

1.5.1 Policies and Guidelines

DoDI 4715.03, the Natural Resources Conservation Program (DoD 2018a), establishes the following principles and guidelines for natural resources management:

- DoD shall manage its natural resources to facilitate testing and training, mission readiness, and range sustainability in a long-term, comprehensive, coordinated, and cost-effective manner;

- DoD shall demonstrate stewardship of natural resources in its trust by protecting and enhancing those resources for mission support, biodiversity conservation, and maintenance of ecosystem services;
- DoD shall manage DoD lands, waters, airspaces, and coastal resources or natural resources for multiple uses when appropriate, including sustainable yield of all renewable resources, scientific research, education, and recreation; and
- All DoD natural resources conservation programs must be integrated with mission activities, installation planning and programming, and other activities as appropriate.

Marine Corps Order (MCO) P5090.2A Ch. 4 (USMC 2018) reiterates that natural resources under Marine Corps stewardship and control shall be managed to support military readiness and be conserved, preserved, protected, rehabilitated, and enhanced; and that land use practices and decisions be interdisciplinary and maintain military readiness, rely on scientifically sound conservation procedures and techniques, and employ scientific methods.

DoD Directive 4715.21, Climate Change Adaptation and Resilience (DoD 2016), establishes policy and assigns responsibilities to provide the DoD with the resources necessary to assess and manage risks associated with the impacts of climate change. The Directive tasks the DoD with anticipating and managing any risks that develop as a result of climate change to build resilience. The DoD's Climate Adaptation Plan (DoD 2021a) lays out how the DoD's operations, planning activities, business processes, and resource allocation decisions will include climate change considerations. The lines of effort in the Climate Adaption Plan include climate-informed decision making, ecosystem services/resilient natural infrastructure, and collaboration with partners. Using the DoD's Climate Adaption Plan as guidance, the DoD has developed tools for DoD climate change resiliency, including tools to assist natural resources managers in the form of geographic information system (GIS)-based climate assessment tools (DoD 2023b).

1.5.2 Ecosystem Management

DoDI 4715.03 and MCO P5090.2A CH 4 further require that INRMPs incorporate the principles of ecosystem management for natural resources under the stewardship and control of DoD. The goals of this strategy are to maintain and improve the sustainability and biological diversity of terrestrial and aquatic ecosystems while supporting sustainable economies, human use, and the environment required for realistic military training operations. The basic principles and guidelines of ecosystem management are to:

- Maintain and improve the sustainability and native biological diversity of ecosystems;
- Consider ecological units and timeframes in management decisions;
- Support sustainable human activities;
- Develop a vision of ecosystem health that includes social and economic conditions;

- Develop priorities and reconcile conflicts;
- Develop coordinated approaches to work toward ecosystem health that involve the military operational community and regional stakeholders;
- Rely on best science and available data;
- Use goals and objectives to monitor and evaluate outcomes; and
- Use adaptive management.

It is DoD policy to conduct installation programs and activities to identify, maintain, and restore the composition, structure, and function of natural communities that make up ecosystems to ensure their long-term sustainability and biodiversity at landscape and other relevant ecological scales to the maximum extent that mission needs allow (DoD 2018a).

1.5.3 Ecosystem Services

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

1.5.4 Adaptive Management

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

Annual and periodic monitoring of habitat conditions, population trends, nesting success, and other ecosystem components is a major activity of the natural resources management programs at Camp Pendleton. Development and maintenance of such inventories are aided by using GIS, global positioning system (GPS), and remote sensing technology, combined with periodic monitoring and surveys. The routine collection of data and the application of state-of-the-art technology maximize the quality and quantity of information available to land managers, enabling adaptive management through the evaluation of potential impacts, biological trends, efficacy of management initiatives, and identification of data gaps. Updated information and “lessons learned” are then incorporated into management protocols and programmatic instructions for users of the Base. This ability to

evaluate land use compatibility and to adaptively manage resource utilization maximizes land area available for training.

1.5.5 Climate Considerations

Climate Adaptation for DoD Natural Resources Managers, A Guide to Incorporating Climate Considerations into Integrated Natural Resources Plans (DoD 2019) provides a framework to capture DoD Directive 4715.21 Climate Change Adaptation and Resilience (DoD 2016). The DoD recognizes that installations will experience significant risks from climate-driven changes in the environment, which could compromise the capacity of the installations to support military training. DoDI 4715.03 (DoD 2016) specifically calls for installations to address climate considerations when updating or revising their INRMPs, and the Climate Adaptation for DoD Natural Resources Managers guide has been developed to help installation managers with implementing policy guidance.

The INRMP adaptation planning process consists of the following steps:

- Set context for adaptation planning;
- Assess climate vulnerabilities and risk;
- Evaluate implications for INRMP goals and objectives;
- Develop strategies and actions to reduce climate risks;
- Implement adaption actions and projects; and
- Monitor and adjust adaption actions.

1.6 CAMP PENDLETON NATURAL RESOURCES MANAGEMENT OVERVIEW AND STRUCTURE

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

The Base's current approach to managing natural resources reflects the principles of ecosystem management, consistent with DoD and Marine Corps policy (DoDI 4715.03; MCO P5090.2A). The natural resources management approach seeks to balance the dual goals of maximizing land use for military readiness and maintaining native habitats. The overriding focus of natural resources management is to implement a comprehensive, ecosystem-based management program

for resource conservation that will facilitate maximum support of the installations' military training missions and infrastructure, while simultaneously promoting both the sustainability of native species and habitat diversity, and compliance with applicable laws and regulations.

With 19 federally listed threatened or endangered species known to occur on Camp Pendleton, and numerous additional sensitive plant and animal species, the Base implements an ecosystem approach to natural resources management, as this approach balances the needs of all ecosystem components (including mission, biological, economic, and human elements), provides comprehensive compliance with the ESA, and integrates both DoD and Department of Interior (DoI) guidelines. Aboard the installation, the primary strategies for natural resources conservation and management include habitat enhancement (e.g., exotic species control, erosion control, seeding, and restoration) and the avoidance and minimization of adverse impacts through implementation of programmatic instructions (published rules and guidelines for land users on the installations).

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

Camp Pendleton's Environmental Security Department ("Environmental Security") works in support of the military training mission and seeks, through proper management, to protect and sustain the Marine Corps continued ability to train on lands that are vital to National Defense. In addition, multiple other organizations, such as Facilities (including Public Works and Water Resources Division), Range and Training Area Management Division, Government and External Affairs, and the Fire Department, have a role in supporting Camp Pendleton's natural resources. Although not directly responsible for implementation of this INRMP, these other organizations provide support to help ensure compliance with natural resources laws, regulations, and management initiatives.

The Base's Environmental Security Department provides the lead and overall coordination of environmental compliance and natural resources management on-Base. The Department is divided into divisions, including the Regional Operations Division, Environmental Compliance Division,

and Environmental Conservation Division. These divisions are further subdivided into branches and sections.

To ensure the proper balance of the operational needs of the Marine Corps and the protection and preservation of the environment for future generations, Environmental Security oversees the commitment of the Base to:

- Comply with applicable environmental laws, regulations, and policy;
- Implement and improve the Environmental Management System;
- Steward natural and cultural resources;
- Remediate contaminated sites that are the result of past disposal practices;
- Conduct pollution prevention to protect the environment; and
- Partner with other federal, state and local resource agencies to ensure success.

The Environmental Conservation Division is responsible for managing the Base's natural and cultural resources and is the primary user of the INRMP. Branches of the Environmental Conservation Division include the Resources Management Branch (RMB) and Environmental Planning Branch (PLN). While the Regional Operations Division and Environmental Compliance Division support natural resources management, these divisions are not discussed below as they are not the primary users of this INRMP.

1.6.1 Resources Management Branch

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

- Coastal and Riparian Ecosystems Management Section (CRE)
- Conservation Law Enforcement Section (CLS)
- Cultural Resources Section (CRS)
- Upland Ecosystems Management Section (UPL)

Chapter 4 of this INRMP describes natural resources management programs of the CRE, CLS, and UPL. The CRS and its programs are not addressed in the INRMP, as they are covered in detail in the Base's Integrated Cultural Resources Management Plan (MCBCP 2017b).

1.6.2 Environmental Planning Branch

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

- Consultation Section (CST)
- NEPA Section (NPA)
- Project Management Section (PRJ)
- Strategic Planning Section (SPS)

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

1.7 INTEGRATION OF THE INRMP TO EXISTING PLANS AND ORDERS

Multiple programmatic plans have been developed specific to natural resource management for Camp Pendleton that are integrated into the INRMP. Management Plans, and their associated Biological Opinions, applicable to ecosystem or species management, will be discussed in Chapter 3 and 4 where applicable. Relevant documents include:

- Wildfire Prevention Plan (MCBCP 2018)
- Estuarine and Beach Ecosystem Conservation Plan (Appendix G)
- Riparian Ecosystem Conservation Plan (Appendix H)
- Pacific Pocket Mouse Management Plan (MCBCP 2019a)
- Thread-leaved Brodiaea Management Plan (MCBCP 2017c)
- Vernal Pool Management Plan (in draft) (MCBCP 2019b)

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

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

Programmatic instructions and plans represent the published "general rules" that regulate and guide activities on Camp Pendleton (e.g., military training, maintenance, construction, and outdoor recreation). Many programmatic instructions are broadly applicable and help avoid or minimize impacts to the environment in general (e.g., fire danger ratings). However, other programmatic instructions may be specific to actual locations of listed species (e.g., least tern nesting sites) or to general areas of Camp Pendleton (e.g., riparian habitat and range and training areas). Programmatic instructions are disseminated by various methods including plans, requirements, orders, and bulletins; and as special conditions in documents approving recurring activities (e.g., Biological Opinions [BOs] issued by USFWS). The following subsections describe programmatic instructions not specifically created for natural resource management but relevant to natural resources for the Base.

1.7.1 2030 Base Master Plan

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

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

1.7.2 Base Exterior Architectural Plan

Camp Pendleton's Base Exterior Architectural Plan (BEAP) provides guidance for the design, development, and review of all physical development at Camp Pendleton. Among the issues this plan addresses, those most relevant to natural resources management are a) landscaping specifications, and b) efforts to reduce the risk of wildland fire in areas adjacent to natural open space (MCBCP 2010). The BEAP outlines objectives and guidelines in cantonment areas for native plant use and invasive plant control that are consistent with the goals and objectives of this INRMP. The BEAP also includes a requirement that native California species make up a minimum of 80 percent of plant material used within cantonment areas, and a maximum of 20 percent of approved, drought-tolerant Mediterranean climate nonnative species. For projects adjacent to open space or in sensitive environments, California native species must constitute 100 percent of the plant material, and for projects adjacent to open space and/or meant as native habitat, plants native to San Diego County are preferred. Provided in the BEAP is a list of approved native and other landscaping plants, and a list of forbidden species, both of which have been approved by the Environmental Security Department. All Base landscaping must comply with these lists, unless an exception is granted. Plants identified in the approved list have been selected, in part, because of their fire-retardant characteristics; they can help deter wildfire in landscaped areas. For all new projects located adjacent to natural open spaces, the Base BEAP requires brush management plans to be developed to help reduce the risk of wildland fire.

1.7.3 Marine Corps Base Camp Pendleton Requirements

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

1.7.4 Marine Corps Base Camp Pendleton Environmental Compliance Guidebook

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

Commands on Base, and to each unit by the Base's designated Environmental Compliance Coordinator (ECC).

1.7.5 Integrated Cultural Resources Management Plan (ICRMP)

The ICRMP (MCBCP 2017b) provides guidance for managing Cultural Resources within Camp Pendleton. Much like the INRMP, the ICRMP is a multi-year plan that supports the military training mission by identifying compliance actions concerning cultural resources management. The ICRMP ensures that the Marine Corps stewardship responsibilities are met through the identification and evaluation of resources, implementation of protection and compliance actions (Section 106 of the National Historic Preservation Act), and collaboration with internal and external stakeholders.

1.7.6 Integrated Pest Management Plan (IPMP)

The IPMP (MCBCP 2020) is a comprehensive, long-range planning document that describes all the pest management operations and pesticide-related activities on the base. It incorporates pest management practices with applicable regulations. Integrated pest management depends on education, proper surveillance, and identification of pests, and non-chemical and chemical control methods. INRMP activities, such as invasive weed treatment, are subject to the IPMP, and RMB staff participates in the IPMP's internal Base Working Group.

1.7.7 MCIWEST-CAMPENO 3500.1 CH 1B

MCIWEST-CAMPENO 3500.1 CH 1B Range and Training Area Standing Operating Procedures (MCBCP 2022) prescribes the regulations and general precautions to be taken while conducting training activities on Camp Pendleton. Included in this order are specific programmatic instructions that address how units training on and over Camp Pendleton are to operate under given conditions. Conditions addressed in Chapter 2 of this order include base-wide environmental procedures, areas off-limits to training, natural resources considerations and restrictions, and the various Fire Danger Ratings. The Range and Training Area Standing Operating Procedures are used by military training units in conjunction with the Environmental Operations Map (EOM) to successfully achieve all training objectives while complying with environmental laws and regulations.

1.7.8 MCIWEST-CAMPENO 5000.5

MCIWEST- CAMPENO 5000.5 (Marine Corps Base Camp Pendleton Base Regulations; MCBCP 2023) establishes the responsibilities and procedures that govern the conduct of all persons and

activities on-Base. Chapter 8 of this order outlines Base policies governing natural and cultural resources. The Environmental Security Department is named as managing the installation's environmental program; consulting with environmental regulatory agencies; communicating environmental policy and compliance requirements to the Base constituents; overseeing environmental compliance; and providing environmental training, compliance assistance, and subject matter expert advice.

In accordance with this order, it is the continuing policy of the Base to:

- Restore, improve, and preserve land, water, and other natural resources, and to prevent or control pollution of these resources in the public and in keeping with the military interest;
- Manage the Base's cultural resources and supervise all cultural resources activities to ensure compliance, via the implementation of the ICRMP and agreement documents (e.g., Programmatic Agreement);
- Grant public access, within manageable quotas, to lands and waters for hunting, fishing, and other recreational pursuits, to the extent that such access will not conflict with the mission of the Base;
- Establish and carry out policy regarding the evaluation, management, and protection of endangered species, wildlife, vegetation, rare plants, wetland resources, and habitat aboard the Base, in accordance with Marine Corps Orders, the Base's INRMP, and federal and state laws;
- Ensure consideration of environmental concerns during project planning and execution via the NEPA process;
- Comply with all environmental requirements to that apply to its activities and practices; and
- Provide one central point of contact for conducting regulatory consultation with the local, state, and federal agencies managing natural resources. This has been designated to the Base's Environmental Security Department.

Chapter 8 Section 2 of MCIWEST-CAMPENO 5000.5 outlines environmental compliance policies related to water quality, air quality, and waste management. Section 3 highlights the management of natural and cultural resources to help ensure compliance, environmental planning, consultation and encroachment through the REPI Program. Section 4 discusses the Conservation Law Enforcement Section (CLS) that is staffed by Federal Conservation Law Enforcement Officers (CLEOs) whose primary function is to ensure compliance with, and enforcement of, federal laws relating to the use and management of natural and cultural resources on the Base; in addition to the management of the Base's hunting and fishing program.

1.8 INTEGRATION WITH FEDERAL, STATE, AND REGIONAL CONSERVATION PLANNING EFFORTS

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

Cooperative relationships with federal and non-federal entities are mutually beneficial to the management of the Base's ecosystems and recovery of federally listed species. In addition, two military installations, Naval Weapons Station Seal Beach Detachment Fallbrook and Marine Corps Air Station Pendleton, are adjacent to Camp Pendleton (Figure 1-1) and have their own INRMPs; this partnership collectively manages shared natural resources. Federal, state, and regional conservation planning efforts relevant to the natural resources present on Camp Pendleton are summarized in the following subsections. The Department of Defense's Readiness and Environmental Protection Integration (REPI) program is not managed by Environmental Security, but it partners with natural resources management on Camp Pendleton.

1.8.1 Federal Planning

1.8.1.1 Endangered Species Recovery Plans

An endangered species recovery plan outlines the path and tasks required to restore species to the point where they no longer require the safeguards of the Endangered Species Act. Camp Pendleton management objectives and actions in Chapter 4 consider tasks named within these individual plans to recover the species. The USFWS and NOAA NMFS have plans for 15 federally listed species on Camp Pendleton:

- Riverside Fairy Shrimp (*Streptocephalus woottoni*) (USFWS 1998a)
- San Diego Fairy Shrimp (*Branchinecta sandiegonensis*) (USFWS 1998a)
- Southern California Steelhead (*Oncorhynchus mykiss*) (NMFS 2012)
- Tidewater Goby (*Eucyclogobius newberryi*) (USFWS 2005)
- Arroyo Toad (*Anaxyrus californicus*) (USFWS 1999)
- California Least Tern (*Sterna antillarum brownii*) (USFWS 1985)
- Western Snowy Plover (*Charadrius nivosus nivosus*) (USFWS 2007)
- Light-footed Ridgway's Rail (*Rallus longirostris obsoletus*) (USFWS 2014)

- Least Bell's Vireo (*Vireo bellii pusillus*) (USFWS 1998b)
- Southwestern Willow Flycatcher (*Empidonax traillii extimus*) (USFWS 2002)
- Pacific Pocket Mouse (*Perognathus longimembris pacificus*) (USFWS 1998c)
- Stephens' Kangaroo Rat (*Dipodomys stephensi*) (USFWS 1997)
- San Diego Button Celery (*Eryngium aristulatum* var. *parishii*) (USFWS 1998a)
- Spreading Navarretia (*Navarretia fossalis*) (USFWS 1998a)
- California Orcutt Grass (*Orcuttia californica*) (USFWS 1998a)

The least Bell's vireo (USFWS 1998b) and Stephens' kangaroo rat (USFWS 1997) are currently drafts and never formally approved.

1.8.1.2 Department of Defense Partners in Flight

The DoD Partners in Flight (PIF) is a cooperative network of natural resources staff within the DoD established in 1991. DoD PIF works in collaboration with partners throughout the Americas to conserve migratory and resident birds and their habitats on DoD lands. Camp Pendleton staff participates in the DoD PIF program. DoD PIF provides leadership and guidance to military installations in ecosystem-based conservation planning, INRMPs, and Bird Monitoring Plans. DoD PIF is a subcomponent of the larger Partners in Flight, which is a 150 partner organization currently steered by the USFWS that engages in science, research, planning, policy development, land management, monitoring, education, and outreach.

In 2006, the Department of Defense and the USFWS entered a Memorandum of Understanding (MOU) to Promote the Conservation of Migratory Birds, in accordance with Executive Order 13186; this MOU describes specific actions that the DoD should incorporate to advance migratory bird conservation, ensure military readiness, and minimize take of migratory birds.

1.8.1.3 Department of Defense Partners in Amphibian and Reptile Conservation

The DoD Partners in Amphibian and Reptile Conservation (PARC) is a cooperative network of natural resources staff within the DoD established in 2009. DoD PARC provides a network for installation natural resources managers to communicate and collaborate to assist herpetofauna management. DoD PARC is a subcomponent of the larger National PARC, a coalition of federal and state agencies, tribes, non-governmental organizations, and industry groups that have agreed to conserve amphibians, reptiles, and their habitats. Camp Pendleton staff participates in the DoD PARC program.

DoD PARC was established after the DoD signed the PARC MOU in 2007, which provides a framework for the cooperation and coordination among the multiple federal agencies in achieving the objectives of the National PARC Steering Committee.

1.8.1.4 Naval Weapons Station Seal Beach Detachment Fallbrook INRMP

Camp Pendleton shares its eastern boundary with Naval Weapons Station Seal Beach Detachment Fallbrook (Figure 1-1), who has an updated INRMP and robust natural resources management program. Camp Pendleton and Detachment Fallbrook have differing military missions; Detachment Fallbrook focuses on ordnance handling and storage, vice military training. However, Camp Pendleton staff often coordinates with the Conservation Program Manager at Detachment Fallbrook to collaborate on project specific environmental planning (e.g., Wildfire Prevention, the Conjunctive Use Project), management actions that are a mutual benefit to both installations and shares data. Collaboration occurs for such actions as invasive plant control, aquatic exotic control in the Santa Margarita River, species monitoring, firebreak maintenance, wildfires, hunting data collection, and participation in regional working groups (e.g., Stephens' kangaroo rat working group).

1.8.1.5 MCAS (Marine Corps Air Station) Camp Pendleton INRMP

Marine Corps Air Station Camp Pendleton (Air Station) sits on 488 acres within the interior of the south-central portion of Camp Pendleton (Figure 1-1); the Air Station is a separate installation owning its own land and not a tenant of the Base, therefore implementing its own INRMP. MCAS Camp Pendleton focus is to provide aviation group support to MAG-39's squadrons and transient units and aircraft. The Air Station previously had their own INRMP in 2013, combined with Camp Pendleton in 2018, and now will return to their own individual INRMP in 2023. Camp Pendleton staff often coordinates with the Environmental Officer at MCAS Pendleton to collaborate on project specific environmental planning (e.g., the Clear Zone, the Conjunctive Use Project), management actions that are a mutual benefit to both installations and shares data.

1.8.1.6 Cleveland National Forest

Camp Pendleton and the adjacent Cleveland National Forest occupy some of the last significant open space and wildlife habitats in the coastal areas of southern California (Figure 1-1). The Cleveland National Forest is the southernmost National Forest in California, encompassing approximately 460,000 acres of chaparral and riparian habitat. The Cleveland National Forest aims to protect and improve the habitats of plants and animals, including 23 endangered plant and animal species, within the area while simultaneously allowing for other forest uses.

Camp Pendleton's eastern boundary (approximately 25 percent) is contiguous with the Cleveland National Forest or holdings of the Bureau of Land Management that are virtually uninhabited. Camp Pendleton benefits the Cleveland National Forest by providing an important habitat linkage and wildlife corridor of open space and continuity from the forest to other surrounding wildlife preserves and conservation areas. Camp Pendleton protects the forest's habitats and biological diversity by limiting human access to the forest and thus also human disturbance.

1.8.2 State Planning

1.8.2.1 California State Oil Spill Contingency Plan

The U.S. Coast Guard and CDFW Office of Spill Prevention and Response agreed to a joint preparation of six oil spill contingency plans in California; Camp Pendleton falls within Area Contingency Plan (ACP) 6. The ACP is a proactive effort from federal, state, and regional agencies to minimize impacts from potential oil spills. Guidance is provided for the first 24 hours of response, and evaluation and recommendations for protection of shoreline resources, including those specific to Camp Pendleton's 17 miles of coastline are included. The ACP is updated every 5 years with input requested from Camp Pendleton in particular.

1.8.2.2 California State Wildlife Action Plan

In 2000, Congress enacted the State Wildlife Grants Program to support state programs that benefit wildlife and habitats. To receive funding for this program, California wildlife agencies were required to submit a Wildlife Action Plan to USFWS in 2005. CDFW (previously California Department of Fish and Game), in collaboration with the Wildlife Health Center, University of California at Davis, consequently developed the first California State Wildlife Action Plan (SWAP) (CADFW 2015c). The SWAP is updated at least every 10 years to allow integration of new information. A final SWAP Update, published in September 2015, provides a vision and a framework for conserving California's diverse natural heritage, and calls for developing a collaborative framework across the State to sustainably manage ecosystems in balance with human uses of the natural resources.

The SWAP is a scientifically based plan that takes an ecosystem approach to conserve and manage diverse habitats, species, and create a blueprint for conservation actions to respond to the highest priorities of California's aquatic, marine, and terrestrial resources. Camp Pendleton is located within the South Coast Region (or South Coast Province per the 2015 SWAP Update). According to the SWAP, the primary stressors affecting wildlife and habitats in this region include growth and development, water management conflicts and degradation of aquatic ecosystems, invasive species, altered fire regimes, recreational pressures, and climate related factors. Camp Pendleton

seeks to address the SWAP's recommended conservation action plans, when applicable. Examples of how this INRMP addresses the SWAP's recommended statewide conservation actions include efforts to control and prevent introductions of invasive species, wildland fire management to benefit ecosystem integrity, management of wetland resources, and climate change assessment and adaptation.

1.8.2.3 Santa Ana – Palomar Mountains Linkage/ California Essential Habitat Connectivity Project

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

Furthermore, in 2010, the California Essential Habitat Connectivity Project was commissioned by the California Department of Fish and Wildlife and California Department of Transportation to produce a statewide assessment of essential habitat connectivity. The goal was to identify large remaining blocks of intact habitat as wildlife corridors.

The final Santa Ana – Palomar Mountains Linkage design is a band of habitat roughly 4 miles wide and 16 miles long that extends from the Cleveland National Forest-Trabuco Ranger District, Camp Pendleton, and the Naval Weapons Station Seal Beach Detachment Fallbrook to the western and northern boundaries of the Cleveland National Forest-Palomar Ranger District. While Camp Pendleton's primary mission is to train Marines, the Base takes a proactive role in the management of special-status species, and Base lands support an array of native plant and animal communities. By managing these special-status species and array of habitats, Camp Pendleton supports the preservation and conservation of the Santa Ana – Palomar Mountains Linkage.

1.8.2.4 California Invasive Plant Council

The California Invasive Plant Council (Cal-IPC) works "to stop the spread of invasive plants across California". Cal-IPC is a non-profit organization that serves California by supporting land managers with landscape-level strategic planning and implementation. In particular, the Cal-IPC maintains the California Invasive Plant Inventory, a comprehensive list of invasive plants based on ecological impacts that Camp Pendleton uses for combating invasive plants. Camp Pendleton

natural resources staff also participates in the Cal-IPC annual Symposium to share knowledge amongst the multiple partners as discussed in Chapter 4.

1.8.2.5 San Onofre State Beach

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

Lease agreements require that State Parks comply with all applicable federal and state regulatory laws. State Parks has established general management guidelines for their leased lands that exist as policy statements within the general plans for each facility operated by the State Parks system. The guidelines provide necessary guidance for all staff and visitors for the operation, maintenance, and use of San Onofre State Beach campgrounds, trails, and beaches to ensure protection of natural resources within State Parks leased lands. Maintenance operations in the parks include maintaining the existing camping and recreational facilities, landscape maintenance, and erosion control. A lease amendment is currently in progress. Operation, maintenance, and future improvements to the lease property shall align with Camp Pendleton's ecosystem approach as outlined in this INRMP; after the lease amendment is completed, Camp Pendleton's Environmental Security Department will oversee environmental compliance, including the development by State Parks for a natural resources management plan, and Section 7 consultation with the United States Fish and Wildlife Service.

1.8.2.6 Climate Change Assessment

The State of California has completed its fourth Climate Change Assessment in 2018 and is currently working on it's fifth to assess climate-related vulnerability at the local scale and inform resilient actions, to safeguard California from climate change (CA 2018). The Fourth Assessment includes 33 state-funded research projects and contributions from 11 externally funded researchers, including the development of cutting-edge climate projections for California. The San Diego region was assessed, with an improved understanding of climate variables including relative humidity and wind speed, and extremes like drought, heat waves, and heavy precipitation events. In addition, the Fourth Assessment included a more extensive simulations of wildfire to help visualize increases in area burned and a more detailed set of sea-level rise projections. Information from multiple technical and regional reports from California's Climate Change Assessment were used in this INRMP to inform the Base's climate adaptation objectives.

1.8.3 Regional Planning

1.8.3.1 Sensitive Species Working Groups

Camp Pendleton staff participates in multiple working groups for sensitive species within the region, due to the importance of Camp Pendleton as a biodiversity hotspot in Southern California. These working groups often include the USFWS, other Federal Agencies such as the United States Geological Survey (USGS), California Department of Fish and Wildlife and other state agencies, local city and county staff, and not for profit agencies, including land conservancies. A list of working groups that Camp Pendleton biologists/ecologists participate in include, but are not limited to, the following: the pacific pocket mouse, Stephen's kangaroo rat management and monitoring, mountain lion, riparian birds, Region 6 western snowy plover, range wide California least tern, range wide snowy plover, South coast steelhead coalition, and the Santa Margarita River invasive species management.

1.8.3.2 Natural Communities Conservation Planning Program

The Natural Community Conservation Planning (NCCP) Act, passed by the State of California in 1991, established regional conservation planning efforts that focus on ensuring the continued survival of sensitive plant and wildlife species and their associated habitats. The NCCP process was developed to encourage the conservation of natural communities before species within those communities are threatened with extinction. The program is designed to be a voluntary, collaborative effort and it represents an ecosystem approach to conservation. There are currently 17 approved NCCPs (including 6 subarea plans) and 9 being planned statewide, covering a total of over 8 million acres. Camp Pendleton acknowledges that cooperative relationships are becoming increasingly important as surrounding jurisdictions establish NCCPs and regional Habitat Conservation Plans (HCPs). Four County plan areas are adjacent to Camp Pendleton: the San Diego North County Multiple Species Conservation Plan to the east, the San Diego County Multiple Habitat Conservation Plan to the south, the San Diego County Water Authority NCCP/HCP to the south, and the Orange County Transportation Authority NCCP/HCP to the north of the Base. One utility company, San Diego Gas and Electric, has a NCCP that spans the southern and northern boundaries of Camp Pendleton.

1.8.3.3 Regional Water Quality Control Board/ Watershed Management Initiative

The State and Regional Water Boards are responsible for protecting California's water resources, with the San Diego Regional Water Quality Control Board (RWQCB) supporting the region where Camp Pendleton is located. The Watershed Management Initiative (WMI) was developed by the RWQCB and was approved in 1995; the WMI establishes a broad framework to achieve water

resource protection, enhancement and restoration while balancing economics. Camp Pendleton falls under the jurisdiction of the RWQCB for many state and federal water regulations, and watersheds on Base (which begin off-Base to the east) fall into the WMI.

1.8.3.4 SDMMP

The San Diego Management and Monitoring Program (SDMMP) mission is "to coordinate science-based biological management and monitoring of lands in San Diego that have been conserved through various planning and mitigation efforts". Scientific research in the region is shared on SDMMP's website to promote collaboration between scientists and land managers, including research on the federally-listed species on Base and wildfire management. SDMMP provides a database on hundreds of reports and documents that describe conservation efforts in San Diego for free, many of which assist the natural resource managers on Camp Pendleton. Camp Pendleton staff often attend the monthly SDMMP management and monitoring coordination meetings.

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CHAPTER 2.0
INSTALLATION OVERVIEW

2.1 LOCATION AND AREA

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

2.2 PRE-MILITARY AND HISTORIC MARINE CORPS LAND USE

Much of southern California's biodiversity and its high degree of species endemism have been significantly impacted through historic land use and increasing human population and development. On the area that Camp Pendleton currently occupies, historic uses and regional growth over the past 200 years have both significantly influenced the physical appearance of Camp Pendleton and its environs, along with the ecological setting in which the Base finds itself today.

The land currently occupied by the Base has a long history of human presence (>10,000 years). The prehistoric Shoshonean-speaking people used the coastal lands for shellfish and vegetable gathering, and the higher oak woodlands for acorn gathering and deer hunting. Other peoples' occupying the Base include the Spanish colonials (1769–1821), the Mexican ranchers (1821–1848), and American ranchers (1848–1942) (Zedler et al. 1997). Cattle grazing and, later, crop cultivation were the primary land uses in the region until the U.S. government bought the land in 1942 and the military took over the property during World War II.

During the Rancho period, agriculture and livestock were the economic base of the region. Rancho Santa Margarita once stretched over 200,000 acres, from Oceanside to Saddleback Mountain. At

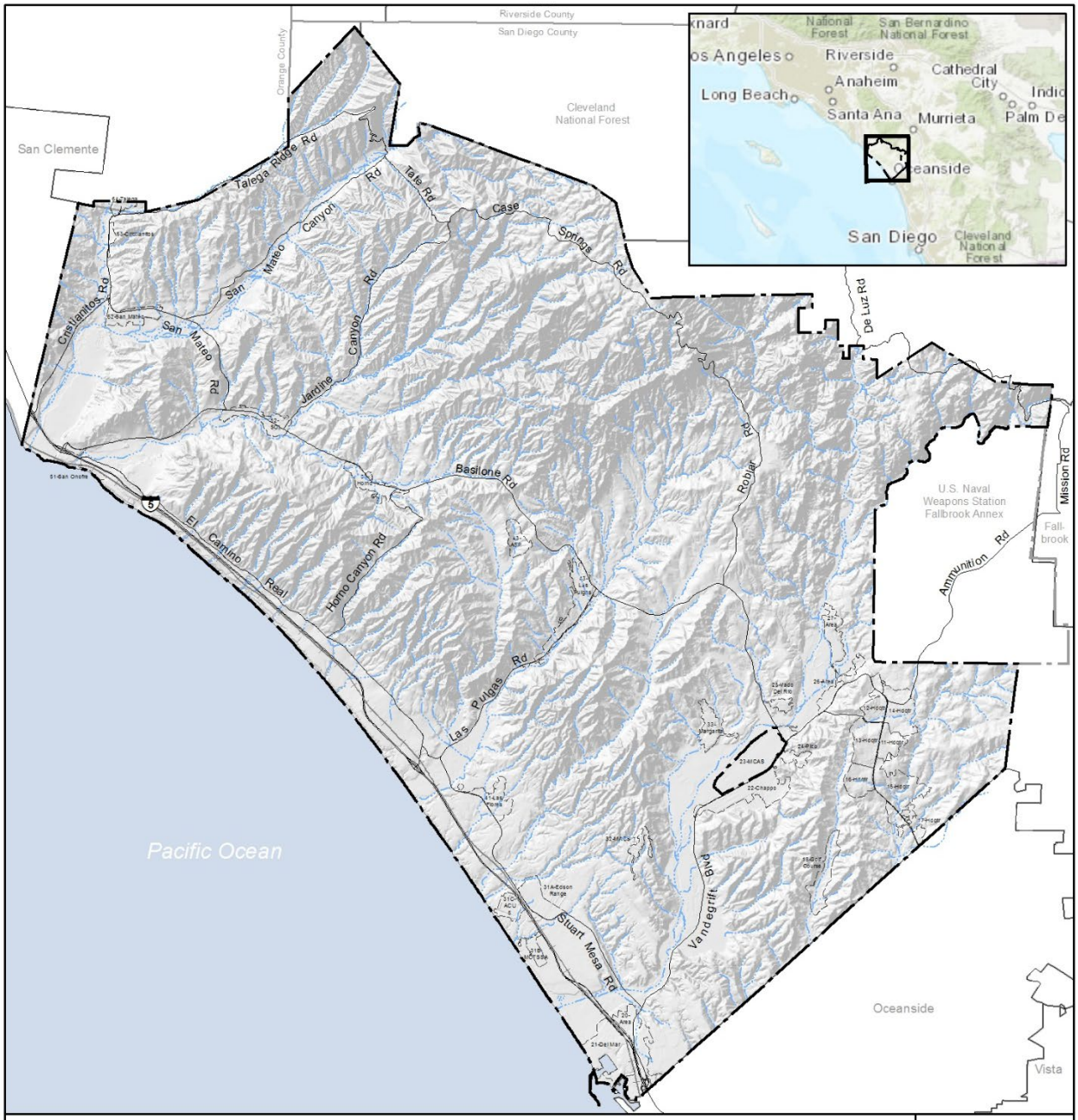

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FIGURE 2-1
CAMP PENDLETON OVERVIEW

the peak of ranching activities, 10,000 head of cattle and 250 horses roamed the area (Ritchie 2007). It is believed that sheep were introduced in the late 1800s. Grazing continued on Camp Pendleton until 2003.

Grazing and farming activities were supported by El Camino Real, the old thoroughfare used by the missionaries that became Highway 101 and used to follow what is now the Basilone Road alignment before it was moved closer to the coast. Infrastructure development included a railroad, which ran from San Diego to Oceanside, inland along the Santa Margarita River to Temecula, and connected to the transcontinental railroad at San Bernardino. In the Santa Margarita River, the tracks were generally 10 to 30 feet above the riverbed in the canyon. However, 30 miles of track was washed out in 1884 and again in 1891. This route was then replaced by a more-secure route along the coast.

Extensive farming was first established in the Las Flores/Las Pulgas basin in 1897, with a bean farm that grew to eventually cover approximately 1,980 acres by 1943. Other areas farmed on Camp Pendleton over the years include the San Mateo, and San Onofre valleys, Ysidora Basin, the Chappo area (now the Supply Depot and airfield), the coastal bench from Oceanside to San Onofre east and west of Interstate 5 (I-5), and Stuart Mesa. At one time, farmed areas of the Base totaled around 10,000 acres (Zedler et al. 1997). Coastal farms were unirrigated, as were parts of the San Onofre and Las Flores areas. Irrigated farms included Ysidora Basin, Stuart Mesa, San Mateo, and parts of San Onofre. Truck farming started in the San Onofre valley in 1925; truck farming is the production of annual fruits and vegetables to be sold fresh, essentially diversifying and rotating the crops. A 3,000-acre guayule (*Parthenium argentatum*) crop deemed the "Emergency Rubber Project" was in place that included most of the coastal bench lands north of Horno Canyon. Other historical crops included lemons, nursery stock, dryland farmed lima beans, tomatoes, strawberries, sweet corn, barley, bulbs, vegetable seed, flowers, and potatoes for the California Potato Experiment Station. In 1944 and 1945, the Base tried to cancel its agricultural leases but gave up after a general protest. It was decided that the agricultural economy of the entire United States would have been affected, particularly because of vegetable seed and poinsettia production.

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

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

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

Originally, Camp Pendleton was meant to serve as an auxiliary training camp for the Marine Corps Base at San Diego (Camp Elliot), but it quickly became the center of West Coast Marine Corps activity as the Corps took on an increasingly crucial role in amphibious (operations that involve the projection of U.S. forces from the sea), warfare necessary to take control of Pacific Islands from the Japanese in the Pacific Theater. Throughout the war, Camp Pendleton was responsible for training Marines for full-scale combat in the Pacific. Its land area was large enough so that it could support training for three full divisions. In 1942, Camp Pendleton received its first combat units, the Ninth Marines, a reinforced regiment that had been training at Camp Elliott (former

portion of MCAS Miramar) and later became part of the Third Marine Division (3rd MarDiv). The Ninth Marines were followed by the 4th and 5th MarDivs.

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

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

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

MajGen. Graves B. Erskine was put in command of the Base in 1947. He was the first Base commander who operated the Base separately and not as part of the "San Diego Area" command. His wish was to develop the installation into a first-class Marine installation. Upon his arrival, he moved into the old Santa Margarita Ranch House, instituted the Camp Pendleton Rodeo, and set about to rebuild and upgrade the facility. Changes he ordered included planting of trees, installation of lawns, and, most importantly, the replacement of temporary buildings with permanent ones. A shortage of funds and building materials required the Marines to renovate old buildings rather than construct new ones. Tents were torn down and replaced with Quonset huts and barracks were renovated. A $130,000 beach club was built at San Onofre, a commissary was opened at Chappo Flats, and a library began to operate across from the Headquarters Building in the Mainside area. Between World War II and the Korean War, new construction activity at Camp Pendleton consisted of a few warehouses and a permanent brick and reinforced concrete barracks and mess hall complex in Area 22.

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

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

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

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

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

During the following decade, the Marine Corps took steps to change troop organization and fighting techniques to increase strategic and tactical mobility without sacrificing combat effectiveness. Based on the threat of nuclear warfare and the development and success of vertical envelopment (amphibious helicopter assault) in particular, changes in divisional organization were

made to adapt the helicopter to amphibious warfare without minimizing the Marines' "force in readiness" role. Testing of these new theories in amphibious operations was conducted through large-scale exercises on the beaches of Camp Pendleton throughout the 1950s and 1960s.

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

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

Mostly because of its strategic location, Camp Pendleton became the Marine Corps' chief training installation during the Vietnam War. Marines from units throughout the country descended upon the Base and upon arrival were immediately assigned to the Staging Battalion. During the Vietnam War, the Staging Battalion was what the Training and Replacement Command had been in World War II and Korea, the final jumping-off point for battle. Once assigned to a Staging Battalion, a Marine became part of a unit and took part in an intensive 15-day training program oriented toward guerilla warfare. Majority of the guerilla warfare training took place at Camp Las Pulgas and in the wooded terrain behind the Naval Hospital in Area 26. To further assist Marines in improving jungle-fighting skills, as well as to accommodate the influx of troops into the station, new combat villages were built. Marines learned to fight amongst bamboo structures complete with underground tunnels, concrete bunkers, and barbed wire. These villages were not only designed to teach fighting techniques, but also to acquaint Marines with the traditions and cultures of Vietnam.

Reactivation of the 5th MarDiv and training of tens of thousands of Marines for Vietnam brought about a billeting shortage followed by a construction boom at Camp Pendleton. The demand was so great that nearly two-thirds of new arrivals were forced to live temporarily in tents while permanent barracks were being constructed. This not only affected Camp Pendleton, but also

caused a housing crisis in Oceanside. In April 1967, the 5th MarDiv moved four of its battalions into modern $3.8 million barracks at Las Flores. From 1958 to the mid-1970s, development across the Base continued as Vietnam became a priority for Camp Pendleton. Between 1969 and 1970 alone, nearly 80,000 Marines were trained at Pendleton and sent to Vietnam.

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

From April 1975 to October 1975, Camp Pendleton served as a refugee camp for Vietnamese and Cambodian refugees who had fled Southeast Asia. Over 50,000 refugees were supported in Camps Talega, Cristianitos, and San Onofre. In1990, Camp Pendleton was again used to prepare and deploy Marines who were among the first sent overseas to assist in the defense of Saudi Arabia. Through March 1991, when the Camp Pendleton-based 1st MarDiv, supported by the Third Marine Aircraft Wing (3rd MAW) and First Force Service Support Group (1st FSSG), liberated Kuwait from the occupying Iraqi Army, the Base provided logistic support and received, trained, and further deployed mobilized Marine reservists and reserve units.

In 1993, MCAS Camp Pendleton suffered a disastrous flood, which also affected the neighboring historic Santa Margarita Ranch House on the Base, and ecosystems within the flood plains throughout the Base. Considerable damage was done but with no loss of life. In 2000, a levee was built in between MCAS Camp Pendleton and Camp Pendleton to reduce the risk of subsequent flooding, which altered the flood plain/regime of the Santa Margarita River on Camp Pendleton.

In March 2003, Marines and Sailors from Camp Pendleton as part of First Marine Expeditionary Force (IMEF) used skills learned at the Base in their historic drive from Kuwait to Baghdad during Operation Iraqi Freedom. Beginning in 2008, ongoing operations in Afghanistan required the development of new training programs and facilities at Camp Pendleton to implement lessons learned in sustaining stability and security operations.

In early 2007, President George W. Bush approved the request for the Marine Corps to grow from its then-current end strength of 175,000 Marines to 202,000. The Marine Corps 202,000 Plus Up

initiative (also known as "Grow the Force" [GTF]) would be accomplished through incremental annual increases in the existing war-fighting organization of the Marine Corps, and by the reallocation of existing facilities and the construction of new support facilities at several Marine Corps installations. As part of the GTF initiative, and to accommodate an increase of nearly 3,000 Marines at Camp Pendleton by 2011, approximately 41 permanent facilities, including associated site improvements and significant base-wide infrastructure expansion, were proposed and completed.

2.3 MISSION

The mission of Camp Pendleton is "to operate a training base that promotes the combat readiness of the Operating Forces and the mission of other tenant commands by providing training opportunities, facilities, services and support responsive to the needs of Marines, Sailors and their families" (MCBCP 2015a). Camp Pendleton is the Marine Corps' premier amphibious training base, its only west coast amphibious assault training center, and the only west coast installation capable of supporting combined and comprehensive air, sea, and ground combat training. The Base is most heavily used by and structured to support the First Marine Expeditionary Force (IMEF). The Base has been conducting air, sea, and ground assault training since World War II, providing a unique combination of natural and military resources for the training of Marines and other DoD personnel. For over 70 years, Camp Pendleton has served as one of the nation's most important training bases and has contributed substantially to the success of our national security forces in conflicts and missions worldwide.

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

consistent with the exercise of Expeditionary Maneuver Warfare, and Operational Maneuver from the Sea.

Camp Pendleton is the Marine Corps' only training installation on the west coast for conducting amphibious operations which is a principal mission of the Marine Corps. Camp Pendleton is home to the IMEF and the Marine Corps Installations West. Major subordinate commands of the IMEF, the 1st MarDiv, the First Marine Logistics Group (1st MLG), and elements of the MAG-39 (an element of the 3rd MAW) are also based at and train on Camp Pendleton. Many other units, including the Marine Corps Tactical Systems Support Activity (MCTSSA), Assault Craft Unit 5 (a tenant U.S. Navy command), Naval Hospital Camp Pendleton, Naval Dental Clinic Camp Pendleton, the Field Hospital Operations and Training Command (a tenant U.S. Navy command), an Army Reserve Center, and the Weapons and Field Training Battalion (an element of Marine Corps Recruit Depot, San Diego), are also based on Camp Pendleton. Forces of the IMEF are continuously deployed in support of operations and contingencies worldwide to meet national security objectives as directed by the National Command Authority.

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

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

2.4 OPERATIONS AND ACTIVITIES

While some locations upon Base support only one type of activity (e.g., family housing and impact areas), most areas on Base support multiple activities (e.g., training lands can also be encumbered by a lease). However, the priority of Camp Pendleton is, and will continue to be, to provide training and support facilities for active duty and reserve Marine, Navy, Army, Air Force, and National

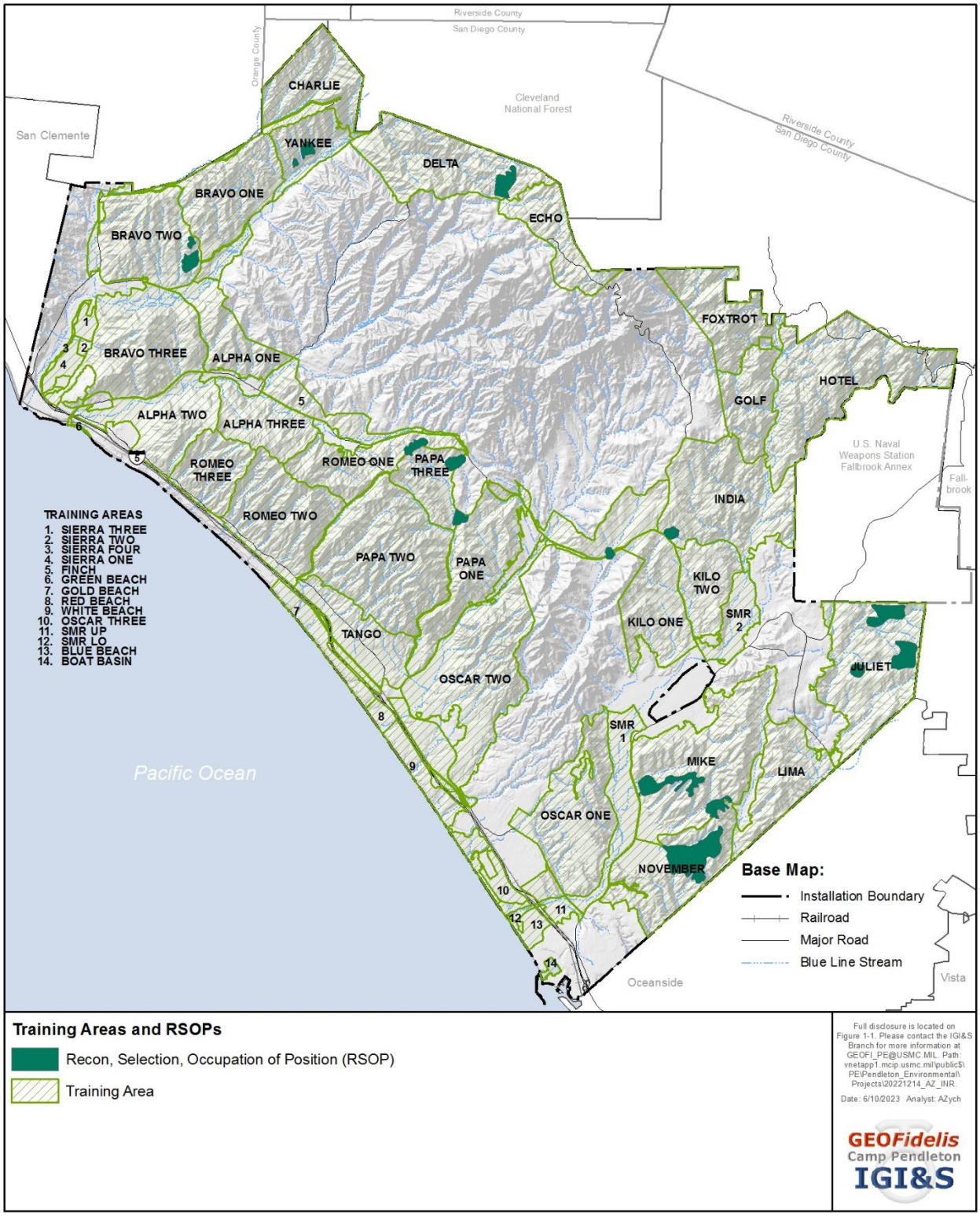
Guard units, as well as other federal, state, and local agencies. Camp Pendleton hosts over 95,000 military, civilian, and contracted personnel daily. Annually, nearly 60,000 personnel train at Camp Pendleton, with up to 45,000 service members and their dependents stationed and living on Camp Pendleton. Additionally, more than 77,000 retired military personnel reside within a 50-mile radius of Camp Pendleton with access to Base recreation facilities, commissary, exchange, and medical services.

2.4.1 Military Training

The uniqueness and variety of Camp Pendleton's topography, combined with its contiguous offshore amphibious training areas, its live-fire ranges, and its protective restricted airspace, offer maximum flexibility for establishing realistic combat training scenarios. Camp Pendleton has designated 113,000 of its 125,000 acres for training (Figures 2-2 through 2-4). Designated land use for training includes 45 training areas (Figure 2-2); 3 dedicated dudded impact areas (Figure 2-3); 66 artillery firing areas, 11 mortar firing areas, 10 live-fire and maneuver areas and 85 live fire training ranges (Figure 2-4); 18 urban training facilities; four amphibious assault landing beaches, and approximately 830 cubic miles of Special Use Airspace (Figure 2-5). While the combat training environment, weapons, tactics, and tempo have changed over the years, Camp Pendleton's training emphasis has continued to be *designed to mold young men and women into the Country's finest fighting force*.

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

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



1 inch = 3 miles

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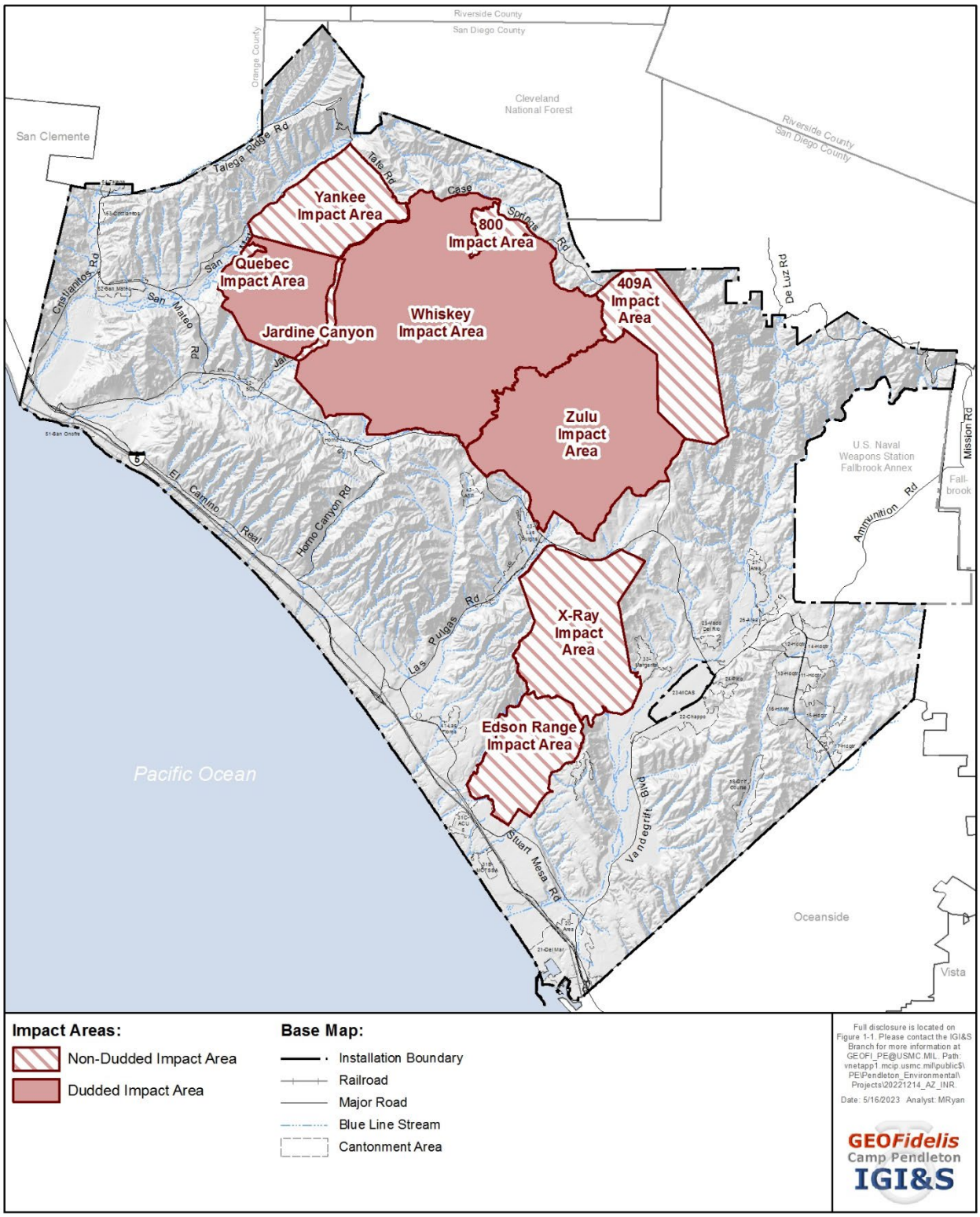
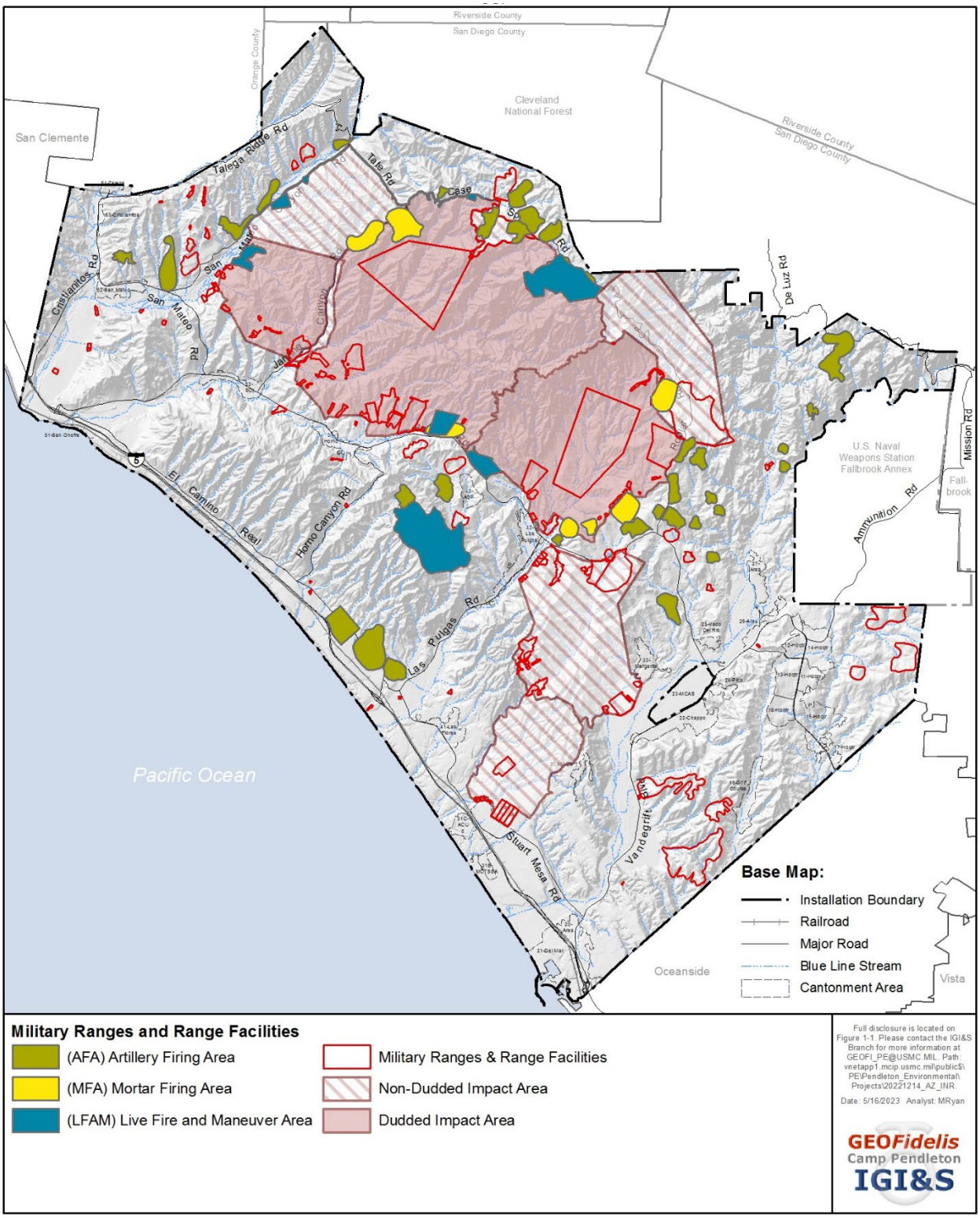
FIGURE 2-2
TRAINING AREAS & RSOPS



1 inch = 3 miles

Camp Pendleton 2023 Integrated Natural Resources Management Plan

FIGURE 2-3
IMPACT AREAS



1 inch = 3 miles

Camp Pendleton 2023 Integrated Natural Resources Management Plan

FIGURE 2-4

RANGES AND FIRING AREAS

2.4.1.1 Amphibious Operations

Camp Pendleton's amphibious training operations take place within a variety of offshore ocean training areas that extend the Base's operational capabilities. The waters immediately west of the Base, known as the Camp Pendleton Amphibious Assault Area (CPAAA), contain 294 square miles of amphibious assault training and maneuvering areas. Note that Camp Pendleton does not manage off-shore natural resources as these are managed by the DoN.

On Camp Pendleton, the majority of amphibious assault training activity occurs at Red Beach. Other amphibious assault training can take place at Gold, Green, White, and Blue Beaches. These four beaches are subject to environmental and physical restrictions, which does limit the capability for ingress opportunities and maneuver corridor training. Of the five amphibious landing beaches, Red Beach has the least amount of environmental and physical constraints on training activities.

2.4.1.2 Maneuver Corridors

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

2.4.1.3 Training Areas

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

west coast is made entirely possible by the existence of the sea, land, and air training capabilities provided by Camp Pendleton.

Inland training areas consist of nearly 113,000 acres of live-fire ranges, impact areas, and training areas (Figures 2-2 through 2-4). Camp Pendleton's training areas and ranges are designed to facilitate all phases of combat readiness training—from individual basic warrior (small arms) training to larger company/battalion-sized training operations. Even larger live-fire combined arms training evolutions that include the use of artillery and Close Air Support (CAS) are conducted aboard the Base.

2.4.1.4 Impact Areas

Several locations on Camp Pendleton have been specifically designated for the receipt of live-fire ordnance (projectiles and explosives) and serve as targeting areas for associated live-fire exercises for the various weapons used in training. These locations, designated as impact areas, cover approximately 33,200 acres of Camp Pendleton (Figure 2-3). Nearly 4,200 acres, including the Range 409 impact area, R-206 and inactive firing Ranges 312A, 313A, and 403, overlap with the training area acreage provided above. Impact areas on Camp Pendleton are classified as either Temporary, Dedicated, or High Hazard Impact Areas (HHIA):

- *Temporary Impact Area* – An impact area within the training complex used for a limited time period to contain fired, placed, dropped, thrown, or launched military munitions and the resulting fragments, debris, and components. Temporary impact areas are normally used for non-dud-producing military munitions and should be able to be cleared and returned to other training support following termination of firing. These include the X-Ray, R-409A, Yankee, Jardine Canyon, San Mateo Canyon, Horno Canyon, Piedre de Lumbre Canyon, R800 Maneuver Box, R-109, R127 (Inactive), R-202, R-206, R-207 (Inactive), R-207A (Inactive), R-211, R-211A, R-219, R-300, R-301, R-303, R-401, and R- 403 (Inactive).
- *Dedicated Impact Area* – An impact area that is permanently designated within the training complex and used indefinitely to contain fired, placed, dropped, thrown, or launched military munitions and the resulting fragments, debris, and components. Dedicated impact areas are normally used for insensitive military munitions (those munitions that are filled with fire resistant, shock resistant insensitive high explosives (IHE)). These include all the Live Fire and Maneuver (LFAMs) areas located in the Training Areas.
- *High-Hazard Impact Area* – An impact area that is permanently designated within the training complex and used to contain sensitive high explosive military munitions and the resulting fragments, debris, and components. High hazard impact areas are normally established as part of dedicated impact areas where access is limited and strictly controlled

due to the extreme hazard of dud ordnance (for example, ICM, HEAT, 40-millimeter [mm], and other highly sensitive military munitions). These include the Quebec, Whiskey, and Zulu impact areas ("Dudded Impact Areas" on Figure 2-3).

HHIAs support the delivery of ground-to-ground and air-to-ground ordnance and may contain unexploded (dud) ordnance. These three impact areas contain most of the live-fire ranges on-Base and are bordered on all sides by safety zones and the remaining maneuver and training ranges. No maneuver activities are conducted within the HHIAs, apart from transit of Jardine Canyon. Access to dud-producing impact areas is tightly controlled for safety reasons. Wildfire in these areas is not normally suppressed due to safety concerns and firebreaks are used to contain wildfires within these areas.

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

2.4.1.5 Training Support Facilities

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

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

Live fire is defined to include the use of weapons or weapon systems that produce projectiles (e.g., small arms, artillery, aviation ordnance, and other dud- and non-dud-producing ordnance). Training operations that involve the use of live fire are restricted to impact areas (described above), established ranges, Artillery Firing Areas (AFAs), Mortar Positions (MPs), Mortar Firing Areas (MFAs), and LFAM Areas (LFAMs) (Figures 2-3 and 2-4).

A live-fire range is a designated area equipped with a variety of targets and monitoring/scoring devices for live-fire training. These ranges are designed to accommodate a broad spectrum of weapons including pistols, rifles, machine guns, mortars, antitank assault weapons, grenades, missiles, and artillery. Also included are man-portable weapons, vehicle-mounted weapons systems, and rotary and fixed wing aircraft systems. Ranges are designed to simulate combat

conditions and scenarios, to train personnel and test the capabilities of weapon systems. As a result, live-fire ranges must be continuously upgraded to keep pace with evolving technology. With few exceptions, the firing ranges are located within and along the perimeter of the impact areas.

AFAs, MPs, and MFAs are designated locations for the firing of inert and explosive artillery and mortar ammunition into the impact areas. AFAs are large and relatively flat areas, usually free of brush and shrubs. MPs are similar but much smaller in area. MFA sites are generally larger than MPs and are used for simulating emergency suppression tactics. Specially designated AFAs are also used in conjunction with live-fire operations by wheeled and tracked assault vehicles. AFA or MP training includes the burning of unused powder and charges, which is conducted in trenches and in accordance with the Range and Training Regulations, equipment technical manuals, and operation manuals. There are six nonfiring AFAs on Base known as Reconnaissance, Selection, Occupation of Positions (RSOPs) that are used for AFA-types of training without live fire. RSOPs receive training-related impacts (less the firing noise and associated impacts) similar to AFAs. MP and MFA sites are located within and along the periphery of the Quebec, Whiskey, and Zulu impact areas (i.e., dudded impact areas). AFA and RSOP areas are in training areas throughout the Base (Figure 2-4).

LFAM activities are field-training exercises that practice the coordination of infantry, vehicle, flight operations, and combat service support operations during various offensive assault and attack scenarios. Often LFAMs accommodate battalion-sized or larger units in mobile assault scenarios that integrate infantry, aviation, mechanized, and motorized units with direct, live-fire and supporting arms, live-fire.

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

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

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

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

Camp Pendleton has been certified for the use of a variety of man-portable, vehicle-mounted, and airborne laser-targeting systems generally employed in target designation in ranges and impact areas. Laser systems may be operated only from observation posts and live-fire ranges as specified in the Range and Training Regulations.

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

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

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

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

2.4.1.6 Aviation Operations

Camp Pendleton's Special Use Airspace (Figure 2-4) consists of four Restricted Areas established to support military training and ground-weapons firing per agreement with the Federal Aviation

Administration (FAA). Restricted Areas R-2503 A and R-2503 B are used on a regular basis and are approved for military use from 0600 to 2359, 7 days a week, year-round, and other times by Notice to Airmen (NOTAM); R-2503 C and D are available for special operations only. R-2503 E falls mainly over Naval Weapons Station Seal Beach Detachment Fallbrook.

Special Use Airspace over Camp Pendleton has been established by the FAA to segregate hazardous military air operations and ground-firing activities from nonparticipating civil aviation operations. Restricted Area R-2503 A overlies the Base's coastal area from the surface to 2,000 feet above mean sea level (MSL) (out to 1 nautical mile offshore); while R-2503 B overlies most of the Base's landmass, including all inland training ranges up to 15,000 feet above MSL. The lateral boundaries of R-2503 C and D are consistent with R-2503 A and B and are available up to 11,000 and 27,000 feet, respectively. At peak periods, a commercial aircraft operates in this airspace every 2 minutes, as well. The close location of intensively used commercial airspace with Camp Pendleton's Special Use airspace requires constant vigilance and visibility to maintain the mandated airspace training and operational requirements. Many unauthorized intrusions from private civilian aircraft into Camp Pendleton's airspace occur annually.

MCAS Camp Pendleton, with 7 aircraft squadrons, 180 aircraft, and over 81,000 flight operations annually on a single runway, is the busiest helicopter airstrip in the Marine Corps (at peak periods, a military aircraft, usually a helicopter, takes off or lands at MCAS CamPen every 3 minutes). Aircraft operations originating from MCAS Camp Pendleton almost always transit over the air space on Camp Pendleton and use aviation training facilities on the Base. Aircraft participating in flight operations include the Huey (UH-1), Cobra (AH-1), and two MV-22 tilt-rotor aircraft (Osprey) squadrons. Additionally, MV-22 aircraft and helicopters from MCAS Miramar routinely operate within the same training areas, ranges, and cantonments currently (and historically) used by all other rotary wing aircraft on Camp Pendleton. On a less frequent basis, aircraft from local Navy installations and ships, Coast Guard Stations, Air Force Bases, and Army facilities utilize the aviation training facilities located throughout the Base.

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

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

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

At present, no fixed wing aircraft are permanently stationed at MCAS Camp Pendleton. Fixed wing aircraft from MCAS Miramar and Yuma confine their takeoff and landing operations to the Air Station. Fixed wing aircraft participating in flight operations over the Base include the Harrier (AV-8B), Hornet (F/A-18), Lightning II (F-35), Orion (P-3), Hercules (C-130), Galaxy (C5), and Globe Master III (C-17), as well as numerous Unmanned Aerial Systems.

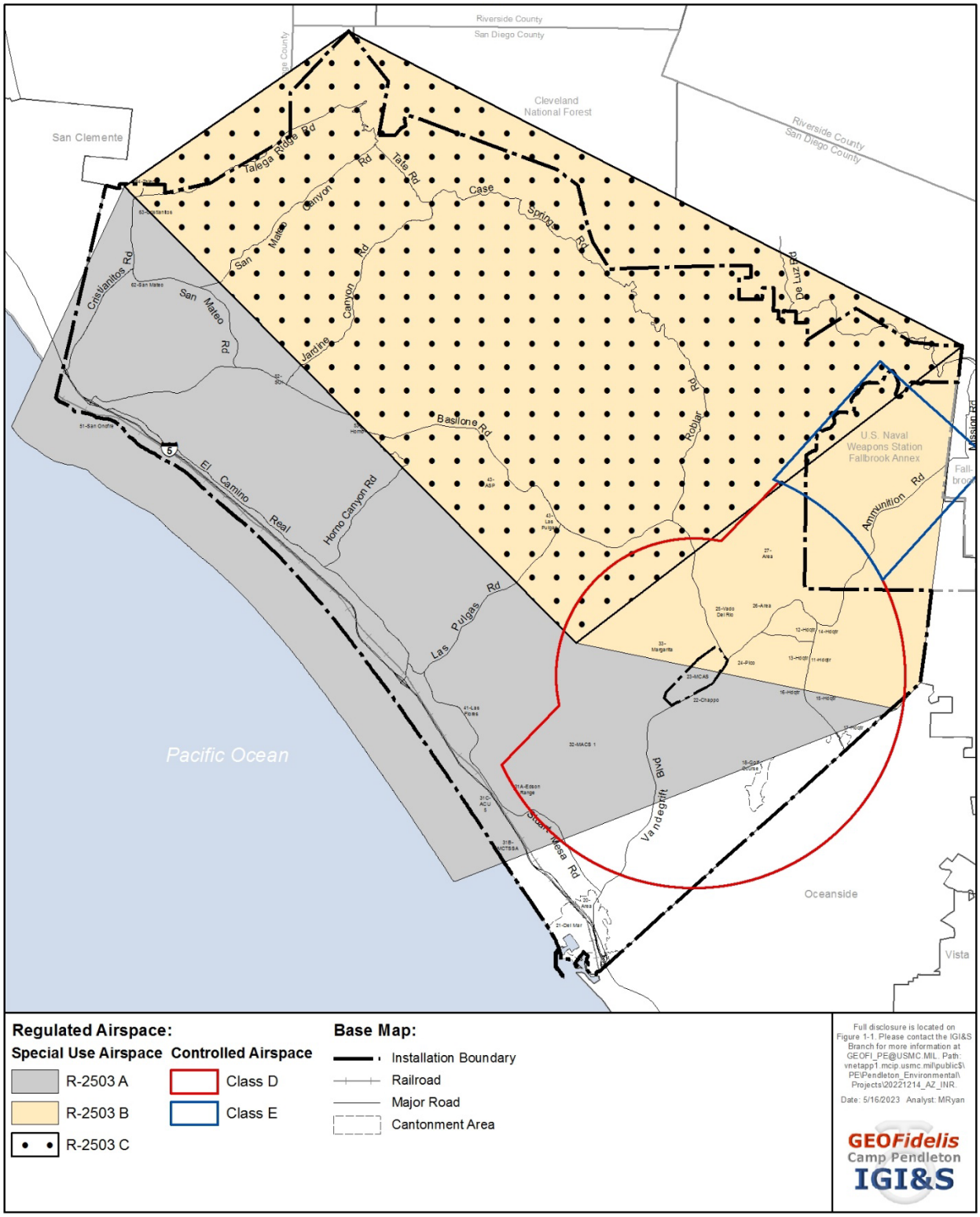
Parachute operations occur within designated Drop Zones. Fighter and attack aircraft conduct Close Air Support activities with live and inert ordnance in the Zulu impact area located in the center of the Base. Unmanned aircraft systems (UAS) operations aboard Camp Pendleton are conducted at R-2503A and/or R-2503B. UAS operation are authorized from 0600-2359 daily and are typically executed between surface and 1500 ft AGL in most authorized ACAs.

2.4.2 Base Infrastructure and Mission Support

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

The Base is home to as many as 50,000 residents and their 17,000 family members. In addition, almost 10,000 civilian workers (e.g., DoD, California State Parks personnel, utilities personnel, contractors) commute daily to the Base. Camp Pendleton currently has more than 3,119 buildings and structures, 530 miles of roads, and nearly 1,000 miles of utility lines base-wide. Much of the infrastructure development of Camp Pendleton, over its 80-plus year history, has occurred on lands previously disturbed by cattle ranching and farming activities that covered approximately 82,500 acres of the former Rancho Santa Margarita y Las Flores property.

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



1 inch = 3 miles

Camp Pendleton 2023 Integrated Natural Resources Management Plan

FIGURE 2-5
REGULATED AIRSPACE

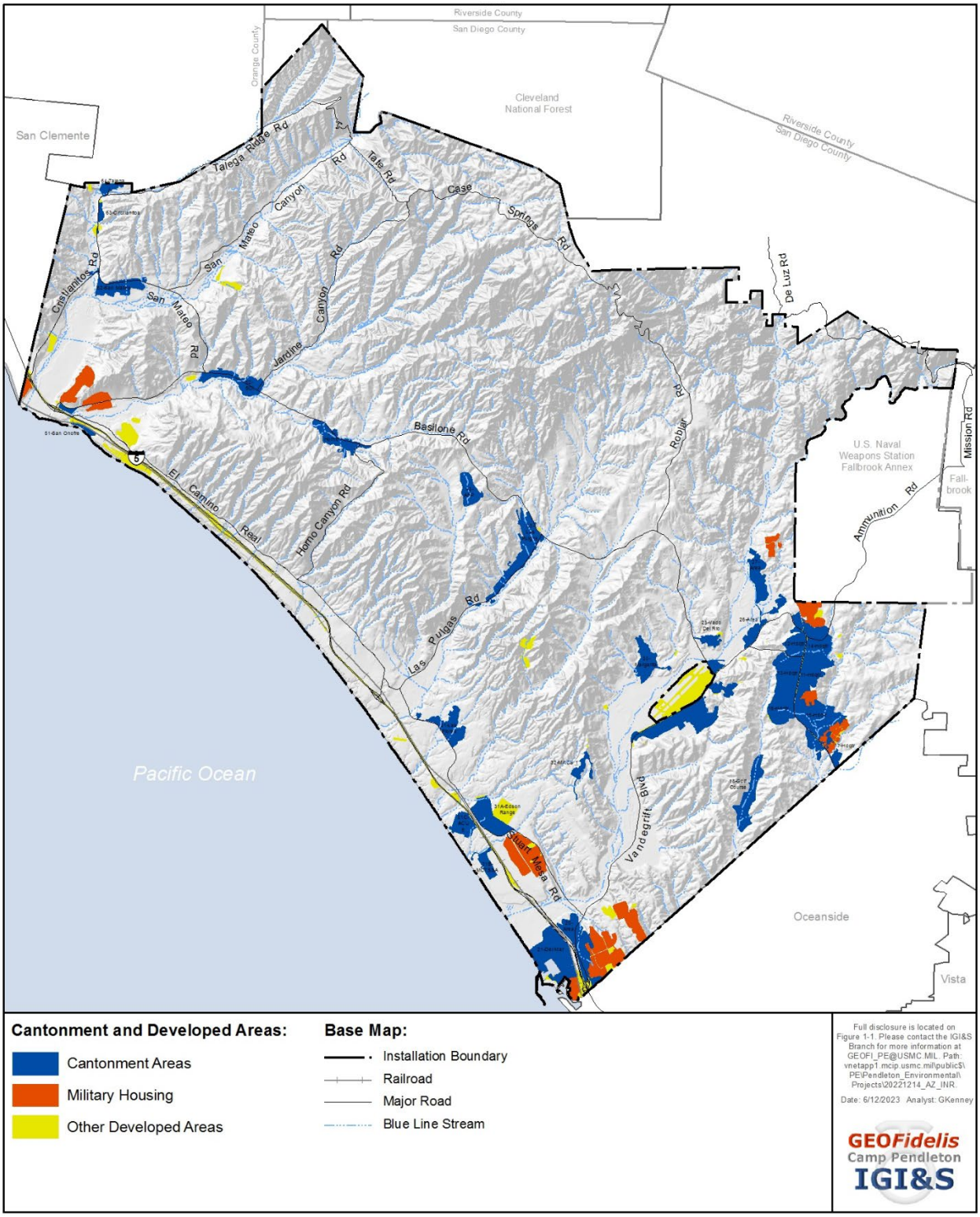
2.4.2.1 Developed Areas

Developed areas on Base, not including roads, total approximately 8,000 acres (Figure 2-6). Cantonment areas are portions of the Base that generally contain infrastructure development, including more than 2,800 buildings and other permanent structures; there are 18 cantonment areas on Base. Some portions of designated cantonment areas on Base maps contain small amounts of open space and may be used for training, recreation, etc. Likewise, designated training areas may contain some buildings and infrastructure development.

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

The largest concentration of development is in the southwestern corner of the Base. Just east of I-5 at the Oceanside gate, 12 family housing areas and major community support facilities exist and include a new Naval Hospital and a Marine Corps Exchange facility. The second largest concentration of development occurs in the southeastern corner of the Base, close to the Fallbrook and San Luis Rey gates, where five family housing areas and major community support facilities exist that include the old Naval Hospital (built in 1974, and currently undergoing demolition), Leatherneck Lanes Bowling facility, quick service restaurants, the Chappo industrial area, and MCAS Camp Pendleton. The Del Mar Boat Basin and an additional family housing area lie to the west of I-5, in the southern portion of the Base.

The largest family housing community, Stuart Mesa, consisting of 1,700+ homes, is located south of Edson Range, adjacent to the former agricultural field. San Mateo Point and San Onofre family housing areas and a shopping center are located near the San Onofre gate at the northwestern corner of the Base. Currently, the Base maintains a total of 7,795 residential units in 21 family housing areas (“Military Housing” on Figure 2-6), as well as eight General Officer Quarters and one Installation Commander Quarters. In addition, Camp Pendleton serves the community with five on-base public schools.



1 inch = 3 miles

Camp Pendleton 2023 Integrated Natural Resources Management Plan

FIGURE 2-6
CANTONMENT AREAS

2.4.2.2 Recreation Areas

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

2.4.2.3 Roads, Firebreaks, and Fuel Treatment Zones

Primary and secondary roads, parking lots, and culverts are widely distributed across the Base. Primary roads consist of paved and improved roads, while secondary roads are dirt roads with decomposed granite, gravel, or shale as a surface covering. Of the more than 530 miles of roadways that exist on Base, approximately 103 secondary roads exist. In addition, the Base has established an extensive current network of firebreaks and fuel treatment zones, totaling over approximately 180 linear miles. A firebreak is a barrier consisting of bladed or disked bare earth used to segregate, stop, and control the spread of fire or provide a control-line from which to work. A fuel treatment zone is a natural or constructed barrier that includes mowed or modified vegetation and is used to segregate, slow, and control the spread of fire. Fuel treatment zones on Base are used in lieu of firebreaks to minimize impacts to natural and cultural resources (e.g., zones adjacent to occupied Pacific pocket mouse habitat). Firebreaks and fuel treatment zones are documented in the Base's Wildland Fire Prevention Plan (MCB CamPen, 2018) and discussed further in Chapters 3 and 4.

2.4.2.4 Borrow Sites, Landfills, and Wood Yard

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

Camp Pendleton operates and maintains two active Class 3 landfills, Las Pulgas and San Onofre, for the acceptance, disposal, and daily capping of nonhazardous, solid waste generated on Base. A

third landfill site, the Box Canyon, was closed in February 2003. The closure included the installation of a 6-foot-thick (1.8-meter-thick) evapotranspiration cap. After the closure activities were completed, land use restrictions and long-term post-closure monitoring and maintenance were put in place to ensure that the final closure cap performs as designed.

Three Mile Pit Inert Debris Engineered Fill Operation was a former gravel pit which was mined and then later used for inert material disposal. In 2007, Three Mile Pit was permitted as an Inert Debris Engineered Fill Operation (IDEFO) to dispose of cured concrete and asphalt from a recycling plant on Camp Pendleton. Approximately 1.5 million tons of fully cured concrete, asphalt, and clean soils were disposed of in Three Mile Pit, with minor amounts of brick and other inert debris. Three Mile Pit stopped accepting inert debris in 2016 and was capped for regulatory closure in 2021-2022.

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

2.4.3 Hazardous Waste Sites

Camp Pendleton has a comprehensive hazardous waste (HW) management program consisting of 45 active HW management sites (Figure 2-7). Each of the 45 sites requires and maintains a County of San Diego Health Permit obtained through Environmental Security's Hazardous Waste Section. According to state and federal regulations, accumulated HW may be stored for no longer than 90 days. However, the Base's HW management program is more stringent and requires that HW is removed for off-base disposal at properly permitted receiving facilities within 60 days. This ensures that HW does not stay on-site longer than regulations permit and affords flexibility for unforeseen events such as inclement weather or deployed Marines. In addition to the 45 HW sites, 13 medical/dental facilities that generate medical and/or dental waste require and maintain County of San Diego medical waste generator permits. The Air Station has one 60-day site and satellite sites at each squadron site.

Installation Restoration Program

The Installation Restoration (IR) program was established in 1986 to clean up and control hazardous waste disposal sites or spills that has previously happened aboard Camp Pendleton, many which occurred during Camp Pendleton's early years after establishment. Environmental Protection Agency (EPA) policies are followed to meet federal requirements. To date, 65 of these

sites have been cleaned up and/or closed. There are currently 15 active sites in the Base's IR Program, all in different phases of the cleanup process.

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

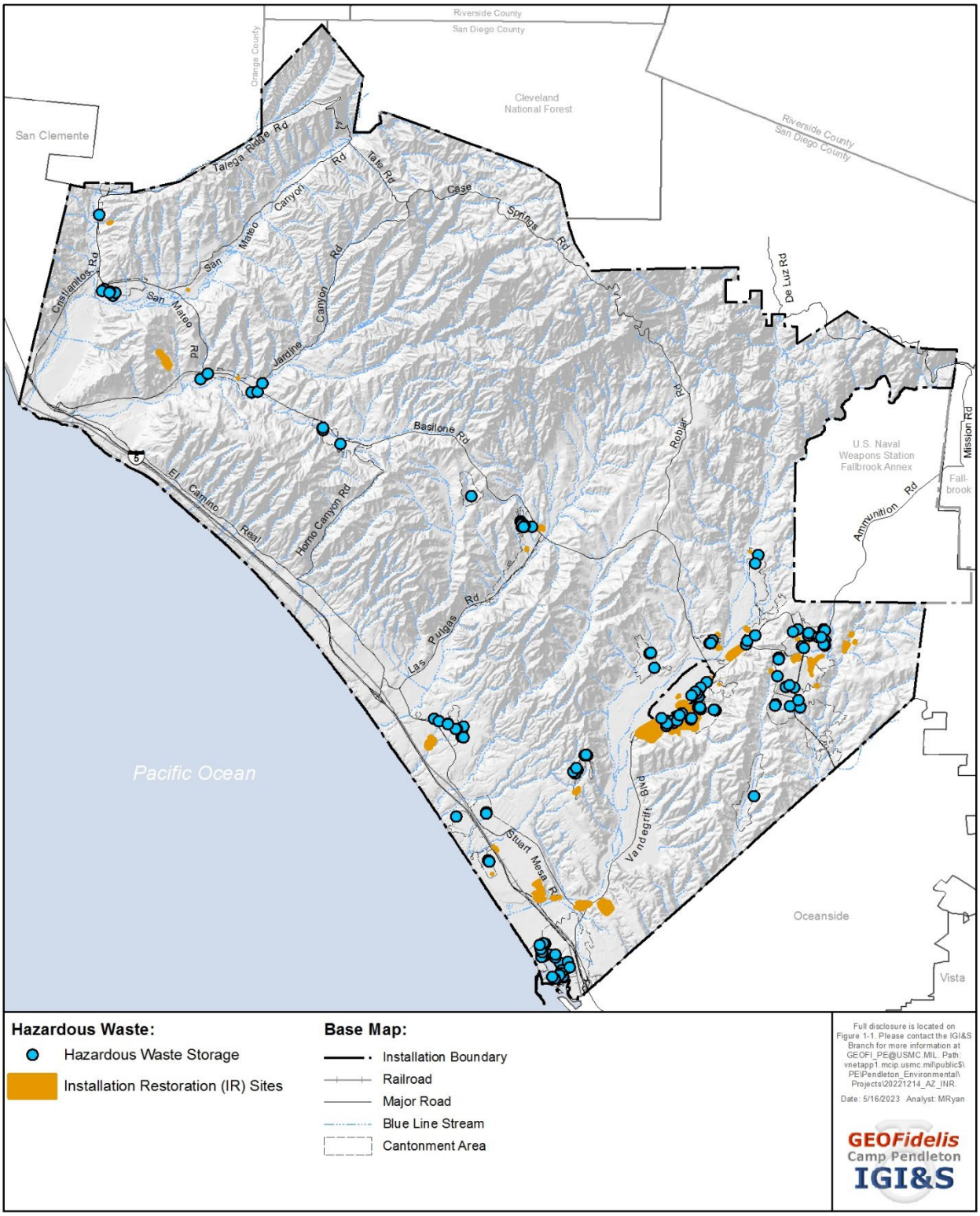
2.4.4 Real Estate Agreements and Leases

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

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

- Proposal cannot adversely affect training.
- Proposal cannot degrade Camp Pendleton quality of life.
- Proposals must be environmentally non-degrading.
- Proposals must align with the Base's INRMP and ICRMP.
- Proposal must ensure safety of operating forces.
- Construction must be consistent with Base architecture.

Lessees are required to manage the natural resources on the lands leased for their use, consistent with the philosophies and supportive of the objectives of the Camp Pendleton INRMP. Environmental Security, in conjunction with the Public Works' Real Estate office, have oversight for those lands leased that have significant natural resources. Lessees are required to identify any activity that may affect federally regulated resources (listed species, wetlands, waters of the U.S., etc.) and provide information and mitigation that may be required to support consultation with the applicable regulatory agency. Often, Camp Pendleton will require that the lessees complete a complimentary natural resources management plan.



1 inch = 3 miles

Camp Pendleton 2023 Integrated Natural Resources Management Plan

FIGURE 2-7

HAZARDOUS WASTE SITES

2.4.4.1 Agriculture

No agricultural production leases, including row crop production, remain in effect on Base. Each former agricultural lease specified soil and water conservation practices required to protect and improve land productivity and fertility, a schedule for application of the required practices, and provisions for restoration of the land upon termination of the lease. Approximately 6,000 acres total of row crop parcels was leased for farming in the 1940s and 1950s. Even larger areas, as many as 10,000 acres, were farmed before the military purchased the property. The Base has reclaimed all historically farmed acreage over time to support military training requirements. The last remaining lease for row crop production, totaling approximately 300 acres located in the Stuart Mesa area on the west side of I-5, was terminated in 2010.

2.4.4.2 Public Recreation – San Onofre State Beach

The largest single leaseholder on Base is the State of California Department of Parks and Recreation, which accounts for approximately 2,000 acres, leased from DoN on 1 September 1971 (amended 1 May 2006) for a 50-year term ending 2021. Prior to the end of the term, the term length was extended for three additional years (ending 2024) by agreement of the parties. The San Onofre State Beach includes 3.5 miles of sandy beaches with six access trails cut into the bluff above; a beachfront campground along Old Highway 101 adjacent to the sandstone bluffs; Trestles and San Onofre surf beaches; and San Mateo campground. The San Mateo campground lies inland within the San Mateo drainage, adjacent to and along the north side of the creek. State Parks-leased areas are used for public recreation. However, with advanced coordination, military training is permissible within the park. Due to the extent of the lease, Camp Pendleton has included California Department of Parks and Recreation on the External Working Group for this INRMP.

Lease agreements require that California State Parks comply with all applicable federal and state regulatory laws. The State of California Department of Parks and Recreation has established general management guidelines for their leased lands. These guidelines exist as policy statements within the general plans for each facility operated by the State Parks system. These statewide policy statements provide necessary guidance for all staff and visitors for the operation, maintenance, and use of San Onofre State Beach campgrounds, hiking/biking trails, and beaches to ensure protection of natural resources within State Parks leased lands. Maintenance operations in the parks include maintaining the existing camping and recreational facilities, landscape maintenance, and erosion control. Ongoing coordination and cooperative projects between the Base and San Onofre State Beach are conducted in line with the Base's ecosystem approach via the Base's Real Estate Department. For example, State Parks and the Base coordinated in the development of a San Onofre Vernal Pool Management Plan to restore and conserve vernal pools and endangered fairy shrimp (Rick Riefner & Associates, 2011). A lease amendment is currently

in progress. Operation, maintenance, and future improvements to the lease property shall align with Camp Pendleton's INRMP; after the lease amendment is completed, Camp Pendleton's Environmental Security Department will oversee environmental compliance, including Section 7 consultation with the United States Fish and Wildlife Service.

2.4.4.3 San Diego Gas & Electric Company (Sempra Energy)

SDG&E, through its parent company Sempra Energy, holds more than 1,300 acres of leases/right-of-way agreements with the Base for transmission lines and various associated support facilities. SDG&E has a Subregional NCCP that allows SDG&E to develop, install, maintain, operate, and repair its facilities, which are or will become necessary to provide electric, natural gas, and other services to the customers served by SDG&E within the plan area. SDG&E's NCCP includes multiple Operational Protocols as well as behavioral and construction techniques to avoid and minimize impacts to sensitive resources. Environmental review of the lease agreements and SDG&E actions is conducted by the ES Planning Section, to ensure compliance with the Base's INRMP.

2.4.4.4 San Onofre Nuclear Generating Station (SONGS)

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

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

2.4.4.5 Interstate 5 (I-5)

An easement of approximately 726 acres has been granted by DoN to state and federal agencies for operating facilities on Camp Pendleton. It is used for the construction, operation, and maintenance of I-5, along with additional easements for operation of two Interstate rest stop areas, a viewpoint, two California Highway Patrol truck weigh stations, and a U.S. Customs and Border Protection checkpoint facility. All of these easements have been granted in perpetuity.

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

2.4.4.6 North County Transit District (NCTD) Rail Line and Maintenance Yard

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

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

In support of their commuter rail operations, NCTD maintains and operates a 24-hour Commuter Rail Maintenance Facility located on Camp Pendleton. This Commuter Rail Maintenance Facility, located within the Stuart Mesa area of Camp Pendleton, is situated adjacent to NCTD's railroad

right-of-way through the Base. Its presence has been authorized by a second and separate easement in perpetuity, granted by DoN to NCTD in 1994. This NCTD easement also supports the operation of a BNSF railroad switching yard located adjacent to the Maintenance Facility. The easement for the NCTD Commuter Rail Maintenance Facility and BNSF switching yard operations totals approximately 20 acres.

2.5 EMERGENT AND FUTURE TRAINING

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

2.5.1 Future Training Requirements and Capabilities

To support IMEF units, formal schools, Navy units, other services, and federal agencies, the Camp Pendleton Range Complex and training support services are looking towards modernization and expansion in the following realms by 2025:

- Reconfiguration of non-live-fire MOUT facilities to support platoon level training, located in the vicinity of the infantry regiment cantonment areas;
- Increase of convoy operations training sites to support live-fire training, including close air support;
- Mitigation of fire danger conditions to open training opportunities year-round. Mitigation includes following the Base's Wildland Fire Prevention Plan (MCB CamPen 2018) for prescription burns;
- Mitigation of environmental restrictions to lessen negative training impacts. Mitigation includes creating species' specific management plans to have no net loss of a federally-listed species while concurrently relieving training restrictions;
- Improvement of the secondary road network to allow safe dependable access to ranges throughout the year;
- Increase of training activities on Green and White Beaches, with additional access points under the railroad and I-5, to the perimeter training areas;
- Make available Red Beach for unencumbered training with improved access points under the railroad and I-5;

- Expansion of range of training support services such as role players, targets, scenarios, and after-action critiques to enhance the training experience while reducing the burden on units conducting training;
- Revitalization of AFA 17, with a live-fire raid site constructed to support limited size MOUT training with combined arms fires, including close air support;
- MAGTF expeditionary command post exercises (CPX) to support exercises from small- to large-scale including joint exercises;
- Improvement of training facilities with after-action feedback;
- Integration of unmanned aerial vehicles (UAVs) into training operations;
- Update of common, Fleet Marine Force (FMF)-compatible communications systems, avoiding stand-alone systems;
- Adequate funding of range support infrastructure, including targetry, sound systems, and lighting, as necessary; and
- Recapturing of the leased agricultural fields for training.

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

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

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

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

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

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

All modernization and expansion will have to undergo environmental review under the National Environmental Policy Act (NEPA) process conducted by Environmental Security, where impacts to natural and cultural resources will be evaluated and regulatory consultations (e.g., Section 7 underneath the ESA with the USFWS) completed, if necessary.

2.5.2 Future Range Availability and Management

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

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

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

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

According to the 2008 RCMP, of the 435 encroachment impacts identified by Camp Pendleton Range Complex Subject Matter Experts (SMEs), over 50 percent of all encroachment impacts were created by two issues, Endangered Species (30.8 percent), and wildfires or high Fire Danger Ratings that precluded military trainings from being executed (21.6 percent). Additional encroachment impacts were created by Cultural Resources (7.4 percent), UXO/Munitions (5.2 percent), Frequency Encroachment (0.10 percent), Maritime Sustainability (3.0 percent), Airspace Restrictions (6.4 percent), Air Quality (2.8 percent), Clean Water (0.05 percent), Wetlands (10.4 percent), Airborne Noise (7.1 percent), and Urban Growth (4.1 percent) (MCBCP 2008). Encroachment is further discussed in Section 2.6.1.

2.6 MILITARY TRAINING SUSTAINABILITY CHALLENGES

2.6.1 Encroachment

Camp Pendleton is, and will continue to be, affected by the geographic, socioeconomic, and ecological setting of the region within which it is located. Land use planning and growth management efforts of local and regional jurisdictions have a potentially significant influence on the Base's land use, planning, training, environmental compliance, and natural resource utilization and management. For the past 50 years, the southern California region has been marked by rapid urbanization, development, and population growth (much of it due to the presence of Camp Pendleton and other military installations within southern California). Projected population growth figures for the region suggest the situation will only intensify.

Regional urbanization and development to support current and anticipated population growth ultimately have the potential to constrain the Base's ability to train Marines. The individual and cumulative effects of these regional issues represent encroachments that can impact the Base's ability to accomplish its mission. In this context, encroachment is defined as an action that has the potential to impede or interfere with Camp Pendleton's responsibility for the military readiness of Marines that train there. Continually proposed, nonmilitary projects adjacent to or within Camp Pendleton's borders must be acknowledged by Base planners, military trainers, and the surrounding developing communities, as part of actual or potential encroachment. For example, leases and easements and, particularly, aboveground utilities such as the SONGS, SDG&E, I-5, and railway lines reduce the land available for military use, affect the use of aviation assets, and challenge the conduct of realistic military training activities. On-base actions, such as recreational activities (e.g., MCCS recreational runs), also must be vetted by the military trainers and Base planners to ensure they have little impact to military training.

Most of the challenges (i.e., encroachment) facing military training on Camp Pendleton is driven by factors discussed in Section 2.5.2, as well as lease agreements on the Base. Camp Pendleton continuously looks for solutions to support military training on the Base. For example, to alleviate some of the training restrictions on the State Parks lease, the lease agreement includes the option of military training within the lease with proper coordination with State Parks. Training restrictions within federally listed species' habitat has been alleviated through creative cooperation with the USFWS. Camp Pendleton's Environmental Security worked closely with the USFWS in the 1990s to relieve training restrictions on the Base from riparian and beach federally-listed species with the issuance of the Riparian and Beach Conservation Plan and Biological Opinion (USFWS 1995), with numerous amendments to the BO. Furthermore, 300+ acres of training restrictions were removed on the Base with the development of the Base's Thread-leaved Brodiaea Management Plan and issuance of the associated Biological Opinion from the USFWS (USFWS 2019). Recently, training relief within Range 409 within Stephens' kangaroo rat habitat and within California gnatcatcher habitat on Base has been provided with creative solutions using the Readiness and Environmental Protection Integration (REPI) program as discussed in Section 2.6.2. The Base will be committing to future listed-species management plans in Chapter 4 to address training restriction relief.

The Marine Corps and Camp Pendleton are committed to the conservation of natural resources. The Base sustains the primary land use established by Congress of military readiness. The Marine Corps believes most military activities can be generally compatible with the conservation of biological resources. The federal ESA is a significant environmental law for Camp Pendleton because of the presence of many federally threatened and endangered species on the Base. In compliance with ESA Section 7(a)(2), the Base has established management programs, protocols, and regulations so that training activities and Base operations avoid and minimize adverse impacts

to federally listed species and their habitats, provide compensatory mitigation for impacts that do occur, and ensure that Base actions do not jeopardize the continued survival of the species. Under ESA Section 7(a)(1), the Base (as a federal agency) in consultation with and with the assistance of the USFWS, utilizes their authorities in furtherance of the purposes of the ESA by carrying out programs for the conservation of endangered species and threatened species listed pursuant to section 4 of this Act. Most of these programs focus on protecting, expanding, and improving occupied and unoccupied ecosystems used by these species.

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

2.6.2 Buffer Acquisition and Readiness and Environmental Protection Integration

Established in Section 2684(a) of the National Defense Authorization Act for fiscal year (FY) 2003, the DoD's Readiness and Environmental Protection Integration (REPI) Program is a key tool for combating encroachment that can limit or restrict military training, testing, and operations. REPI protects these military missions by helping remove or avoid land-use conflicts near installations and addressing regulatory restrictions that inhibit military activities. Through REPI, DoD enters into unique cost-sharing agreements with conservation organizations and state and local governments to conserve a buffer compatible land uses and preserve areas near military installations that may eliminate or relieve current or anticipated environmental restrictions that could interfere with military training, testing, or operations. These protected and managed lands are not owned by the military for the purposes of military training or testing.

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

- Enhanced military readiness by limiting incompatible development near military installations, special use airspace and military training routes;
- Protected valuable habitat and provided opportunities (e.g., management funds) for endangered species recovery;
- Strengthened military-community relationships and forged partnerships with new allies; and

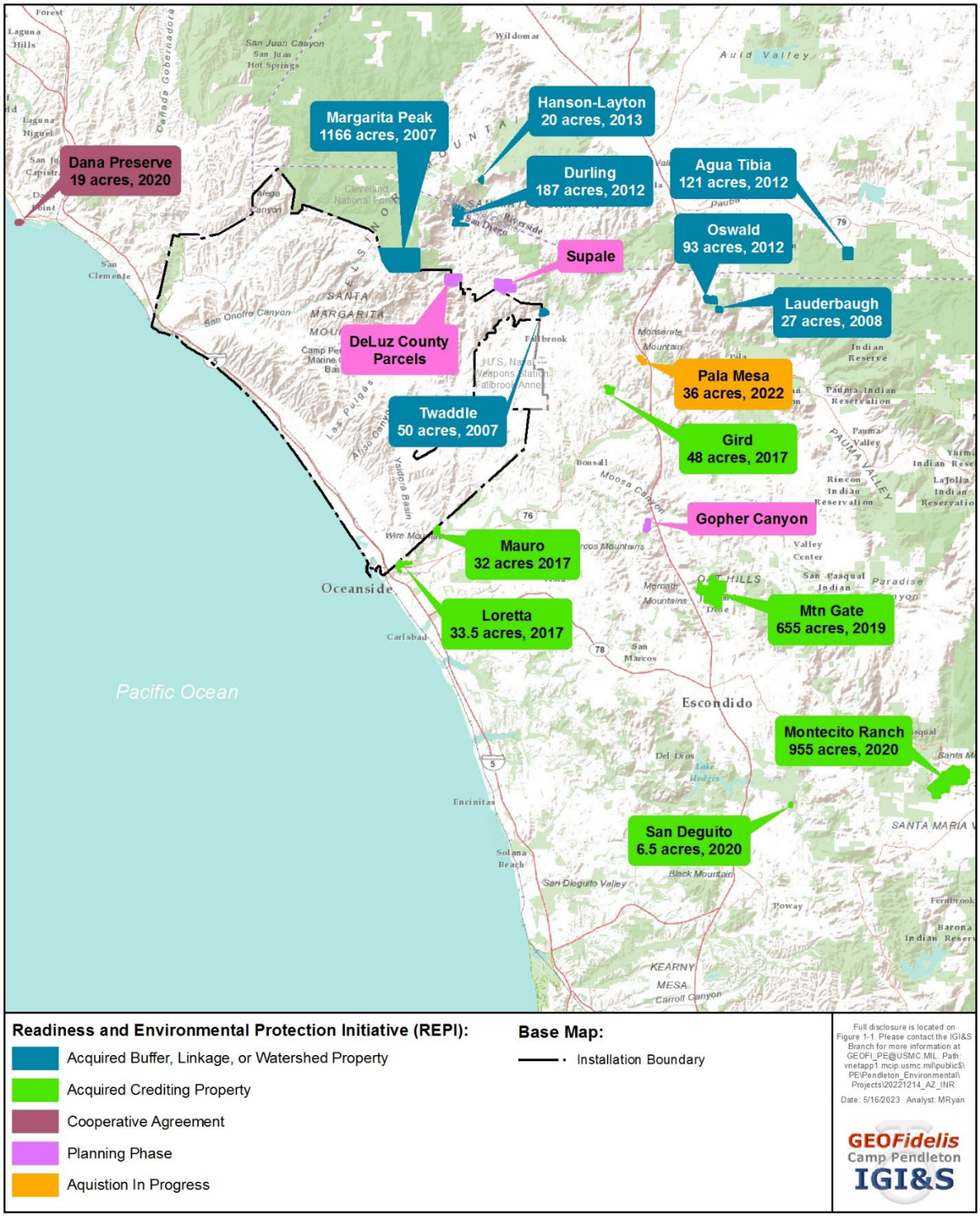
- Spurred collaboration with other federal land conservation programs and landscape-scale initiatives.

Of Camp Pendleton's 125,448 acres, ground combat element (GCE) maneuver training is limited to 80,070 acres due to other Base requirements, including dud-producing impact areas, cantonments, housing areas, leases, right-of-ways, and other infrastructure. Of the 80,070 acres, 30,531 acres restrictions for federally protected species and cultural resources, leaving 49,539 acres for unrestricted training (MCBCP 2008).

The goal of Camp Pendleton's encroachment control and REPI program is to protect the current training areas and dud-producing impact areas from further restriction due to incompatible development and to reduce current and anticipated future threatened and endangered species restrictions. Through REPI, restrictive use, conservation easements and management agreement controls are utilized to buffer the Base's training and readiness operations, conserve habitat for species, maintain a regionally significant wildlife corridor between Camp Pendleton and/or protect the Santa Margarita River watershed values. To date, 15 encroachment partnering projects have been executed so far totaling 3,883 acres (Figure 2-8).

Reducing ESA restrictions to training will be accomplished by a combination of habitat preservation off-Base and an on-Base stewardship program that will ensure the continued existence of listed species on Base after training restrictions are lifted. Off-Base habitat preservation under the REPI program complements local government habitat conservation plans and utilizes information and priorities developed under those programs and from USFWS to identify annual projects. The Project Area of Interest was established in conjunction with USFWS and MCAS Miramar to include habitat for targeted species that will support their recovery in southern California. Priority areas include occupied habitat for each species and locations that could provide high-quality habitat. Future goals of the Base are to reduce training restrictions in occupied coastal California gnatcatcher (*Polioptila californica californica*) habitat, occupied arroyo toad (*Anaxyrus californicus*) upland habitat and occupied Stephens' kangaroo rat (*Dipodomys stephensi*) habitat.

In August 2021, the Biological Opinion (USFWS 2021) was signed for the coastal California gnatcatcher recovery crediting system (RCS) that intends to rely primarily on the DoD REPI program to provide funds for the conservation and management of non-military lands to achieve gnatcatcher recovery goals, while providing relief of military training restrictions on Camp Pendleton and Marine Corps Air Station Miramar. A few high priority training areas on both installations with gnatcatchers will have "Range and Training Area Standard Operating Procedures" (MCBCP 2022) selectively modified or removed to increase training flexibility ("training relief"). To offset the impacts to gnatcatchers where Range Regulations are modified or



1 inch = 6 miles

Camp Pendleton 2023 Integrated Natural Resources Management Plan

Figure 2-8
REPI Lands

removed, the Marine Corps will conserve occupied gnatcatcher habitat off-Base in a manner that is consistent with the Service's existing strategy to preserve large core areas of occupied gnatcatcher habitat and the linkages that connect those occupied core areas. The Base is planning to relieve training restrictions in on Artillery Firing Area (AFA) 15 in 2024 with AFA 14 and 16 relief to follow as credits are accrued.

In June 2020, Montecito Ranch in Ramona California (Figure 2-8) was purchased with funding assistance from the REPI program. Conservation of the offsite habitat conservation property, which supports a large amount of suitable Stephens' kangaroo rat (SKR) habitat, offset anticipated 409A project-related impacts and facilitate recovery of SKR. Although this habitat is currently unoccupied, SKR occupy the adjacent property, and protection of the offsite conservation property will provide an opportunity to increase the amount of occupied SKR habitat in the region and contribute to recovery of the species. In October 2022, an Agreement for the Management of Natural Resources on the Montecito Ranch Property by and between the United States of America and the Endangered Habitats Conservancy, stipulates that if the SKR population on Montecito Ranch expands or increases as a result, the Marine Corps will receive additional credit that could be used to further alleviate training restrictions on MCBCP.

In September 2020, a Cooperative Agreement between the Center for Natural Lands Management and the U.S. Navy was signed to implement the Dana Point Preserve Pacific Pocket Mouse (PPM) Enhanced Management Plan, utilizing funding from the REPI program. The Marine Corps will receive credit for funding PPM habitat enhancement at the Dana Point Preserve through consultation to address training-related impacts to PPM and determine how the credit could be used to offset effects to PPM from these activities.

2.6.3 Energy Security

DoD's Energy Policy Directive, DoDD 4180.01 (DoD 2018c), which is aimed at improving DoD's energy security through increasing efficiency and diversifying energy resources, will result in a major reduction in the use of fossil fuels and thereby reduce greenhouse gas emissions greatly. DoN's energy policy specifically requires the Navy to use all measures to minimize energy consumption, reduce energy expenditures, and utilize alternative energy resources and environmentally sustainable technologies where it is reasonable, affordable, and practical to do so.

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

Most recently, EO 14057 - Catalyzing Clean Energy Industries and Jobs Through Federal Sustainability was signed in December 2021 (EO 2021a). E.O. 14057 outlines a coordinated, whole-of-government approach, along with individual agency goals and actions, to transform Federal procurement and operations to reduce greenhouse gas (GHG) emissions and environmental impacts and secure a transition to clean energy and sustainable technologies. It establishes that the Federal Government will lead by example to achieve a carbon pollution-free electricity sector by 2035 and net-zero emissions economy-wide by 2050, using its scale and procurement power to achieve:

- 100 percent carbon pollution-free electricity on a net annual basis by 2030, including 50 percent 24/7 carbon pollution-free electricity;
- 100 percent zero-emission vehicle acquisitions by 2035, including 100 percent zero emission light-duty vehicle acquisitions by 2027;
- A net-zero emissions building portfolio by 2045, including a 50 percent emissions reduction by 2032;
- A 65 percent reduction in scope 1 and 2 GHG emissions from Federal operations by 2030 from 2008 levels;
- Net-zero emissions from Federal procurement, including a Buy Clean policy to promote use of construction materials with lower embodied emissions;
- Climate resilient infrastructure and operations; and
- A climate- and sustainability-focused Federal workforce.

Over the past 15 years, Camp Pendleton has executed several initiatives to improve energy efficiency, reduce dependence on nonrenewable resources, and increase use of renewable energy resources. Examples include the installation of solar hot water and photovoltaic systems at 53 Area and 62 Area training pools, a photovoltaic array at the Box Canyon Landfill, and a rooftop photovoltaic system on the Chappo and Edson dining halls. Natural gas-powered vehicles have also been added to the fleet of Base vehicles at Camp Pendleton, and the Base is partnering with commercial enterprises and the State of California in researching the future use of hydrogen-powered vehicles. Electric car recharge stations are currently on Base.

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

2.6.4 Climate Change

DoD's Climate Change Adaptation and Resilience Directive, DoDD 4715.21 (DoD 2016), assigns responsibilities to provide the DoD with the resources necessary to assess and manage risks associated with the impacts of climate change. This involves deliberate preparation, close cooperation, and coordinated planning by the DoD to:

- Facilitate federal, State, local, tribal, private sector, and nonprofit sector efforts to improve climate preparedness and resilience, and to implement the 2014 DoD Climate Change Adaptation Roadmap;
- Help safeguard U.S. economy, infrastructure, environment, and natural resources; and
- Provide for the continuity of DoD operations, services, and programs.

EO 14008 - Tackling the Climate Crisis at Home and Abroad was signed in January 2021 (EO 2021b). In response to E.O. 14008, in October 2021, the DoD published the Climate Risk Analysis (DCRA; DoD 2021). The Executive Summary of the DCRA states that:

> "The risks of climate change to Department of Defense (DoD) strategies, plans, capabilities, missions, and equipment, as well as those of U.S. allies and partners, are growing. Global efforts to address climate change – including actions to address the causes as well as the effects – will influence DoD strategic interests, relationships, competition, and priorities. To train, fight, and win in this increasingly complex environment, DoD will consider the effects of climate change at every level of the DoD enterprise."

The DCRA is an important step towards integration of climate change considerations at DoD and provides the following:

- Introduces key security implications of climate change to DoD, including DoD's role supporting whole-of-government and international efforts in concert with allies and partners;
- Reviews the DoD climate policy and responsibilities, highlighting key documents;
- Presents a review of climate hazards, risks, and security implications;
- Outlines how DoD will incorporate consideration of climate into relevant strategy, planning, and processes; and
- Describes interagency scientific and intelligence products and experts, which could support future analyses of climate risk, as well as expected funding for exercises, wargames, analyses, and studies related to climate change.

One of the main objectives of the DCRA is to incorporate "Planning" into the DoD mission, and although not explicitly stated, this would include natural resources management in this INRMP. Climate-driven changes in the environment over the coming decades are predicted to pose significant threats to DoD installations, which could potentially compromise the capacity of installation lands and waters to support the military mission (DoD 2019b). As climate change will affect both the natural landscape and built infrastructure, which impacts readiness and environmental stewardship responsibilities at installations across the nation, DoD must employ creative ways to address the impact of climate change to remain ready to operate in a changing environment amid the challenges of climate change and environmental damage (DoD 2014a, 2014b). Potential climate change impacts to the DoD natural environment, mission and operations on Camp Pendleton are identified as rising temperatures, changes in precipitation patterns, increases in storm frequency and intensity, rising sea levels and associated storm surge, increased frequency and severity of wildfires, and soil loss on coastal bluffs.

In addition, depletion, and degradation of biodiversity, caused by urban growth, has placed San Diego County in the position of being a biodiversity hotspot. San Diego County may have the largest number of imperiled species as well in the United States (Dobson et al. 1997). Indirectly, this has created a form of pressure for Camp Pendleton, by creating an increasing dependence on the Base and any remaining off-Base natural areas for habitat for these species. Camp Pendleton is concerned that as regional development continues to deplete the region's natural landscape and negative impacts from a changing climate occur to the entire region, Base lands will become increasingly and disproportionately important to regional habitat and sensitive species conservation. As more species in the region are federally listed as threatened or endangered, the Base is facing increasing regulatory requirements and management needs.

Detailed information on the impacts from climate change until the end of the century is provided in Appendix B, along with the associated vulnerabilities/risks to Camp Pendleton's natural resources and military mission. Highlights of this assessment are provided in Section 2.6.4.2 and Section 2.6.4.3. Our implementation of management actions to address these vulnerabilities are discussed in Section 2.6.4.4 and furthermore in detail in Chapter 4.

2.6.4.1 Climate Adaptation

The iterative process of climate adaptation planning, with opportunities for periodic review, evaluation, and adjustment, is consistent with DoD's longstanding commitment to adaptive management (INRMP Implementation Manual, DoD 2018b). Further, climate adaptation planning is also a form of ecosystem management because it involves understanding dynamic system processes and managing in the face of shifting or non-stationary conditions.

The DoD recognizes that installations will experience significant risks from climate-driven changes in the environment, which could compromise the capacity of the installations to support military training (DoD 2018a). Sustaining Camp Pendleton's capacity to meet its mission now and in the future will be greatly improved by understanding the installation's risks and vulnerabilities to climate change effects, and by getting a start on adapting to the predicted future changes. DoDI 4715.03 (DoD 2019a) specifically calls for installations to address climate considerations when updating or revising their INRMPs and the Climate Adaptation for DoD Natural Resources Managers, A Guide to Incorporating Climate Considerations into Integrated Natural Resources Plans (DoD 2019) provides a framework to assist in climate planning.

The INRMP adaptation planning process consists of the following steps:

- Set context for adaptation planning: document current and future climate projections, including uncertainties;
- Identify potential climate impacts and vulnerabilities, risks to natural resources and mission;
- Evaluate the implications of climate-related changes to INRMP goals, objectives, and actions;
- Identify opportunities, develop strategies and actions to reduce climate-related risks and vulnerabilities;
- Implement climate adaptation actions and projects. Link natural resource adaptation concerns/responses with other installation projects/planning; and
- Monitor and adjust climate adaptation actions.

2.6.4.2 Future Climate Projections

The State of California is one of the most "climate-challenged" regions in North America (Bedsworth et al. 2018), and as a biodiversity hotspot, San Diego in particular will be impacted by climatic shifts in multifold ways (CA 2018). Detailed information on the assessment of climate change on the on the impacts and associated vulnerabilities/risks of climate change are provided in Appendix B. A brief summary of the forecasts from Statewide Summary Report of California's Fourth Climate Change Assessment (CA 2018) and other readily available tools (e.g., NOAA' U.S. Climate Resilience Toolkit and Climate Explorer, as discussed in Appendix B) follows:

- In San Diego County, warming projections range from 4-6 °F under the low emissions scenario and 7-9 °F under the high emissions scenario by the end of the century;
- The frequency, duration and intensity of heat waves will increase;

- Precipitation will remain highly variable with frequent and severe droughts punctuated by more intense individual precipitation events;
- Soil moisture will decrease substantially during prolonged drought; under a high emissions scenario, spring soil moisture will decrease 10-15% by 2100;
- Sea level along the San Diego County coast is expected to rise approximately 1 ft by mid-21st century, and 3 ft or potentially much higher by end of the century;
- San Diego cliffs are usually between 65 -115 feet tall; the long-term cliff retreat rate is estimated at an average of 0.2 to 0.7 f/yr (Young 2018);
- The risk for large catastrophic wildfires driven by Santa Ana wind events will likely increase; and
- With a high emissions scenario, the number of large fires statewide increases substantially ranging from 58 percent to 128 percent above historical levels by 2085. Under the same emissions scenario, the estimated burned area will increase by 57 percent to 169 percent, depending on location (Moser et al. 2012).

2.6.4.3 Risk to Natural Resources and Mission

For the natural environment, these factors can have cascading impact on individual species such population-level declines, changes in species' ranges, breeding seasons, and migration patterns. At the ecosystem level, climate impacts could convert entire ecosystems (e.g., increased frequency of fire converts shrub habitat to grasslands) or alter disturbance regimes (e.g., fire and flooding). Other climate-related impacts can be the amplification/intensification of existing stressors, such as invasive species, diseases, or water pollution. As such, it can often be difficult to disentangle or "attribute" the added effect of climatic changes on modifications occurring in each natural system.

Climate changes on Camp Pendleton may cause increased costs and management difficulties for the natural resources management program. Examples of climate-related changes may cause:

- Populations of threatened and endangered species to become more difficult to sustain and thus manage;
- Non-listed species to decline such that they become eligible for protection under the Endangered Species Act;
- Climate-driven changes in hydrologic regimes, which in turn, may increase costs of compliance with the Clean Water Act;
- New challenges, such as the emergence of problematic species not previously invasive; and
- New challenges to natural resources management – e.g. there may be significant narrowing of available windows for installations to conduct prescribed fire burns, or increased season length for spread of invasive species.

Further vulnerabilities and risks to the natural resources on Camp Pendleton are discussed in Appendix B.

Such climate changes can have cascading impacts on a military mission, including implications for training and operational readiness. Further vulnerabilities and risks to the military mission on Camp Pendleton in particular are discussed in Appendix B. Some examples include climate-induced impacts causing:

- Effects on training and testing sites suitability due to land loss or alteration of natural ecosystems;

CASE: Climate impacts on an installation's natural resources can reduce the physical availability of suitable training and testing areas. Beach areas, for example, are crucial for practicing amphibious assaults but can be highly vulnerable to sea-level rise. At Camp Pendleton and Naval Base Coronado in Southern California, beach training areas are projected to be reduced by 50–77 percent (Chadwick 2014).

- Timing limitations to training activities due to increases in wildfires, floods, and other natural hazards;

For example, in many places, increased drought and associated vegetation responses are anticipated to increase fire risk, resulting in extended live-fire restrictions (DoD 2023b). Besides financial costs of fire-related damages, there is often a temporary loss of training, security, and safety assets (e.g., power lines, roads).

- Increased damage to facilities and operational assets due to loss in protective functions offered by wetlands, dunes, and other natural systems; and
- Higher regulatory compliance costs and restrictions due to declines in protected species or habitats. Climate change may complicate or impede regulatory compliance, resulting in increased costs and/or training restrictions.

2.6.4.4 Develop Strategies to Reduce Climate Risks

Adaptation strategies and actions should be capable of mitigating key climate risks to the natural resources under management, and ultimately to the military mission of the installation. Natural resource managers typically look to past conditions as a benchmark for their work, and resource conservation is often focused on either maintaining current conditions or restoring a system to some desired historical state. For this 5-year cycle of the INRMP, Camp Pendleton will focus on restoring and maintaining the current systems (Appendix B). Recognizing that there might be a time when managing for the persistence of current conditions will in many instances no longer be possible. In those cases, managers and regulators will need to acknowledge that ecological

transformations may be inevitable, and shift to a mindset of managing for change, rather than always attempting to resist those changes.

The management actions that Camp Pendleton has taken over the last 40+ years, continues to implement, and plans to implement over the next 5 years focuses on restoring current systems, which ultimately combats climate change by maintaining ecological function and diversity. In addition, Camp Pendleton is in the infancy of planning and implementing climate change specific projects, as new studies on climate change emerge and collaborations are developed. These natural resources management efforts will be identified in Chapter 4 and Appendix B, where the INRMP identifies program elements to ensure that INRMPs fulfill the requirements of the Sikes Act per the DoD INRMP Manual (DoD 2018b). With the element specific goals and objectives in Chapter 4, the following will be highlighted to reduce climate risks:

- Vulnerabilities to the program element will be highlighted;
- Identification of strategies that could reduce climate vulnerabilities and risk; and
- Modifications of monitoring protocols to ensure that they are climate-informed.

2.6.4.5 Adaptive Management: Implement, Monitor, and Adjust Climate Actions

When determining how to fund climate adaptation projects, the easiest avenue is to determine how the action or project fits into existing natural resources projects (DoD 2019). Modifying already existing projects can shorten the time for implementation and have the backing of an already existing driver for funding (e.g., ESA).

DoD guidance (DoD 2019) recognizes that climate adaptation planning for large scale efforts often entails a time horizon of more than 10 years and therefore recommends that managers break up complex projects into phases that can be implemented over the course of several years, and several funding cycles. In addition, collaborative partnerships provide an important mechanism for information and cost-sharing and are encouraged. Camp Pendleton addresses funding and implementation in Chapter 5.

Monitoring will become increasingly significant of effective climate adaptation planning to understand how conditions are changing, and to respond to that change (DoD 2019). Camp Pendleton already supports a robust monitoring program, including monitoring to support climate-informed decisions in the riparian system for water management; these monitoring efforts are highlighted in Chapter 4.

Monitoring currently provides data to see if management is meeting the INRMP goals, and already is analyzed to demonstrate short and long-term impacts of climate to species (e.g., many species'

population numbers, fecundity, etc. are already tied to drought). The INRMP accommodates a degree of flexibility to respond to these changes. This adaptive management is highlighted in Chapter 4 and is a key component of responding to and combating climate impacts.

CHAPTER 3.0
EXISTING CONDITIONS

3.1 PHYSICAL ENVIRONMENT

3.1.1 Climate

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

Seasonal rainfall along Camp Pendleton's coast has a mean rainfall of 10 inches per year and an annual median of only 7 inches. Average annual precipitation in the mountains on Camp Pendleton ranges up to 22 inches in the wettest locations (e.g., Case Springs), depending upon slope and elevation. Approximately 75 percent of the Camp Pendleton's precipitation falls between November and March, with January as the wettest month. Winds generally originate from the west or southwest, carrying in cool, moist offshore air.

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

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

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

As discussed in Chapter 2 and Appendix B, current climate trends are anticipated to produce warmer temperatures, more frequent droughts, and earlier spring snowpack loss in California, with extreme weather events potentially degrading existing habitats (Cayan et al.2012).

3.1.2 Topography

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

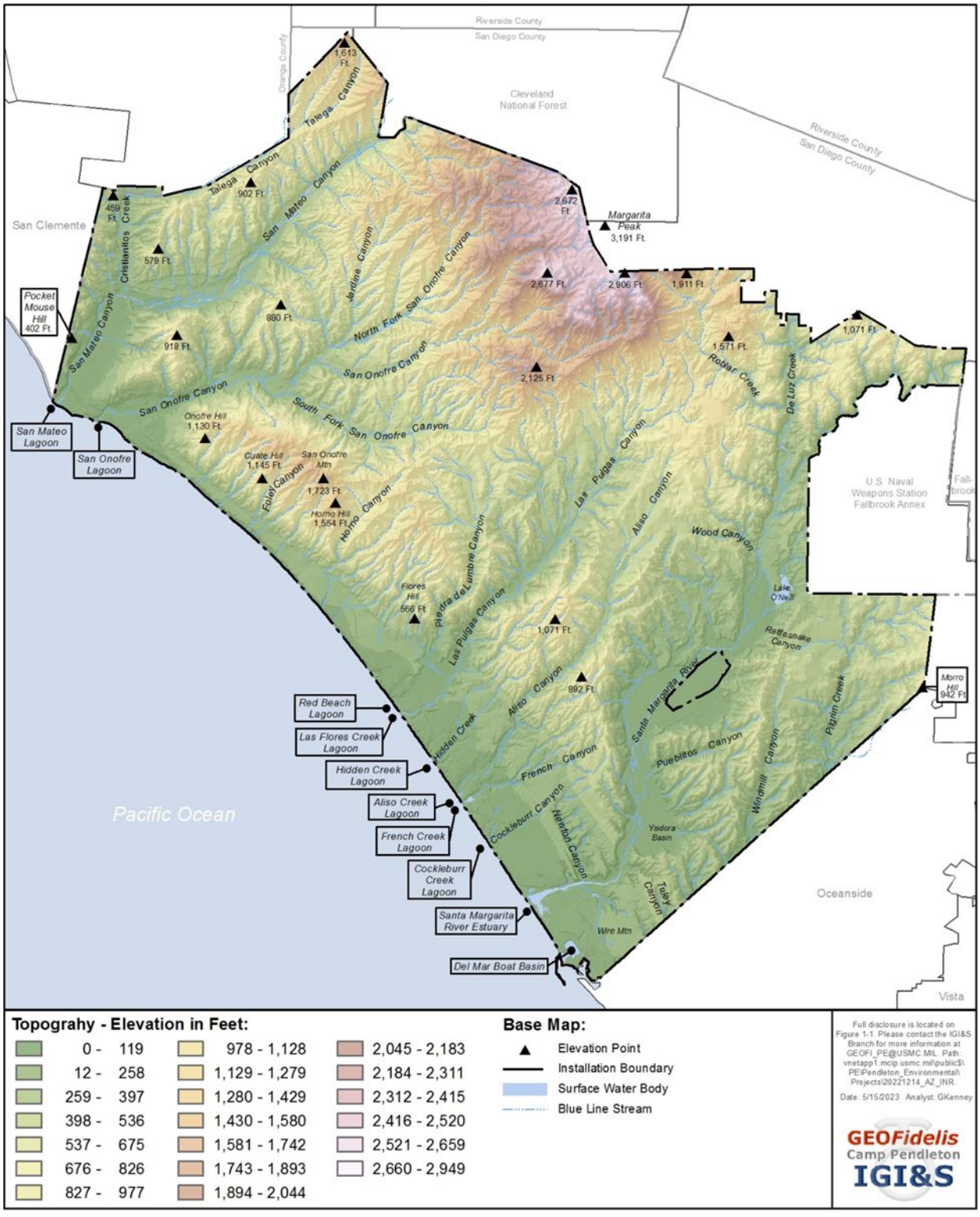
The terrain of Camp Pendleton is varied and includes sandy shores, seaside cliffs, coastal plains, rolling hills, canyons, and mountains rising to elevations of 2,906 feet (Figure 3-1). Two major physiographic provinces occur on Camp Pendleton: coastal plains, which have steep cliffs at the coast and gently sloped terraces leading to the rolling foothills of the Santa Margarita Mountains. The break between these two provinces occurs generally along Basilone Road.

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

Part of the coastal area consists of steep, low-lying hills known as the San Onofre Hills, which are dissected by the major stream systems of Camp Pendleton. The highest elevation of the range is 1,723 feet atop San Onofre Mountain. Other areas contain low, wave-cut terraces that have distinct cliffs or escarpments along the seaward edge. East of the San Onofre Hills is gently rolling topography with soils deep and level enough to support some agriculture. The San Onofre Hills give rise to the Santa Margarita Mountains, part of the Peninsular Range that extends from Orange and Riverside Counties to the Mexican border. Margarita Peak, at 3,191 feet, is just east of Camp Pendleton (and a Camp Pendleton procured REPI property; see Section 2.4.2) and about 10 miles inland from the coast; Margarita Peak is the highest point in San Diego County west of Interstate-15.

3.1.3 Geology and Soils

The topographical features are largely the result of the Base's underlying geologic composition. The oldest stratum is pre-Cretaceous and Cretaceous plutonic bedrock of the Santa Margarita



1 inch = 3 miles

Camp Pendleton 2023 Integrated Natural Resources Management Plan

Figure 3-1
Topography

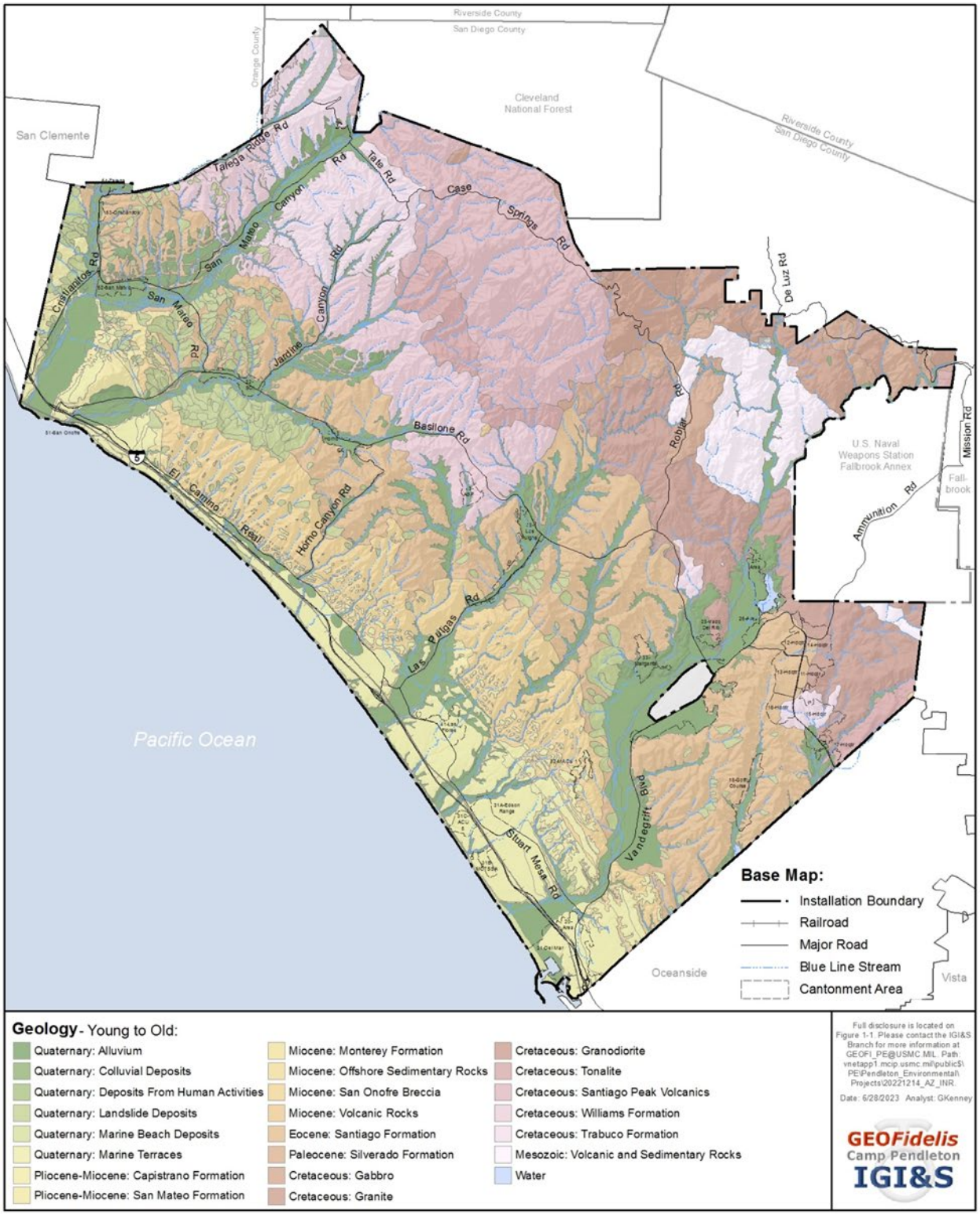
Mountains, made up of granitic, igneous, and metamorphic rock (Figure 3-2). The inter-montane area separating the Santa Margarita Mountains and the San Onofre Hills is mainly composed of soft sandstones and shales of marine origin, formed during the Upper Cretaceous, Eocene, Upper Jurassic, and Lower Cretaceous Periods (Figure 3-2). The San Onofre Hills consist of resistant conglomerates, sandstones, shale, and breccia (angular conglomerates) formed during the Miocene Period.

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

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

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

Natural erosion also occurs in areas such as sea cliffs, bluffs, and canyon heads along Camp Pendleton's shoreline where erosion can be catastrophic. To document the problem of erosion on Camp Pendleton along San Onofre State Beach, Kuhn (1999) documented the landslide movement between old Highway 101 and the shoreline since 1980 and the stormwater runoff effects because of natural and anthropogenic diversions such as roads, railroad installations, agricultural activities,



Camp Pendleton 2023 Integrated Natural Resources Management Plan

Figure 3-2
Geology

military operations, fires, seismic activity, and heavy rainfall. This study provided confirmed the natural aspect of the problem and that it will be exacerbated with climate change.

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

3.1.4 Hydrology

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

3.1.4.1 Watersheds

Mountain ranges divide the Base into three major drainage areas or hydrologic units (HUs); San Juan, Santa Margarita, and San Luis Rey (Figure 3-3 and Table 3-1). Surface waters are discussed in relation to the HUs that they occur in because their condition and quality are affected by the areas and activities that drain into them. Over half (approximately 67 percent or 84,000 of 125,250 acres) of the Base is within the San Juan HU. HUs are further divided into hydrologic areas (HAs) based on water-bearing and non-water bearing formations, typified by a major tributary of a stream, a major valley, or a plain along a stream containing one or more ground water basins, and having closely related geologic, hydrologic and topographic characteristics.

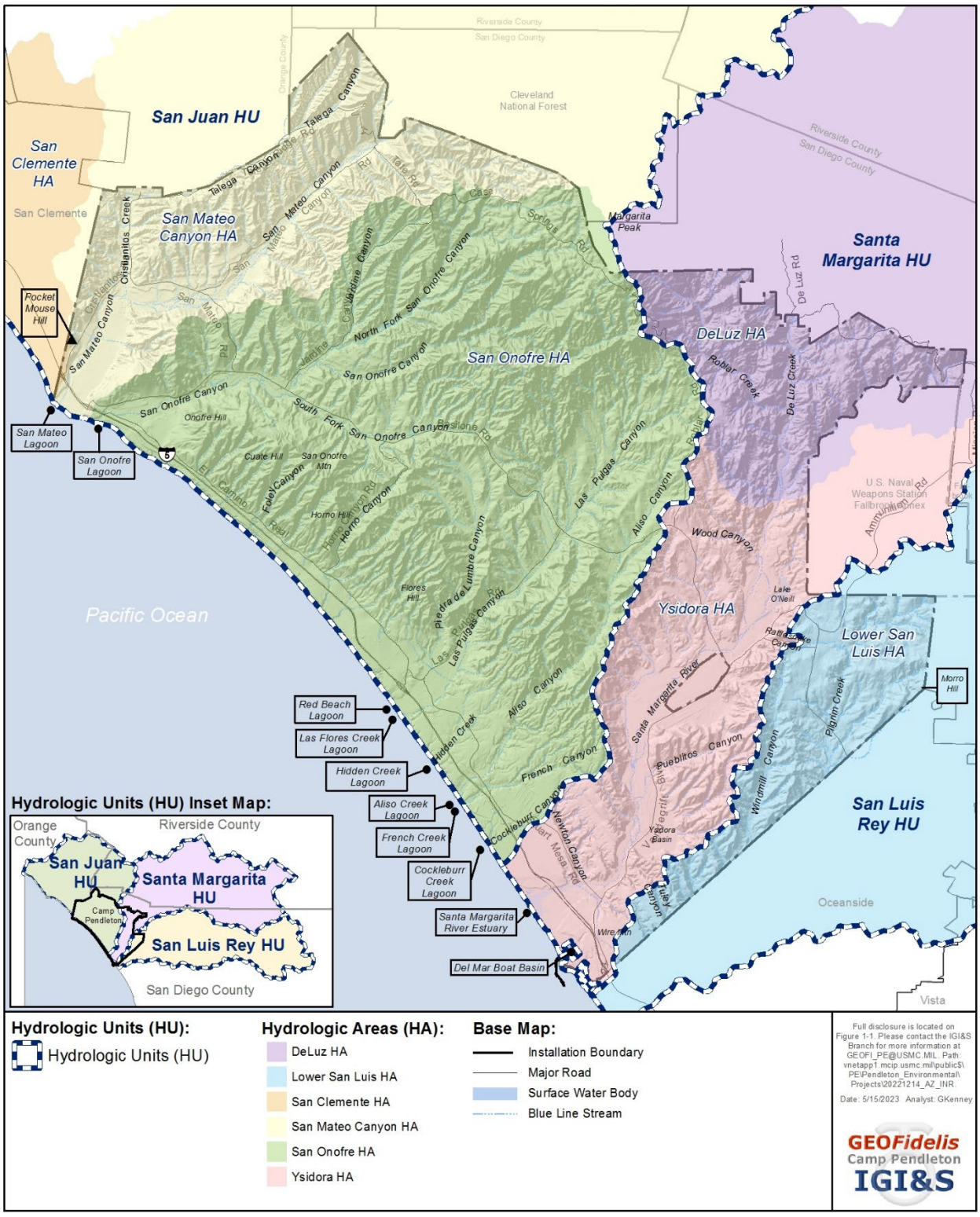
The two largest drainages on Camp Pendleton, Santa Margarita HU and San Juan HU, form broad alluvial plains as they approach the Pacific Ocean. As the streams reach the sea, sloughs or estuarine lagoons form due to sand bars or narrow tidal barriers. These impound low stream flows but are breached during high-flows caused by storm events and normal tidal fluctuation. Based on water quality data, measurements, and observations for the Santa Margarita River estuary, incoming tides are generally able to top the sandbar once or twice a day, while a small natural channel in the sandbar allows water to drain back out when the water level of the outgoing tide

falls below the elevation of sand accumulated on the sandbar. The sandbar blockages subsequently re-form by sedimentation and normal wave action.

TABLE 3-1 CAMP PENDLETON WATERSHEDS

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

The three largest estuaries on Camp Pendleton are situated at the mouths of the Santa Margarita, Las Flores, and San Mateo streams. Review of U.S. Geological Survey (USGS) data for the period 1988 through 2012 indicates that the Santa Margarita River estuary does not close every year, but typically does close for 1/4 to 1/3 of the year, usually the summer to fall timeframe. Occasionally, the Santa Margarita River estuary has been observed to remain open throughout the year. Even when "closed," overtopping of tide still feeds ocean water into the lagoon during high tide (tide higher than berm height) (Cook 2015).



1 inch = 3 miles

Camp Pendleton 2023 Integrated Natural Resources Management Plan

Figure 3-3
Watersheds

Aliso Creek and Hidden Creek estuaries are also tidally influenced. The San Onofre and San Mateo estuaries have large sand bars that separate them from the ocean for most of the year. Occasionally, intense storm events can open the estuaries to the ocean. While they do not get as much tidal influence as the aforementioned estuaries, they do get salt intrusion from subsurface flow. During prolonged periods of drought from 2012 to 2018, sandbars in the Santa Margarita River estuary were not breached for several months at a time, causing buildup of sand in the estuary that changed the direction of flow at the river mouth when sufficient precipitation finally breached the sandbars. Conversely, after a high precipitation event in February of 2019, the mouth of the Santa Margarita River opened and has continuously remained open.

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

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

Domestic water for Camp Pendleton is supplied by wells that extract groundwater from four of the five aquifers on Camp Pendleton. These aquifers or groundwater basins are composed of saturated deposits of alluvium overlying impervious bedrock. Camp Pendleton produces domestic and industrial water from groundwater aquifers, which are recharged by percolation from overlying rivers and streams. The aquifers are also recharged through the exercise of the Base's water rights. The water rights allow the Base to divert Santa Margarita River water into percolation basins for recharge and into Lake O'Neill for storage, release, and recharge. Unlike most other water systems in southern California, Camp Pendleton does not currently rely on imported water to meet the Base's water requirements. However, the Base does purchase approximately 100 acre-feet/year (less than 1 percent of the Base's water requirements) for use at San Mateo Point Housing near the northern boundary of the Base.

Santa Margarita River wells provide water to the Headquarters Area, Naval Hospital, Camp Del Mar, and all points in-between, representing about 73 percent of the total water consumed on Base. The Las Flores Creek wells produce water for Camp Pulgas and Camp Las Flores, while the San

Onofre Creek wells produce water for Camp Horno and Camp San Onofre. Camps Talega, Cristianitos, San Mateo, the San Onofre Housing and School, and the 51 Area Marine Corps Exchange complex are all served by wells from San Mateo Creek (MCBCP1993). Production levels have remained below the safe yield limits determined for the four Basins.

For the Base, safe yield has been calculated in two basic reports, the USGS report by Worts and Boss in 1954 and the Leedshill-Herkenhoff report in 1989. Safe yield is defined as the limit to the quantity of water that can be withdrawn regularly and permanently without depletion of the storage reserve. Worts and Boss (1954) determined basic hydro-geologic information for Camp Pendleton, and Leedshill-Herkenhoff (1989) reported an increase in the USGS safe yield figures. Safe yield volumes from the Leedshill-Herkenhoff study were utilized for the current Camp Pendleton drinking water permit for the Santa Margarita (7,640 acre-feet/year) and Las Pulgas (700 acre-feet/year) groundwater basins (Worts and Boss 1954).

In 2015, Camp Pendleton's Conjunctive Use Project (CUP; MCBCP 2015) Environmental Impact Statement (EIS) resolved the water rights issues between MCB Camp Pendleton and Fallbrook Public Utility District (FPUD) to satisfy the Court's order to find a "physical solution" to the ongoing dispute in *United States v. Fallbrook Public Utility District, et al*., which was one of the oldest water rights disputes in California. MCB Camp Pendleton and FPUD entered into a Memorandum of Understanding (MOU) in 2001 agreeing to jointly participate in the project in good faith and with full cooperation; this understanding came to fruition with the EIS completed in 2015 for the rehabilitation of existing facilities and the construction of new facilities for the conjunctive use of surface water and groundwater resources within the Lower Santa Margarita Basin, Camp Pendleton. As part of the proposed action, an Adaptive Management Plan (AMP), followed by a separate Facility Operation Plan (FOP) has been developed by MCB Camp Pendleton to manage project diversion, recharge, production, and delivery facilities. An important feature of adaptive management is the ability to adjust water management operations based on measured and observed data that describe the relationship between hydrology and environmental and physical constraints. For example, pumping is increased during wet years when diversions capture runoff from high flow events to replace storage lost during drier than normal years and curtailed during dry years.

3.1.4.2 Precipitation and Runoff

Since 2014, local weather data on Camp Pendleton have been collected at the six RAWS units noted in Section 3.1.1; these units have replaced most of the older, less reliable weather stations. Precipitation records dating back to July 1876 for the lower area of Camp Pendleton from the Lake O'Neill weather station reveal an average of 13.84 inches of precipitation per year, with a minimum of 4.51 inches and a maximum of 38.23 inches. In the mountains at Case Springs at

2,300 feet elevation, the 1965 to 2005 records indicate an average of 21.86 inches per year, with a minimum of 6.08 inches and a maximum of 50.42 inches. Table 3-2 shows precipitation data from weather stations located throughout Camp Pendleton.

The potential for large floods on Camp Pendleton is particularly high because of the extreme variability of precipitation and runoff. Successive soil-saturating storms in early 1993, combined with intense rainfall (6.8 inches in 24 hours) in the upper watershed, led to record flooding in the Santa Margarita River on 16 January. At the damaged gauging station at Ysidora, the estimated peak discharge of 44,000 cubic feet per second (cfs) was the highest in 68 years of record keeping, exceeding the previous record (16 February 1927) by about 12,000 cfs or 34 percent (Bowers, 1993).

TABLE 3-2 PRECIPITATION DATA FROM CAMP PENDLETON WEATHER STATIONS

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

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

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

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

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

3.1.4.3 Floodplains and Surface Waters

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

TABLE 3-3 FLOW RATE PREDICTING 100-YEAR FLOOD CONDITIONS FOR MAJOR DRAINAGES ON CAMP PENDLETON

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

Source: MCBCP 2012

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

1993 flood was computed at 44,000 cfs at Ysidora and represented a 62-year flood event. The flow destroyed the bridge at Basilone Road and damaged the Stuart Mesa Road Bridge.

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

More frequent and damaging flood events are predicted to occur on-Base as a result of increased upstream urbanization in the Santa Margarita watershed and climate change (Section 2.6.3.2; Appendix B). Previous damaging floods have occurred at Camp Pendleton in 1951–52, 1956, 1968–69, 1978, and 1980 (Leedshill-Herkenhoff 1989). In addition, flooding in 1993 shut down aviation operations on Marine Corps Air Station Camp Pendleton, destroying millions of dollars of equipment including 70 aircraft.

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

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

3.1.4.4 Water Quality, Supply, and Use

Water Quality

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

Upstream users can affect the water quality of surface waters on Base since Camp Pendleton is the last water user on the extensive Santa Margarita River system and San Mateo Creek. River Nutrient levels in the Santa Margarita, particularly nitrogen, have been observed to be above the Water Quality Objective in the last few years (Stetson 2010). This increase may be due in part to intensive agricultural use of fertilizers in the upper watersheds. In addition, the dramatic expansion of residential, commercial, and industrial development during the past decade in the upper part of this drainage has produced more urban runoff and wastewater discharge and may also be responsible for the increase in nutrient levels. However, surface waters are not used as a potable water supply for the Base (Stetson 2010).

In the past and continuing today, water samples are collected on Base and upstream from the Base within all watersheds, but especially from the Santa Margarita River and San Mateo Creek watersheds. These data are used as part of Camp Pendleton's water quality monitoring program and support the Base's efforts with off-Base organizations and regulatory agencies, and as part of cooperative agreements to reduce the levels of contaminants that reach the Base in surface waters. For example, Camp Pendleton biologists have been participating in the Santa Margarita River Nutrient Initiative Group (SMRNIG) and advisory team since 2020, collaborating on Southern California steelhead data, life history and habitat requirements potentially affected by proposed changes in the basin's total maximum daily load (TMDL).

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

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

Soil and groundwater contamination has been detected at various locations on Base. In 1989, Camp Pendleton was placed on the National Priorities List for cleanup of hazardous waste. Contamination from solvents, metals, petroleum, and other wastes were released on Base by past waste handling and disposal practices. A cleanup program is currently in operation, and groundwater monitoring indicates that contamination has not migrated to groundwater supplies at concentrations in excess of California drinking water standards at any location, nor has it migrated off-Base (Battelle 2006). See Section 2.4.3 for additional details on the Base's Installation Restoration Program.

Water Supply and Use

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

Since complete well production records began in 1944, Basewide total annual water use has ranged from a low of 5,850 acre-feet (1991) to a high of 9,891 acre-feet (2000), with a total annual average use of 8,531 acre-feet. Fluctuation in use is related to water conservation efficiency during drought years, troop mobilization levels, water system leaks, crop water needs (prior to the end of agriculture in 2005), and other factors. Now, ground water pumping is managed by the Adaptative Management Plan (AMP) based on environmental conditions as a result of the Conjunctive Use Project.

3.1.5 Coastal Processes

Chadwick et al. (2014) describes in detail the coastal process of Camp Pendleton, including sea level, tides, beach processes, shoreline position, cliff erosion and gullying. Three basic physical processes that are important to shoreline evolution in southern California are as follows: sea level, including mean sea level and sea level fluctuations (tidal influence); ocean waves, including sources, shoaling, refraction, sheltering, and runup; and beach processes, including the budget of sand.

Tidal influence on Camp Pendleton beaches is particularly important since tidal swings are large – the local open-coast extreme range is nearly 3 meters (Chadwick et al. 2014). In addition, incoming waves along the southern California coast fall into four main categories as (USACE, 1988): North Pacific (extra-tropical) swell, Southern hemisphere swell; tropical storm swell; and seas generated locally by coastal marine layer dynamics or arriving storms. Therefore, the mean sea level greatly fluctuates on Camp Pendleton depending on the tides and swell that is coming to shore on a particular day.

Camp Pendleton's beaches consist of a thin veneer of sand over a rocky, low-tide terrace. Naturally supplied sand is derived either from upland erosion or from relic deposits offshore from wave events. Upland-derived material arrives at the coast through rivers and from the cliff faces as result of terrace erosion. Once sand reaches the beaches, waves provide the energy that moves sand on beaches, either off or horizontally. Because of the structure of the southern California coast, the sand budget of a particular beach is largely localized. In other words, if sand shortages, surpluses, or interruptions to transport occur from place to-place or time-to-time, the beach width effects are relatively isolated, spreading at most a few tens of kilometers. The magnitude and direction of sand transport changes with wave height, period, and incoming direction (Chadwick et. al 2014).

In addition, on long time scales of decades and centuries on Camp Pendleton, the rate of mean sea level rise determines the shoreline position. When mean sea level rise is low and the sand supply large, the shoreline advances and the beach widens. As the rate of mean sea level rise increases or the rate of sand supply decreases, the shoreline retreats until the sea cliff or other backshore

environment is undermined or becomes flooded (Masters and Aiello 2007). On short time scales of days to years, and most noticeably on seasonal scales, the wave climate largely determines the shape and width of the beach (Chadwick et al. 2014).

Sea level changes on Camp Pendleton currently and in the future are discussed in Appendix B. In short, sea level along the San Diego County coast is expected to rise approximately 1 ft by mid-21st century, and 3 ft or potentially much higher by end of the century (Kalansky et al. 2018). Chadwick et al. (2014) estimates Camp Pendleton beach training areas are reduced to about 41% of baseline for 1.0 m Sea Level Rise (SLR) and further reductions to a remaining area of 27% of baseline for 2.0 m SLR.

3.1.6 Wildland Fire

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

Vegetative, topographic, and climatic factors in the region have also favored fire since the emergence of the Mediterranean climate after the end of the Pliocene Epoch (approximately 2.6 million years before present) (Axelrod 1988). Semiarid Mediterranean climates like that of Camp Pendleton are some of the most fire-prone environments in the world (Lawson & Goodman 2014). During the winter, rain promotes vegetative growth, and then in the summer, drought dries the vegetation and creates a high fire risk (Keeley et al. 2012). The fire season begins several months after plants have stopped growing and the live fuel moisture has dropped (Dennison and Moritz 2009; Minnich, 2006; Sugihara et al. 2006). However, large fires can occur at any time given low rainfall, wind, and humidity conditions (Keeley and Fotheringham 2003). Therefore, the coastal southern California fire season is year-round (Lawson and Goodman 2014).

A high fire frequency and burned area severity can permanently change the vegetation type (type conversion) of a given site by reducing shrub cover and allowing invasive plants to colonize and dominate a recently burned site. This process is then exacerbated with the addition of ground disturbance activities, specific to the training mission of Camp Pendleton. The use of pyrotechnic devices and live-fire ammunition during training creates an additional risk of increased fire occurrence relative to other areas of southern California and even the country. It is this combination of a fire-prone southern California landscape with the unlimited ignition potential from military training activities that justifies a very high level of natural resources management with subsequent

fire management and planning. These circumstances cause a higher frequency of fire at some locations on Camp Pendleton compared to most areas in southern California (MCBCP 1998).

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

Fire mapping is primarily conducted by contracted aerial photo flights. The digitized fires from aerial photos are used to determine the perimeter of a fire in conjunction with other data collected. This data includes size, zones, weather, behavior, type, source, cause of ignition, and point of ignition for each fire. The resource managers maintain GIS-based fire records from 1973 to the present. However, to improve tracking and understanding of fires that occur on Base, an annual wildland fire-mapping project was established in 1997. Camp Pendleton records all fires on Base and Environmental Security arranges for the mapping of all fires of five acres or larger for historical reference.

From 1973-2022, an average of 12,000 acres per year of land on Camp Pendleton has burned (SNWSC and CBI 2012). The frequency of fire is influenced by three factors: presence of frequent ignition sources from weapons firing, explosions, utility lines, and pyrotechnic devices; biological and climatic conditions conducive to fire in the late summer and fall; and large areas of open space with abundant vegetation (i.e., fuel). During the 2012 through 2022 period, 86 percent of ignitions

TABLE 3-4 WILDLAND FIRES (2012–2022)

Cause	Number of Ignitions	Number of Acres
Mission	1,381	86,790
Utilities	66	23,692
Prescribed Burn	43	10,863
Recreation	35	949
Natural	2	<1
Negligence	72	2,757
Total	**1,609**	**127,150**

Source: MCIWEST-MCBCP Annual Wildland Summary, 2012–2022

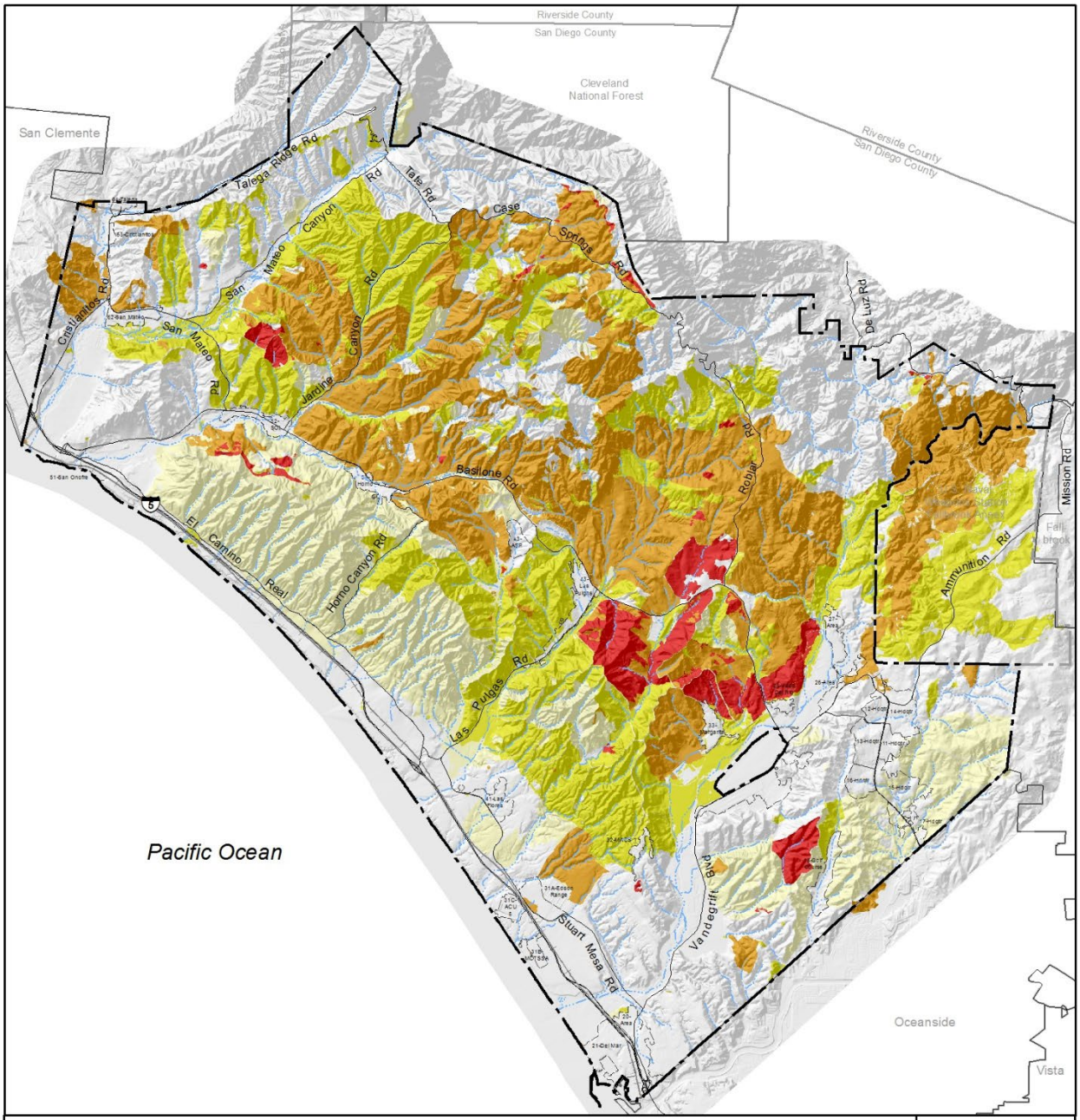


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Figure 3-4
Wildland Fire

and 68 percent of acreage burned were related to the mission (e.g., firing weapons and explosions), 3 percent of ignitions and 9 percent of acreage burned were due to prescribed burning, and 4 percent of ignitions and 19 percent of acreage burned were caused by utilities (Table 3-4).

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

Most vegetation burned each year is perennial grassland and coastal sage scrub. From 2012 through 2022, 44,717 acres of perennial grasslands burned and 37,095 acres of coastal sage scrub habitat burned. The burned land overlaps the habitats of several threatened and endangered species, including arroyo toad, coastal California gnatcatcher, thread-leaved brodiaea, least Bell's vireo, Riverside fairy shrimp, Stephens' kangaroo rat, and southwestern willow flycatcher.

The Base finalized a comprehensive Wildland Fire Prevention Plan in August 2018 (MCBCP 2018). After consultation, the USFWS issued a Biological Opinion (BO for the Wildfire Prevention Plan (USFWS 2020).

An essential component of fire prevention is fuels management. The management of fuels has three forms: prescribed burns, firebreaks, and mowing to prevent fires. Pre-suppression fuels management involves maintaining defensible space using firebreaks and fuelbreaks to limit or slow the spread of fire. The Base has established an extensive network of firebreaks and fuel thinning zones, totaling over 180 linear miles. During periodic reviews, specific firebreaks may be eliminated if considered unnecessary by the Camp Pendleton Fire Department (CPFD). Environmental Security monitors the firebreak system closely and makes recommendations to the Facilities Maintenance Department (manage the firebreaks) concerning firebreak best management practices and status. Since 2012, approximately 7 linear miles of firebreaks were discontinued but, currently, no others are considered for elimination. All requirements for new firebreaks are reviewed through the NEPA process before they can be constructed on Base.

Prescribed fire is another important pre-suppression method for fuels management. Per the Wildland Fire Prevention Plan (MCBCP 2018), Environmental Security and the CPFD submit an annual burn plan (a subset of the Wildfire Prevention Plan) to target high fuel areas that, if not treated, may contribute to large wildfires.

Fire suppression occurs year-round throughout Camp Pendleton as needed. Fire suppression activities include fire line construction, backfires, direct suppression, and "mop-up" activities.

Where possible, fire vehicles use existing roads or firebreaks. However, suppression actions may include driving off-road, including over burned areas. Past fire patterns indicate the location of most fire suppression activity on-Base. Due to the frequency of these fires and subsequent suppression activities, Environmental Security provides qualified staff to serve as Resource Advisors. They promote resource management objectives such as reducing fire damage in coastal sage scrub and pre-planning for avoidance. The Resource Advisor also proposes Fire Department Minimum Impact Suppression Tactics in sensitive areas. In many cases, existing paved and dirt roadways can be used as firebreak lines to contain a wildland fire. The location of vulnerable habitats or listed species is considered when carrying out all forms of fire suppression, especially if an area is to be bulldozed or hand-cut for a fire line. The Base plans to collaborate with the USFWS to identify and possibly consult on fire suppression actions that are reasonably foreseeable and may unavoidably cause harm to listed species.

The CPFD is responsible for the operations of wildland fire suppression; they have the equipment and personnel to suppress wildfires. Fire suppression is conducted on-Base on utilizing CPFD resources with additional cooperative support from local and regional firefighting agreements. In-house firefighting resources include ten standard Type III wildland firefighting vehicles, eight light patrol vehicles (3/4-ton 4x4 trucks with water tanks), and two Type II water tender trucks. Cooperative agreement resources provided by off-Base fire agencies include air tanker planes, helicopters, hand crews, fire engines, and bulldozers.

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

3.2 BIOLOGICAL ENVIRONMENT

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

Nomenclature used for plants within this document follows the "*Checklist of the Vascular Plants of San Diego County*" 5th Edition) (Rebman and Simpson 2014) unless state or federally listed

under an alternate name. Nomenclature used for amphibians, birds, mammals, and reptiles within this document follows the California Wildlife Habitat Relationships System (CDFW 2015a) and the California Natural Diversity Database (CDFW 2015b) unless state or federally listed under an alternate name. References to Basewide survey efforts assume exclusion of restricted areas (i.e., Quebec, Whiskey, and Zulu impact areas) for safety reasons.

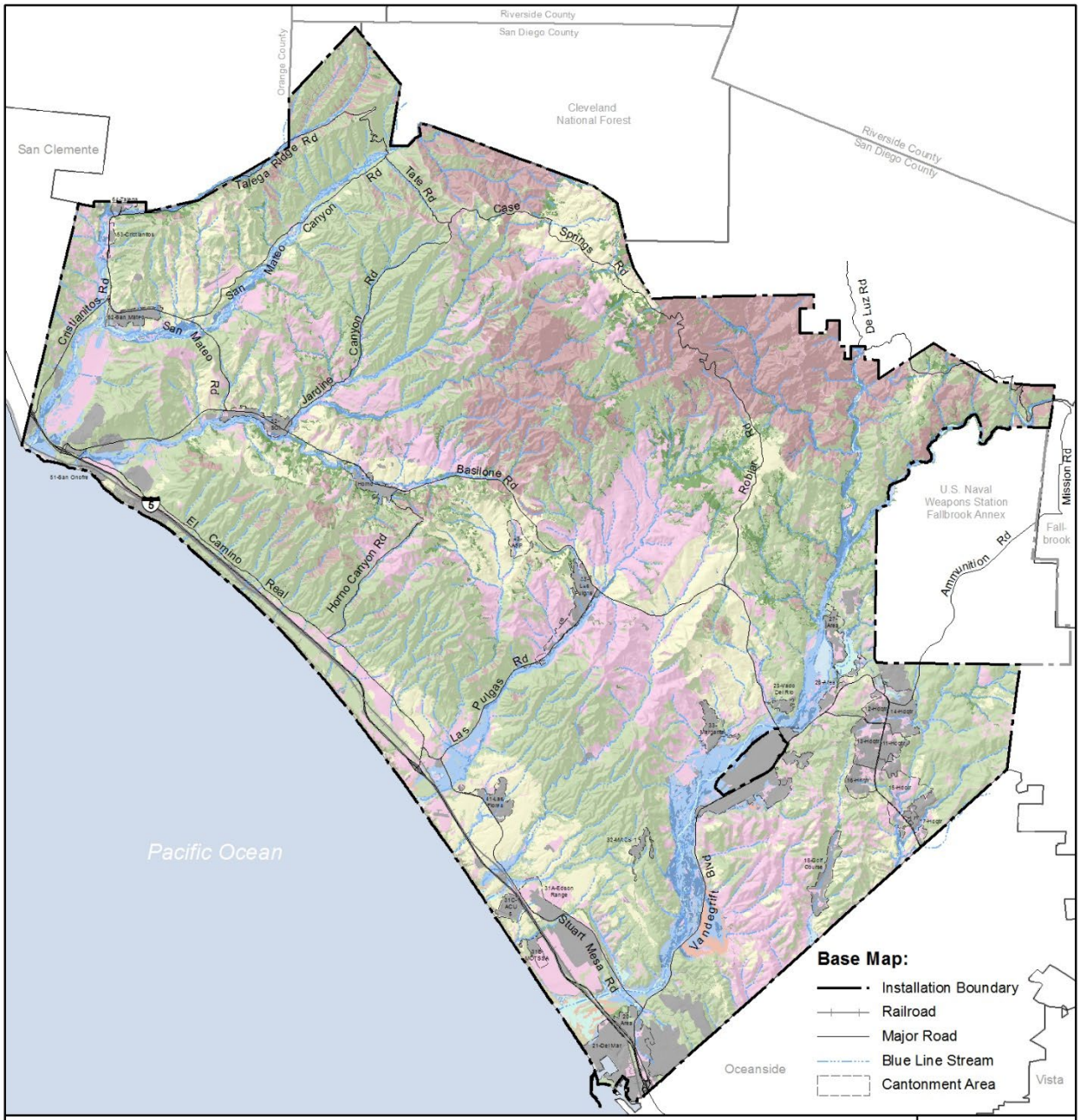
3.2.1 Ecosystems

Camp Pendleton manages natural resources on Base using an ecosystem approach. Supporting this approach, Camp Pendleton management is organized around two major groups of ecosystems: 1) terrestrial upland ecosystems and 2) wetland, aquatic, and marine ecosystems. In taking this approach, Camp Pendleton recognizes the following biological principles: (1) ecosystems are dynamic by nature; (2) the functioning of ecosystem components operates at different rates; (3) all components are interrelated, especially the human component; (4) the ecosystem is a complex system functioning as a whole, not as a collection of parts; and (5) ecosystem integrity may be disrupted by excessive "interference" of any single component.

TABLE 3-5 TERRESTRIAL AND AQUATIC ECOSYSTEMS FOUND ON MCB CAMP PENDLETON

Terrestrial Upland Ecosystems	Wetland, Aquatic, and Marine Ecosystems
Coastal Bluff and Cliff-Face Scrub	Nearshore
Coastal Sage Scrub	Intertidal
Chaparral	Dune and Strand
Oak Woodlands	Dune Wetland
Forblands and Grasslands	Estuary
	Stream
	Alkali Marsh
	Freshwater Marsh
	Riparian
	Waterbodies
	Vernal Pools

Ecosystems are composed of the primary vegetation communities and unvegetated habitats that are summarized in Table 3-5 and depicted in Figure 3-5. Numerous subtypes of these broad vegetation communities are recognized on Camp Pendleton and more detailed descriptions of these different cover types are provided in Appendix D. Vegetation distribution within vegetation communities is primarily determined by climate, available moisture, and substrate. Thus rainfall, temperature, soil type, topographic position, and elevation are all important predictors of vegetation. All of these vary substantially on Base because of its coastal location, diverse geology, and pronounced topography. These characteristics allow for a diverse inventory of native plant



1 inch = 3 miles

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Figure 3-5
Plant Communities

and wildlife species, with 1,015 plant species (Appendix E) and 559 wildlife species (Appendix F) known to occur on Base. Elevation on Base ranges from sea level to 2,906 feet. Temperature varies from the low 100s (°F) in summer to just below freezing in some areas during the winter, with mean temperature decreasing with elevation (Zedler et al. 1997).

Ecosystems are managed through various actions and management plans as described below.

3.2.1.1 Ecosystem Management

Management of Terrestrial Ecosystems

Management of terrestrial ecosystems emphasizes vegetation management to improve or maintain suitable conditions for plant and animal members of those systems, especially the federally listed species. Improving habitats for listed species to promote their conservation often provides benefits to other members of an ecosystem. For example, providing more exposed soils in Pacific Pocket Mouse (PPM) habitats creates additional nesting sites for many native bees. The process of managing ecosystems on Base always considers the possible effects to training and works to maintain or increase flexibility for operational commands to accomplish established military training requirements. The Base has or plans to develop management plans, as discussed in Chapter 4, for all threatened and endangered species such as the Pacific Pocket Mouse Management Plan (2019), Rare Plant Management Plan (2017, revising), and Stephens' Kangaroo Rat Management Plan (planned in the next 5 years). An objective for ecosystem management on Base includes conserving valued plant communities such as coastal sage scrub, oak woodlands, and native grasslands. The Base uses a protocol for monitoring in coastal sage scrub (CSS) that identifies areas at risk for type conversion (Lawson and Bieber 2020), treats invasive plants in grasslands, and monitors for invasive beetles such as gold spotted oak borer in oak woodlands. These actions help conserve those ecosystems and the services that they provide.

Wetland, Aquatic, and Marine Ecosystem Management

Management of Camp Pendleton's Wetland, Aquatic, and Marine Ecosystem is covered by two finalized conservation plans, as discussed below. In addition, the Base is in the development of a Vernal Pool Management Plan that addresses the federally-listed fairy shrimp species with an expected completion date in 2023; management is discussed in Section 4.2.7.

<u>Estuarine and Beach Ecosystem Conservation Plan</u>

The Base's Estuarine and Beach Ecosystem Conservation Plan (Appendix G) is designed to sustain and enhance Camp Pendleton's natural resources along its coastline with an emphasis on dune

systems and their connecting strands, coastal lagoons, and the Santa Margarita River estuary. This includes conservation of federally listed species and their associated habitat, and maintaining and enhancing the functionality and biodiversity of the estuarine community. The conservation plan focuses on protecting and maintaining California least tern (*Sternula antillarum browni*) and western snowy plover (*Charadrius nivosus nivosus*) nesting areas and protecting the southern tidewater goby (*Eucyclogobius newberryi*) and designates specific management zones along the coastline for these purposes. These management zones are summarized below:

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

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

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

To enhance functionality and biodiversity, the Estuarine and Beach Ecosystem Conservation Plan requires the Base to restore the dune system, via invasive plant removal, and to monitor the dune plant communities every 5 years. It also guides the Base to protect rare dune plants. Restoring

dune habitat within species nesting area supports the goal of the Estuarine and Beach Ecosystem Conservation Plan to maintain the ecosystem's ability to support listed species.

In 2020, the Service issued an amendment to the 1995 Estuarine/Beach Biological Opinion, known as the Red Beach Amendment, that clarifies California least tern and western snowy breeding season, provides for additional monitoring and management actions for Blue and White Beach training areas nesting sites, and removed training restrictions for Red, Gold and Green beach training areas (FWS-MCBCP-96B0003-09F0058, USFWS 2020).

Riparian Ecosystem Conservation Plan

Riparian plant communities, wetlands and stream ecosystems are managed through the Base's Riparian Ecosystem Conservation Plan (Appendix H). The primary purpose of this conservation plan is to manage fish and wildlife resources in riparian areas, and the management actions identified are designed to sustain and improve the biological diversity of the riparian ecosystems on Base. A stated goal regarding habitat management is to enhance riparian ecosystem value through the eradication of exotic plant communities and promotion of successional stages of riparian scrub and woodland habitats. The main objectives to achieve this goal include removing giant reed (*Arundo donax*), also called arundo, and tamarisk (*Tamarix ramosissima*), also called salt cedar, to restore riparian ecosystem dynamics, such that natural plant and animal communities on Base are sufficiently resilient to withstand the array of disturbances and incursions occasioned by military training activities. To date, 1,304 acres of arundo and tamarisk have been removed and these areas are passively recovering as evidenced from the riparian habitat monitoring program and the historic increase in least Bell's vireo occurrence. Several riparian restoration projects have been conducted in areas that were not naturally recovering. The components of the Riparian Ecosystem Conservation Plan, particularly compliance with programmatic instructions and execution of management programs, are anticipated to offset current and planned training requirements and infrastructure maintenance activities. In the case of major construction projects, the conservation plan is supplemented by additional measures established in the reasonable and prudent measures, and terms and conditions of the Riparian BO (USFWS 1995) (Appendix I) that covers the plan. The Base has stated its commitment to achieving these goals through active management programs (see Chapter 4).

The Riparian Ecosystem Conservation Plan has an established set of non-discretionary "programmatic instructions" to avoid and/or reduce and minimize adverse impacts to the ecosystem. Military training and facilities' maintenance units follow the guidance given in the programmatic instructions such as scheduling activities outside of the breeding season, if feasible, or selecting construction sites that would impact the least amount of riparian habitat possible to avoid incidental take and adverse impacts. When adverse impacts cannot be avoided, the Base

offsets species/habitat loss of value and function through a habitat enhancement program or by purchasing compensation credits off-Base. Camp Pendleton also monitors habitat and species populations, conducts brown-headed cowbird and aquatic exotic species control, and/or conducts other management actions, as appropriate, and thereby establishes "baselines" from which to track progress toward goals.

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

Accurate and current data regarding riparian species and habitat status and trends are critical to sound management, and species and habitat monitoring is important toward meeting the management goals identified in the Riparian Ecosystem Conservation Plan. Goals that riparian species and habitat monitoring support include (1) updating the inventory of riparian habitat approximately once every 5 years (frequency dependent upon circumstances and as mutually agreed to); (2) achieving greater biological diversity and distribution of sensitive species populations in the San Mateo, San Onofre, and Las Flores drainages; and (3) establishing self-sustaining populations of federally listed species that require little human intervention for maintenance (see Appendix H for details and other goals). The 1995 Riparian Ecosystem Conservation Plan set aside 1,000 acres of riparian habitat in a "bank", which is not intended for mitigation of ongoing or future actions; it is to be maintained at base levels or to be expanded, not to be depleted. In addition, the Plan allows for a "Flexibility Account", whereby the Base can restore riparian habitat and add this to the "bank" with the goal of achieving lower mitigation ratios for permanent impacts of riparian habitat. The flexibility account ledger is managed by Environmental Planning Branch.

The Riparian Ecosystem Conservation Plan does not cover impacts to wetlands under the Clean Water Act (CWA). Wetland impacts under the CWA are covered under separate permits obtained from the U.S. Army Corps of Engineers (USACE).

3.2.1.2 Primary Ecosystem Plant Communities and Unvegetated Habitats

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

Terrestrial Upland Ecosystem

The primary plant communities within the Terrestrial Upland Ecosystem (Table 3-5) are described below and depicted in Figure 3-4. These plant assemblages occur from just inland of the coastal bluffs to the higher elevations of the Santa Margarita Mountains. Because upland areas in southern California are generally moisture-limited, receiving almost all of their moisture in the winter, terrestrial vegetation differs distinctly, functionally, and visually from season to season.

Coastal Bluff and Cliff-Face Scrub

Coastal bluff scrub vegetation typically occurs on the Base on the coastal bluffs facing the Pacific Ocean. This vegetation type occupies 213 acres on the Base. Dominant shrubs include California desert thorn (*Lycium californicum*), big saltbush (*Atriplex lentiformis*), bluff buckwheat (*Eriogonum parvifolium*), coastal sagebrush (*Artemisia californica*), California encelia (*Encelia californica*), California buckwheat (*Eriogonum fasciculatum*), goldenbush (*Isocoma menziesii*), bladderpod (*Peritoma arborea*), lemonadeberry (*Rhus integrifolia*), and succulents such as coast cholla (*Cylindropuntia prolifera*), ladies' fingers (*Dudleya edulis*), fish-hook cactus (*Mammillaria dioica*), coast prickly-pear (*Opuntia littoralis*), and woolly sea-blite (*Suaeda taxifolia*).

Cliff-face scrub is dominated by sticky dudleya (*Dudleya viscida*), which is a perennial herb. Other dominant plants include California brickellbush (*Brickellia californica*), San Diego mountain-mahogany (*Cercocarpus minutiflorus*), California buckwheat (*Eriogonum fasciculatum*), toyon (*Heteromeles arbutifolia*), laurel sumac (*Malosma laurina*), holly-leaf cherry (*Prunus ilicifolia*), lemonadeberry (*Rhus integrifolia*), giant stipa (*Stipa coronata*), and smilo grass (*Stipa miliacea*). Cliff-face scrub occupies 3 acres on the Base.

Coastal Sage Scrub

The coastal sage scrub vegetation on Camp Pendleton is subcategorized, although dominant species may vary by site. The 2018 Camp Pendleton vegetation mapping indicates that the Base supports approximately 55,225 acres of coastal sage scrub and its subtypes. Coastal sage scrub was originally the dominant vegetation in San Diego County. Today, nearly 70 percent of its original area has been lost and much of what remains exists in small patches of isolated habitat (City of San Diego 1998). It can be found mostly on south- and west-facing slopes, from Camp Pendleton to the lower slopes of Palomar Mountain and around Escondido, the San Pasqual Valley, El Cajon, and Jamul, to the area surrounding Otay Mountain. Coastal sage scrub habitat is important because it contains a variety of rare and endangered species (City of San Diego 1998). It is the primary breeding and foraging habitat for the coastal California gnatcatcher. Unlike

chaparral, it is drought deciduous, dropping leaves and twigs as a strategy to survive the summer dry period.

Chaparral

Chaparral types are dominated by evergreen species with small, thick, leathery, dark green, sclerophyllous leaves and do not lose their usually softer, larger, and grayish-green leaves over the summer. Chaparral types tend to be most abundant at higher elevations, particularly above 3,000 feet, where temperatures are lower and moisture supplies are more ample while coastal sage scrub types are more common at lower elevations where higher temperatures, lower rainfall, and a more pronounced summer drought exist. The Base supports approximately 13,731 acres of chaparral subtypes.

Oak Woodlands

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

Engelmann oak and coast live oak are drought-hardy and tolerant of fire. Both will resprout vigorously from the branches and the base when the crowns are severely burned or killed. Engelmann oak is a species restricted to southern California and adjacent Baja California. It is considered rare and though it is not in any immediate threat of extinction, its preservation is of special concern to land managers. Camp Pendleton contains one of the largest and healthiest populations in the region, with over 2,000 acres of Engelmann oak woodlands. Coast live oak is the most widely distributed of the evergreen oaks. It can achieve large size and great age and the widely spreading crowns of old, open grown trees are one of the distinctive features of the natural California landscape and especially of Camp Pendleton. Coast live oak occurs at the fringes of riparian woodlands, scattered in grassland or coastal sage scrub, and in solid stands on the north side of the front range, and as an element of Engelmann oak woodlands. Coast live oak woodlands occupy 2,265 acres of the Base.

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

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

Forblands and Grasslands

Upland herbaceous plant communities include forblands and grasslands. Native forblands occupy 112 acres on the Base and include areas dominated by Blochman's dudleya (*Dudleya blochmaniae*) and fascicled tarweed (*Deinandra fasciculata*). Nonnative forblands occupy 10,282 acres on the Base and include areas dominated by mustard (*Brassica* sp. and *Hirschfeldia incana*), thistles (*Centaurea solstitialis, C. melitensis),* poison hemlock (*Conium maculatum*, and sweet fennel (*Foeniculum vulgare*).

There are two types of grasslands on Camp Pendleton, the native perennial grasslands and nonnative annual grasslands, and both are important features of Camp Pendleton. Native grasslands occur on approximately 13,684 acres and are dominated by California brome (*Bromus carinatus*), giant wild-rye (*Elymus condensatus*), needle grass (*Stipa* species), and Coast Range melic (*Melica imperfecta*). Nonnative grasslands include occupy 7,107 acres and are dominated by wild oats (*Avena barbata, A. fatua*), brome grasses (*Bromus* sp.), purple false brome (*Brachypodium distachyon*), and perennial rye grass (*Festuca perennis*).

At Camp Pendleton, fine-textured soils of coastal terraces are largely covered with grasslands, as are the rolling hills with deeper soils at higher elevations. Trees or shrubs mostly cover the rocky and thinner soils where moisture can penetrate to depth. Like most of southern California,

introduced grasses and forbs are now major components of the vegetation found in grasslands, resulting in an increasing amount of nonnative forblands and grasslands occupying the Base.

Wetland, Aquatic, and Marine Ecosystem

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

Nearshore

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

Many marine organisms, including most commercially valuable fish species, depend on nearshore waters at some point during their development. Phytoplankton, algae, and canopy forming macroalgaes persist in the nearshore environment if there is suitable substrate. One species of flowering plant, surf grass (*Phyllospadix scouleri*) can occur in the nearshore zone (Oberbauer et al. 2008). Additionally, there are two kelp forests off the coast of Camp Pendleton that support numerous fish species, invertebrates, marine mammals and sea turtles.

Intertidal

The intertidal zone is regularly inundated by the ocean; it is the area that includes the area exposed by low tide up to and including the spray zone (Oberbauer et al. 2008). Intertidal communities can be found on sandy beaches, in bays and estuaries, and along rocky shorelines. Organisms that live within the intertidal zone are constantly enduring regular periods of immersion and emersion, essentially living both underwater and on land. As a result, intertidal organisms have adapted to a range of climatic conditions and must have the ability to cope with a wide range of temperatures and salinity levels. Characteristic vegetative species include algae and surf grass, although these areas are often unvegetated (Oberbauer et al. 2008).

Dune and Strand

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

The dune and strand system on Camp Pendleton is rich in plant life and includes a unique set of species making up the southern foredune, backdune, and strand communities. The foredune community occupies the actively moving sand dunes. The strand community links the dune communities and is considered the beach. It is pure sand up to extreme high tide line, then slowly is stabilized by dune vegetation. Coastal dunes include the southern foredune, a sparsely vegetated community with plant cover ranging from 30 percent to 60 percent. On Camp Pendleton, this plant community is dominated primarily by beachbur (*Ambrosia chamissonis*), populations of red sand verbena (*Abronia maritima*), and beach evening-primrose (*Camissonia cheiranthifolia* ssp. *Suffruticosa).* On Camp Pendleton, this community is estimated to occupy less than 165 acres (67 hectares).
Per the Riparian BO (USFWS 1995), the Base monitors the dune systems through their Dune Habitat Mapping and Monitoring Project to classify dune vegetation; map dune plant communities; and determine vegetative cover, species distribution, and density. In 2007, the project was implemented over a representative 75-acre area near the mouth of the Santa Margarita River. The results of the 2007 dune monitoring effort illustrated that the dune scrub habitat is expanding through natural colonization by indicator dune species. Dune scrub species are colonizing areas once mapped as beach habitat and ice plant (*Carpobrotus edulis*). Dune habitat is often lost where natural coastal erosion processes remove portions of beach, foredune scrub, and other communities (RECON 2008).

The Base implements programmatic instructions and habitat enhancement measures specified in the Estuarine and Beach Ecosystem Conservation Plan (Appendix G) for the protection and management of dune and strand habitat. This includes conservation of listed species and their associated habitat, and maintaining and enhancing the functionality and biodiversity of the beach

and strand community. Specific dune and strand enhancement activities have included removal of invasive plant species and associated thatch that adversely affect the growth and cover of native plants, followed by applying pure sand and seed of native species. Dune restoration projects employ methods such as sand mobilization, development of dune hummocks, active planting/seeding of native plants, and consideration of habitat needs for western snowy plover.

Dune Wetlands

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

Estuary

Camp Pendleton's estuarine and beach ecosystems consists of eight coastal sandbar lagoons and estuaries. This includes the Santa Margarita River estuary and the coastal lagoons located at Cocklebur, French, Aliso, Las Flores, San Onofre, Hidden, and San Mateo Creeks. The coastal communities receive the lowest average rainfall; however, they benefit from frequent fog and the moderating influence of the ocean, which reduces heat and moisture stress during the summer. Camp Pendleton's estuaries support a variety of habitats, including open brackish water, salt marshes, seagrasses and benthic habitat for invertebrates.

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

Stream

Freshwater streams, and their associated natural drainages, provide a unique habitat for aquatic organisms and vegetation within Camp Pendleton. Streams are communities that include benthic organisms and aquatic vegetation that has adapted to living in an environment of flowing water. Management of freshwater streams is covered by the Base's Riparian Ecosystem Conservation

Plan (Appendix H). Noteworthy streams on Base include Talega Creek, San Mateo Creek, Cristianitos Creek, San Onofre Creek, Las Flores Creek, Piedra De Lumbre Creek, Aliso Creek, French Creek, Hidden Creek, Cocklebur Creek, De Luz Creek, Roblar Creek, and Pilgrim Creek, and the Santa Margarita River. Stream habitat on Base harbors multiple sensitive species, including arroyo toad, western pond turtle, two-striped garter snakes, arroyo chub, Southern California steelhead, and Pacific lamprey.

Alkali Marsh

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

Freshwater Marsh

The freshwater marsh community is found along stream courses and near riparian wetland areas. This vegetative community is dominated by perennial, emergent monocots up to 13–16 feet tall and often consisting of uniform, dense stands with closed canopies. Freshwater marsh occurs in wetlands that are permanently flooded by standing freshwater lacking a significant water current. Prolonged saturation of such areas permits the accumulation of deep, peaty soils. Characteristic species include cattails (*Typha domingensis* and *T. latifolia*), bulrushes (*Schoenoplectus* spp.), sedges (*Carex* spp.), and flatsedges (*Cyperus* spp.). Coastal freshwater marsh communities occur in scattered locations along the immediate coast; in coastal valleys near river mouths; and around the margins of rivers, creeks, lakes, and springs. This community is now much reduced throughout its entire range due to urban and agricultural expansion, river channelization, and through the implementation of flood control measures. Representative areas of freshwater marsh on Camp Pendleton are common along most stream courses on the Base.

Riparian

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

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

Riparian ecosystems contain a wide variety of plant communities (e.g., riparian woodlands, riparian scrublands, freshwater marsh, and open water/gravel) and occur in drainages, seepages, and riverine areas where water availability is high. Because upland areas in southern California are generally moisture-limited, riparian vegetation is distinctly different, functionally and visually, from that of the surrounding more xeric vegetation. In contrast to oak woodlands and sage scrub, riparian vegetation is dominated by winter-deciduous trees such as willows, cottonwoods, alders, and sycamores.

Management of Camp Pendleton's riparian communities is covered by the Riparian Ecosystem Conservation Plan (Appendix H). This conservation plan is designed to manage fish and wildlife resources in riparian areas. This plan addresses long-term requirements of the riparian resources with a programmatic manner, i.e., habitat management actions are to be planned and evaluated in the context of achieving and maintaining a "healthy ecosystem" for sensitive species. It is the intention to apply this programmatic approach to all ongoing and future actions at Camp Pendleton, as they potentially affect the integrity of riparian ecosystems. Camp Pendleton's riparian ecosystem supports breeding of numerous Neotropical migratory bird species, including the federally listed least Bell's vireo and southwestern willow flycatcher, as well as serving as migrating habitat for western yellow-billed cuckoo.

Water Bodies

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

TABLE 3-6 FRESHWATER BODIES ON CAMP PENDLETON

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

In support of recreation and fishing programs on Camp Pendleton, Environmental Security provides management for freshwater lakes, such as Lake O'Neill, for the purpose of freshwater game species. Management includes the removal of exotic aquatic species and oxygenating the water in Lake O'Neill for sports fishing. The Base implements the San Diego County larvicide application program for mosquito abatement on the ring of vegetation that circumnavigates the water bodies; however, no larvicide is used on open water. Use of mosquito fish for insect control is prohibited by the Riparian BO (MCBCP 1998).

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

Vernal Pools

A vernal pool is a type of isolated ephemeral wetland. Vernal pools are shallow, ephemeral wetlands with very specific hydrologic characteristics, occurring within a Mediterranean climate. Pools pond in the winter and spring within soil types that can produce a seasonally perched water table. Vernal pools provide habitat for aquatic macroinvertebrates, such as Riverside fairy shrimp (*Streptocephalus woottoni*) and San Diego fairy shrimp (*Branchinecta sandiegonensis*), and

aquatic flora such as American pillwort (*Pilularia americana*) and Orcutt's quillwort (*Isoetes orcuttii*). In many pools, emergent aquatic species typical of wetlands also occur, such as Mariposa rush (*Juncus dubius*). In the spring as the rains diminish and the pools dry, plants that tolerate some inundation but require the dry phase enter their flowering stage, such as spreading navarretia (*Navarretia fossalis*), little mousetail (*Myosurus minimus*), and San Diego button-celery (*Eryngium aristulatum* var. *parishii*). Most plants in this community survive the dry summer as dormant seeds; others die back to underground corms or rhizomes.

Vernal pools on Camp Pendleton occur naturally on hummocky soils, with impervious subsurface layers in swales between mima mounds or in other depressions that impound water. They occur primarily on coastal terraces within approximately 3 miles from the beach.

The Base has conducted numerous inventories of natural vernal pools and human-caused basins such as road ruts; in total, approximately 3,696 vernal pool depressions, and road ruts that are temporarily ponded have been mapped on the Base.

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

Camp Pendleton uses the vernal pool module of California Rapid Assessment Method for wetlands (CRAM) to monitor the condition of vernal pools. The CRAM vernal pool module is adapted for the unique conditions found in those ephemeral wetlands. CRAM for vernal pools measures the condition of pools based on attributes including buffer area, hydrology, biological structure, physical structure. The method is designed to be completed within eight hours, including office and field work. CRAM provides a detailed procedure that can be used for both individual vernal pools and vernal pool systems, which may include as many as six vernal pools at a time, depending on microwatershed size.

3.2.2 Federally Listed Species and Species of Regional Concern

The large natural areas within Camp Pendleton provide habitat to a variety of species, 19 of which are federally threatened or endangered species including 14 animals and five plant species as noted below in Table 3-7. Figures 3-6 through 3-13 show maps of the distribution of each species on Base.

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

Management of 6 of the 9 coastal and riparian federally threatened and endangered wildlife species on Base is conducted through the implementation of habitat-based management plans for riparian, estuarine and beach (Appendix G, Appendix H). The remaining 3 coastal/riparian listed species greatly benefit from management and protection measures established in the for riparian, estuarine and beach management plans; as do future species that may be listed. The current focus of Camp Pendleton is to develop species-specific management plans (e.g., Vernal Pool Management Plan and others [see rare plant management plans discussed in Chapter 4]); these plans are not exclusively habitat based, although habitat management plays an integral role in the successful implementation of these plans and would be an important component of the proposed species management plans. A list of the current active management plans for Camp Pendleton are in Table 3-8 and discussed below. Note, that for federally listed wildlife species, surveys and management activities vary by season as indicated in Table 3-9.

3.2.2.1 Federally Listed Wildlife Species

Brief species accounts for the 14 federally listed threatened or endangered wildlife species that are known to occur on Camp Pendleton, and actively managed, are provided below. More detailed species accounts are provided in Appendix J. For further species information, please refer to the USFWS' Environmental Conservation Online System available at http://ecos.fws.gov/ecp/. For all species, procedures and general considerations military training is regulated in the Base's Range and Training Area Standard Operating Procedures (MCIWEST-CAMPENO 3500.1 CH 2 (MCBCP 2022), coined "Base Training Regulations"); these regulations are utilized in conjunction with the Environmental Operations Map (EOM), published by the Environmental Security office.

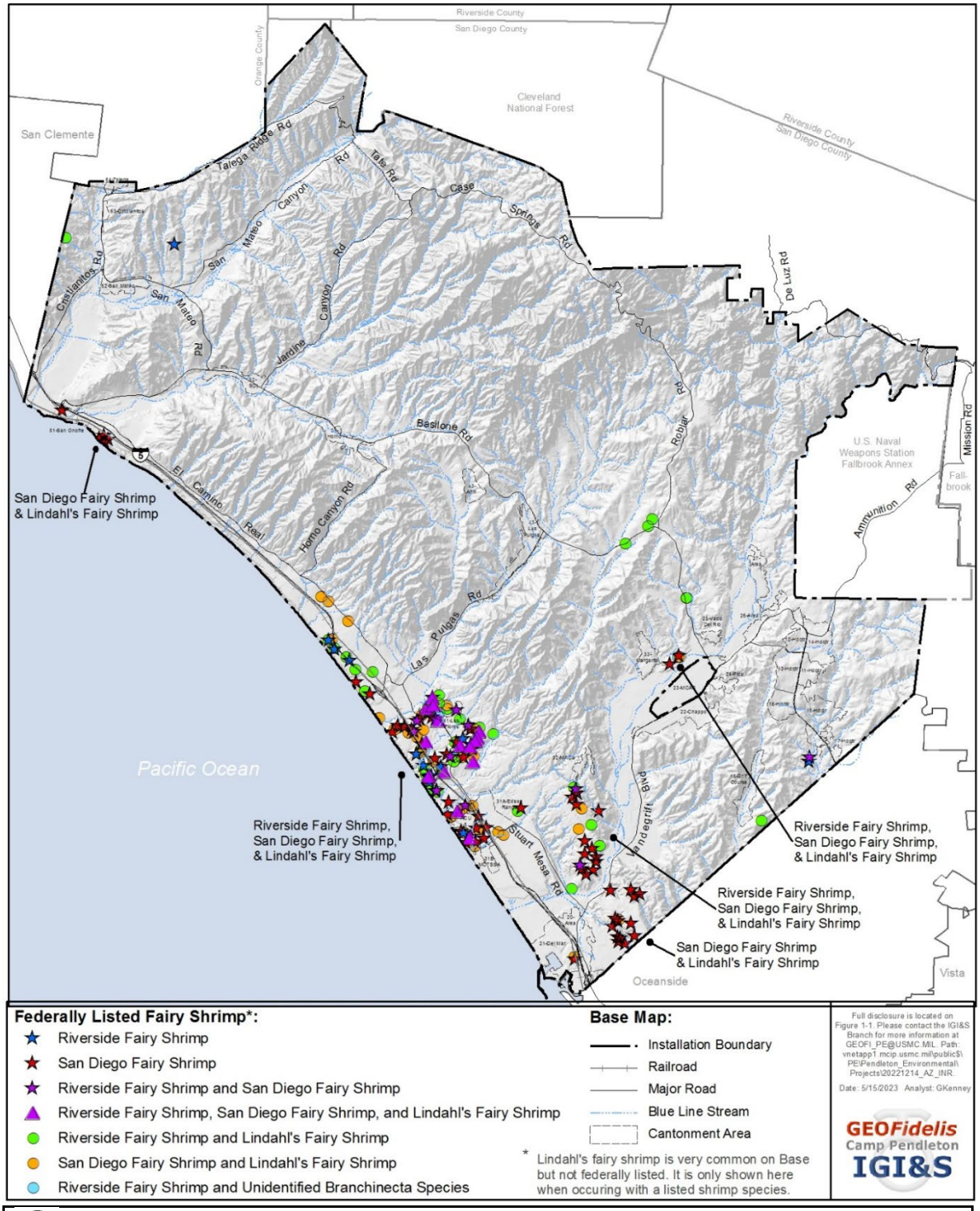
TABLE 3-7 FEDERALLY LISTED SPECIES AT CAMP PENDLETON

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

[1] A recent study classifies the southern populations of tidewater goby as a new species, the southern tidewater goby (*Eucyclogobius kristinae*) from the northern tidewater goby (*Eucyclogobius newberryi*) (Swift et al. 2016). Formal recognition of southern tidewater goby as a separate species is expected to be published by USFWS in the Federal Register in 2022.

[2] Formerly light-footed clapper rail (*Rallus longirostris levipes*). USFWS has not formally published the name change in the Federal Register; however, CDFW has adopted the new name.

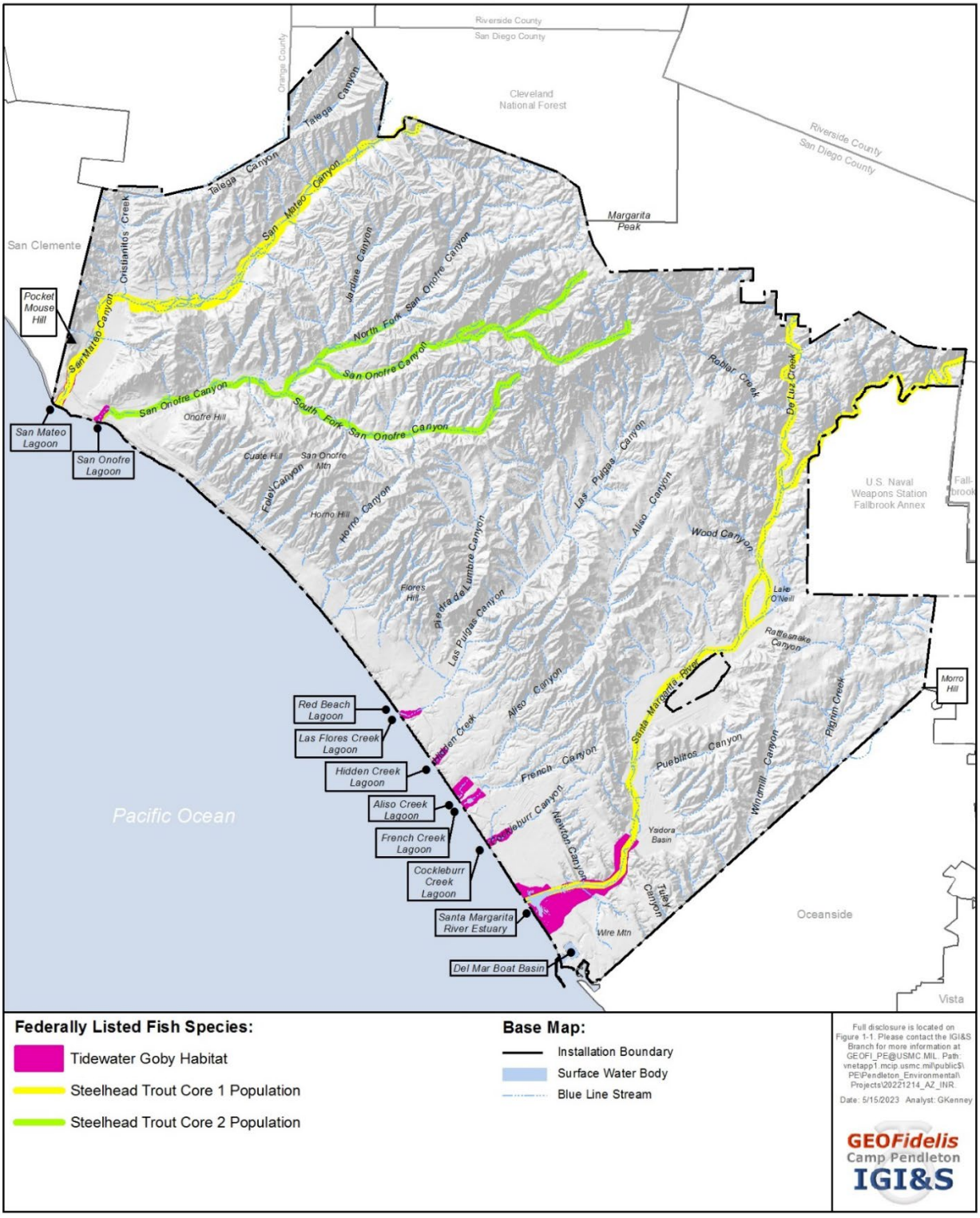
[3] USFWS listed a "distinct population segment" (DPS) of yellow-billed cuckoo rather than a species or subspecies.



1 inch = 3 miles

Camp Pendleton 2023 Integrated Natural Resources Management Plan

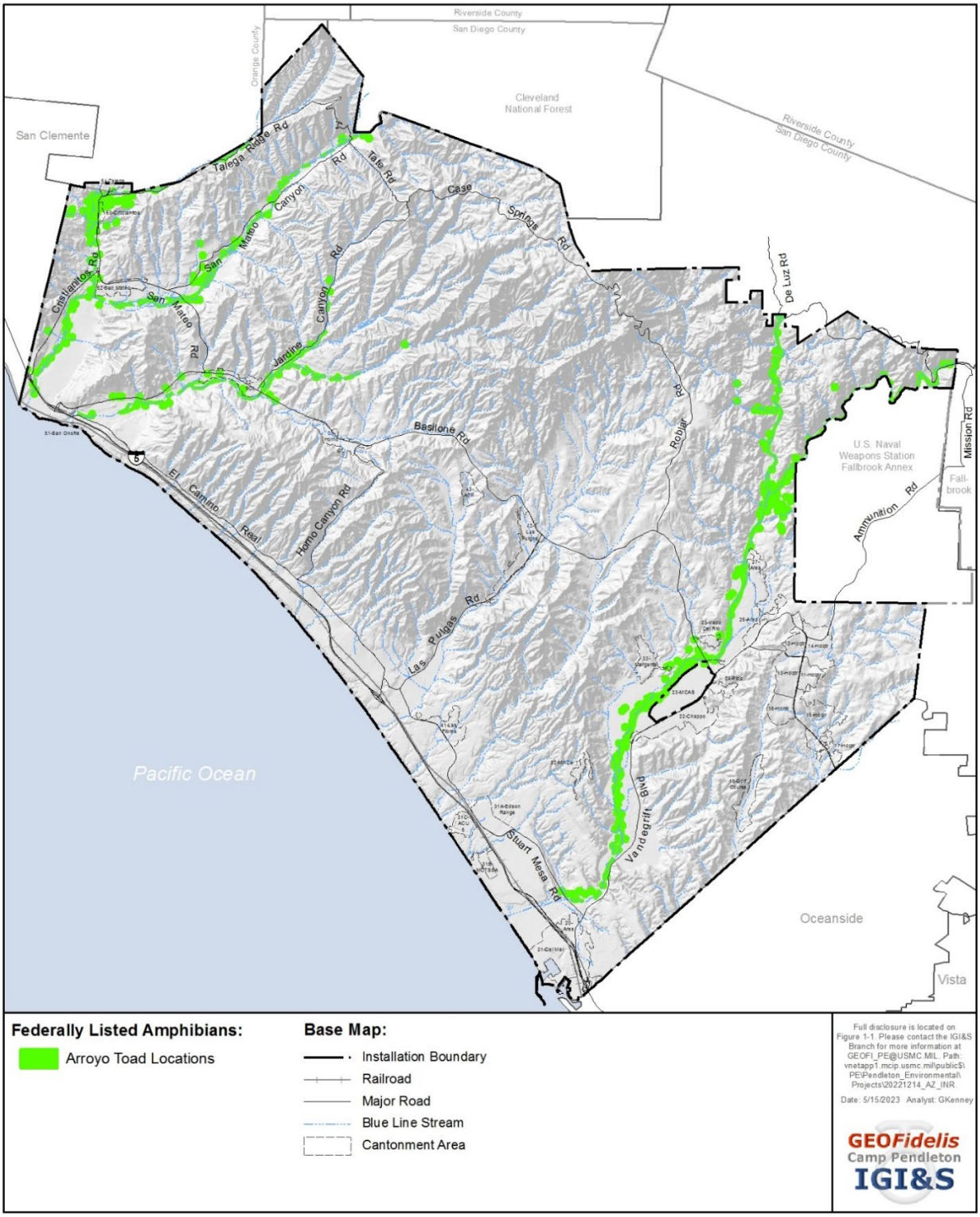
Figure 3-6
Federally Listed
Fairy Shrimp Locations



1 inch = 3 miles

Camp Pendleton 2023 Integrated Natural Resources Management Plan

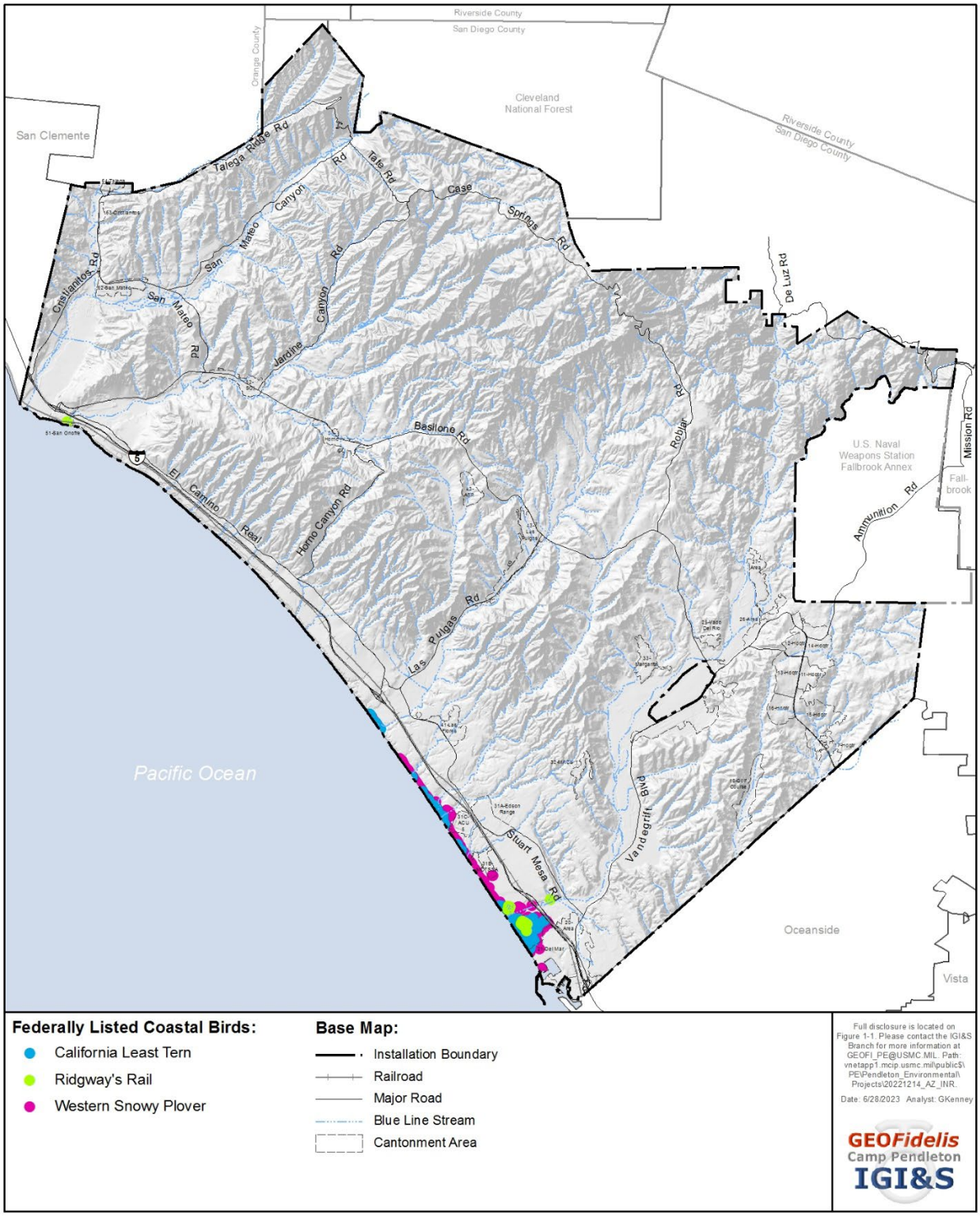
Figure 3-7
Federally Listed
Fish Species Locations



1 inch = 3 miles

Camp Pendleton 2023 Integrated Natural Resources Management Plan

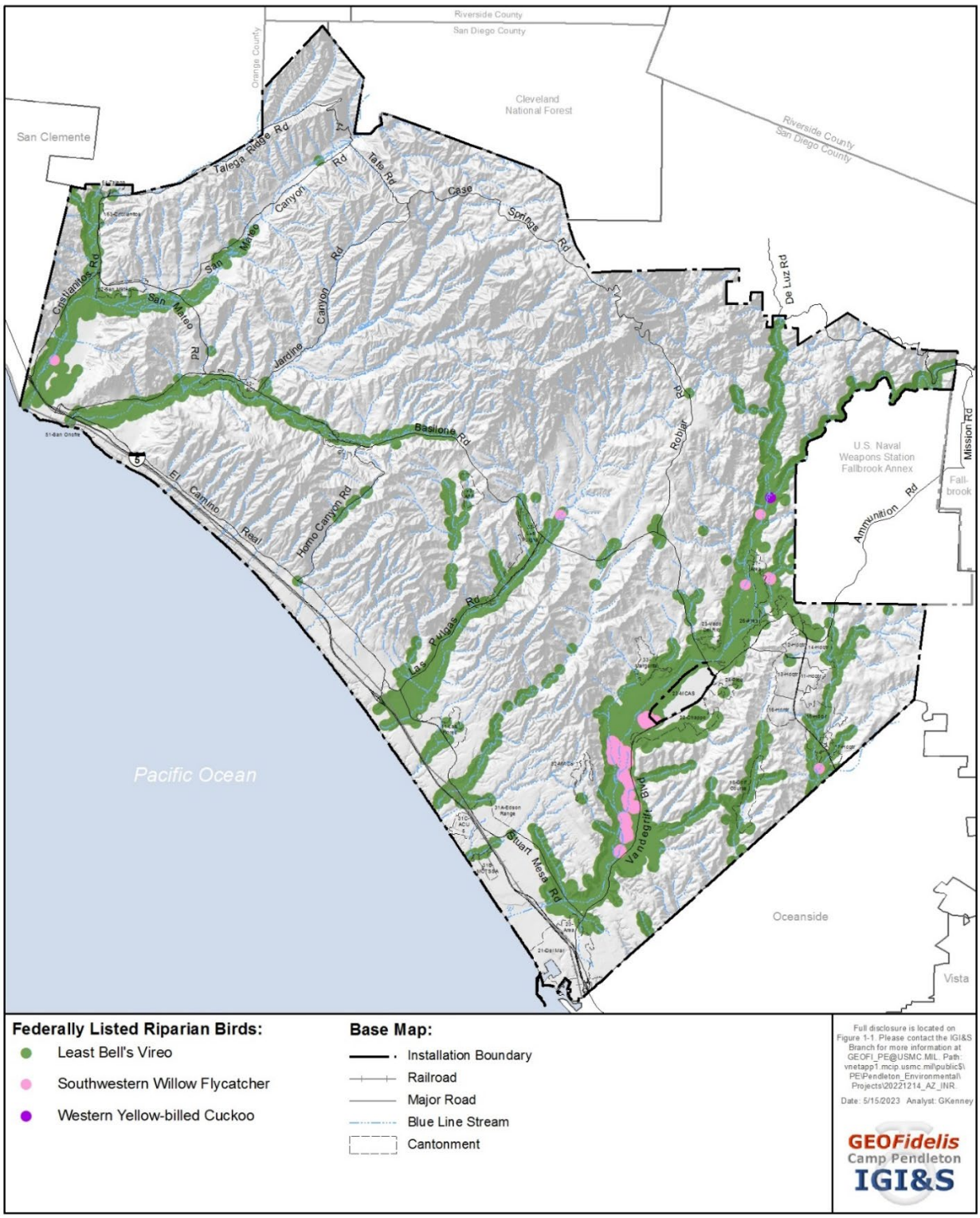
Figure 3-8
Federally Listed
Amphibian Species Locations



1 inch = 3 miles

Camp Pendleton 2023 Integrated Natural Resources Management Plan

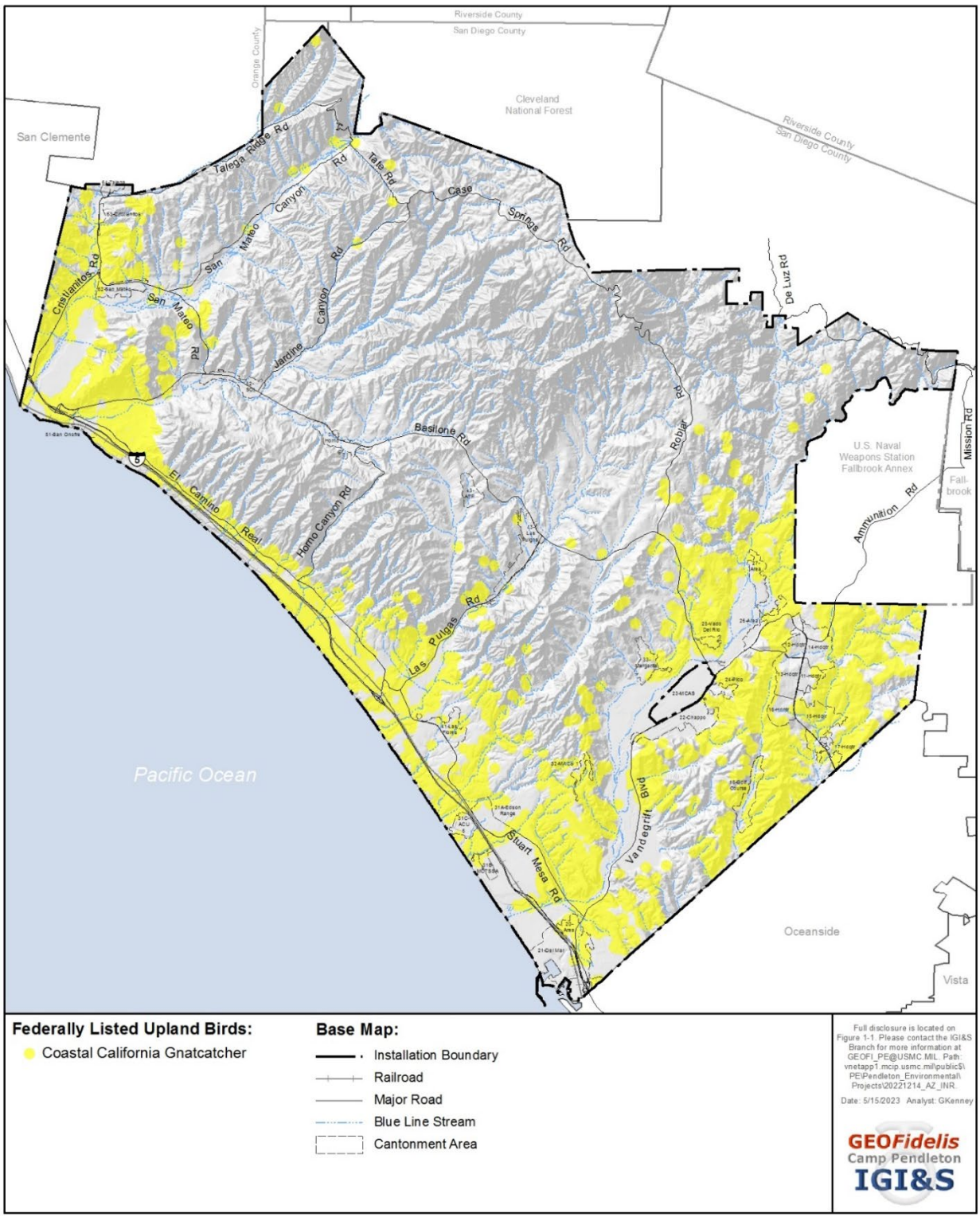
Figure 3-9
Federally Listed
Coastal Bird Species Locations



1 inch = 3 miles

Camp Pendleton 2023 Integrated Natural Resources Management Plan

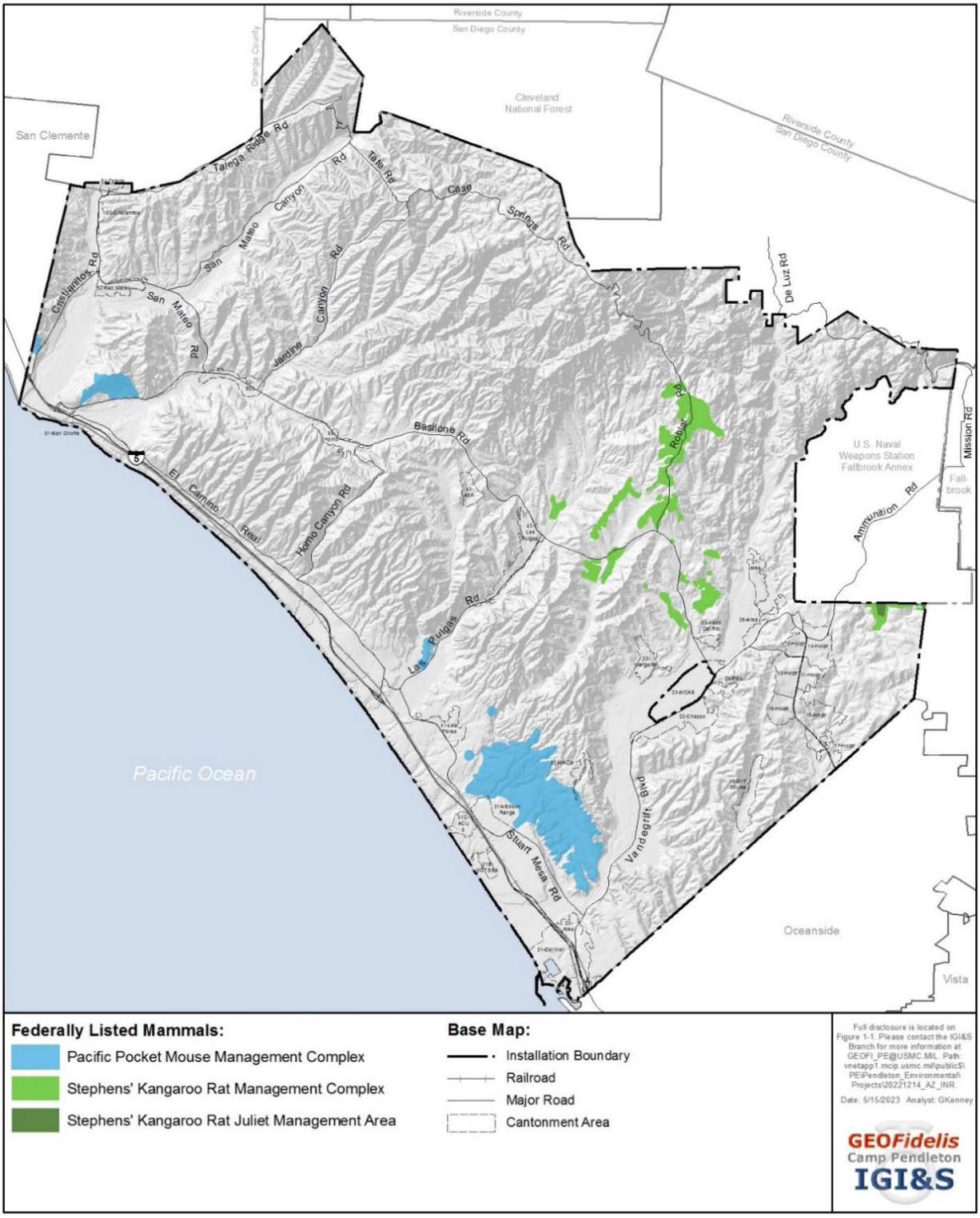
Figure 3-10
Federally Listed
Riparian Bird Species Locations



1 inch = 3 miles

Camp Pendleton 2023 Integrated Natural Resources Management Plan

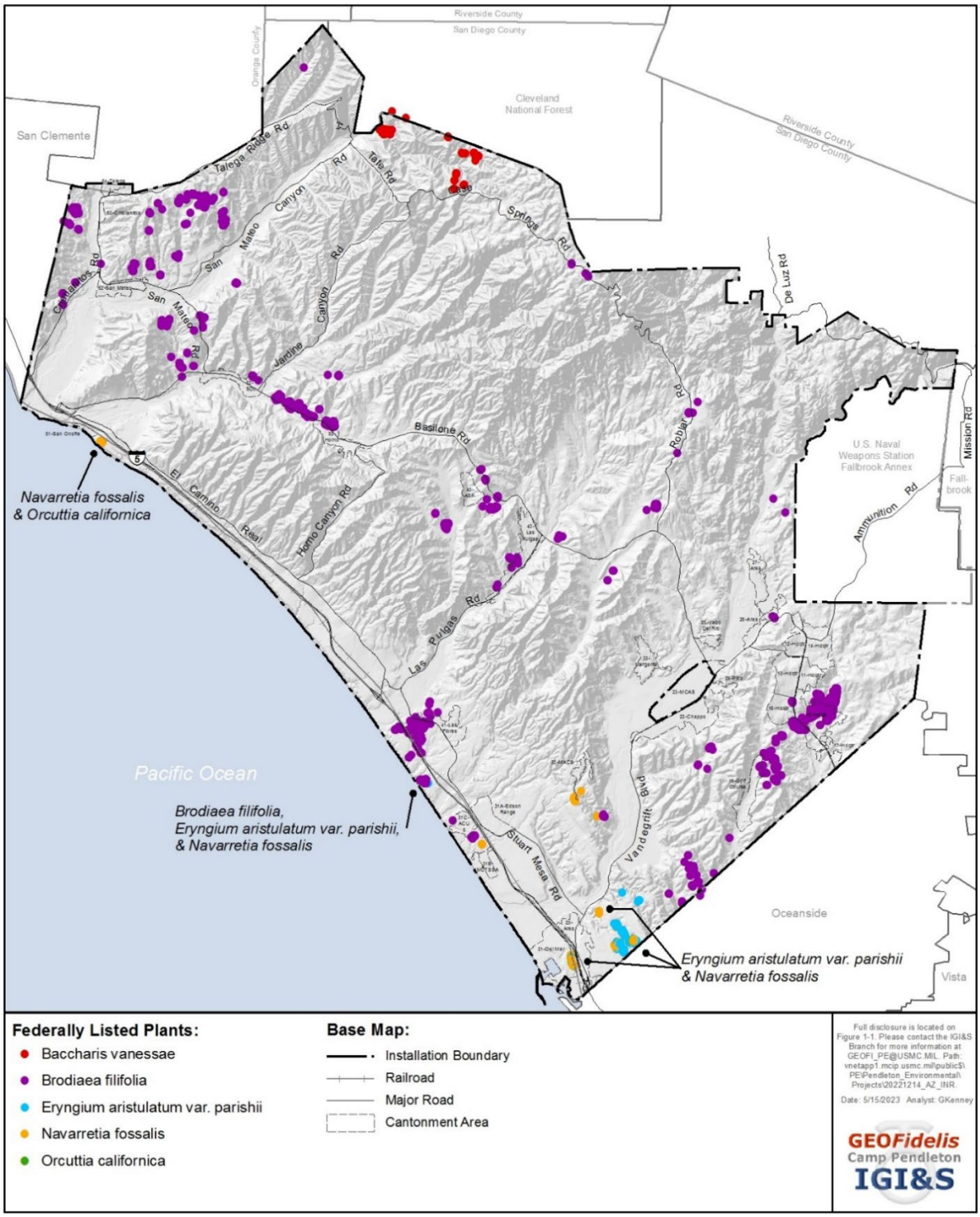
Figure 3-11
Federally Listed
Upland Bird Species Locations



1 inch = 3 miles

Camp Pendleton 2023 Integrated Natural Resources Management Plan

Figure 3-12
Federally Listed
Mammal Species Locations



1 inch = 3 miles

Camp Pendleton 2023 Integrated Natural Resources Management Plan

Figure 3-13
Federally Listed
Plant Species Locations

TABLE 3-8 MANAGEMENT PLANS FOR FEDERALLY LISTED SPECIES FOUND ON CAMP PENDLETON

Species	Status	Year Completed	Status[1]
Invertebrates			
Riverside Fairy Shrimp	Endangered	N/A	Submitted to USFWS
San Diego Fairy Shrimp	Endangered	N/A	Submitted to USFWS
Fish			
Southern Tidewater Goby	Endangered	1995[2]	Complete
Amphibians			
Arroyo Toad	Endangered	1995[3]	Complete
Birds			
California Least Tern	Endangered	1995[2]	Complete
Western Snowy Plover	Threatened	1995[2]	Complete
Least Bell's Vireo	Endangered	1995[3]	Complete
Southwestern Willow Flycatcher	Endangered	1995[3]	Complete
Mammals			
Pacific Pocket Mouse	Endangered	2019	Partial
Plants			
San Diego Button-celery	Endangered	2017	In Progress
Spreading Navarretia	Threatened	2017	In Progress
Thread-leaved Brodiaea	Threatened	2017	Complete
Encinitas Baccharis	Threatened	2017	In Progress

1 Status: In Progress - Plan is in draft and after an update will be submitted to the USFWS, however management actions per the plan are occurring; Submitted to USFWS – Plan has been submitted to the USFWS for Section 7 Consultation; Partial – Plan has addressed management actions for the listed species and specific actions are being submitted separately for Section 7 Consultation with the USFWS; Complete – Section 7 Consultation with the USFWS is complete with an associated Biological Opinion.

2 This species is included in the Base's Estuarine/Beach Conservation Plan.

3 This species is included in the Base's Riparian Conservation Plan.

The combination of the Beach/Estuarine and Riparian Conservation Plans (Appendix G, Appendix H) limit impacts to these species by restricting activities in and adjacent to listed species habitat. For Riparian and Beach/Estuarine listed species, these restrictions are based off of the Riparian and Estuarine/Beach Biological Opinion (USFWS 1995): Reasonable and Prudent Measures and Terms and Conditions (Appendix I). For species not addressed in USFWS 1995 (those species predominantly in upland habitats), the military training restrictions are briefly discussed below.

Riverside Fairy Shrimp (*Streptocephalus woottoni*)

Riverside fairy shrimp are small freshwater crustaceans that occur in vernal pools and ephemeral basins. They hatch from resting eggs in ephemerally ponded basins with appropriately cool water

temperature and sufficient ponding periods. Fairy shrimp populations are threatened by habitat fragmentation and destruction of vernal pools.

TABLE 3-9 SPECIAL MANAGEMENT SEASONS OF FEDERALLY LISTED WILDLIFE SPECIES FOUND ON CAMP PENDLETON

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

[1] Note: The Special Management Seasons presented in this table may represent periods of restricted Base activity, species breeding season, species management implementation, or a combination of any or all of these.

Camp Pendleton Distribution and Management

A survey conducted during the 1997–1998 and 1998–1999 wet seasons identified the coastal mesas on Camp Pendleton as supporting one of the largest known populations of Riverside fairy shrimp, with at least 83 pools occupied (REC 2001). Inventory surveys conducted in five study areas between 2006 through 2009 detected 53 pools occupied by Riverside fairy shrimp in

PHOTO 1 RIVERSIDE FAIRY SHRIMP

Cocklebur Mesa, a portion of Edson Range, MASS 3, Oscar Two, and Red Beach. Findings through 2014 indicate a total of 181 pools occupied by Riverside fairy shrimp on Camp Pendleton (Figure 3-6). As of 2019, 196 basins with Riverside fairy shrimp are identified in the Base's programmatic vernal pool management plan entitled *Vernal Pool and Fairy Shrimp Conservation Plan at Marine Corps Installations West—Marine Corps Base Camp Pendleton* (MCBCP 2019).

The Base Training Regulations/ Environmental Operations Map (EOM) prescribes procedures and general considerations for range and training area users that limit impacts to this species by restricting activities in and adjacent to vernal pools. Management actions are identified in the VP and FS Conservation Plan that were designed to reduce conflicts between conservation and training while expanding training flexibility. The EOM lists the following restrictions for vernal pools: (1) keeping bivouac/command post/field support activities at least 50 m from vernal pools year-round; (2) keeping vehicle/equipment on existing roads (foot traffic is authorized year-round); and (3) prohibiting digging (including construction of fighting positions).

San Diego Fairy Shrimp (Branchinecta sandiegonensis)

The San Diego fairy shrimp is a small, delicate freshwater shrimp that occurs in vernal pools filled by winter and spring rains that usually begin in November and continue into April or May. San Diego fairy shrimp are threatened by loss and degradation of habitat due to urbanization. Along with threats to habitat degradation, the San Diego fairy shrimp is also threatened by hybridization and competition from the Lindahl's fairy shrimp.

Camp Pendleton Distribution and Management

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

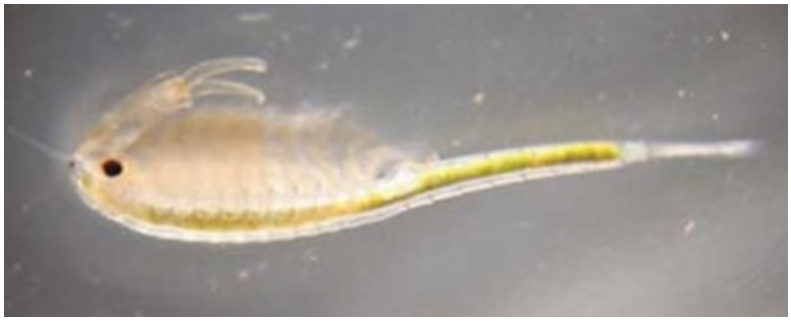


PHOTO 2 SAN DIEGO FAIRY SHRIMP

Diego fairy shrimp in Cocklebur Mesa, a portion of Edson Range, MASS 3, Oscar Two, and Red Beach. Findings through 2014 indicate a total of 526 pools occupied by San Diego fairy shrimp on Camp Pendleton. As of 2019, the VP and FS Conservation Plan lists 554 basins with San Diego fairy shrimp on Base (Figure 3-6).

The Base Training Regulations/Environmental Operations Map (EOM) prescribes procedures and general considerations for range and training area users that limit impacts to this species by restricting activities in and adjacent to vernal pools. Management actions are identified in the VP and FS Conservation Plan that were designed to reduce conflicts between conservation and training while expanding training flexibility. The EOM lists the following restrictions for vernal pools: (1) keeping bivouac/command post/field support activities at least 50 m from vernal pools year-round; (2) keeping vehicle/equipment on existing roads (foot traffic is authorized year-round); and (3) prohibiting digging (including construction of fighting positions).

Southern California Steelhead (*Oncorhynchus mykiss*)

The southern California steelhead is an anadromous sea-run rainbow trout that migrates to the ocean after spending 1 to 4 years in freshwater. Major threats to steelhead are introduction of nonnative species, point and nonpoint source pollution, and loss of watershed habitat from development, blocked access to headwater spawning areas, and/or dewatering of streams by diversions and groundwater pumping. A final recovery plan for southern California steelhead was issued by NOAA Fisheries in January 2012 (NMFS 2012). Recovery planning areas identified in the document include the San Mateo, San Onofre, Santa Margarita, and San Luis Rey watersheds as Core 1 and Core 2 populations (Figure 3-7).

Camp Pendleton Distribution and Management

PHOTO 3 SOUTHERN CALIFORNIA STEELHEAD

The most recent confirmed observations of steelhead include two individuals within San Mateo Creek in 2017, and individual just below the Lake O'Neill weir in the Santa Margarita River in 2021. Additionally, steelhead have been detected several times in the SMR between 2020 and 2021 using eDNA methods, and three dead steelhead were removed from the weir plunge pool in the summer of 2021. Freshwater fish surveys were conducted in San Mateo

Creek in 1995, 1996, and 1997, but failed to detect any steelhead. Likewise, surveys in the Santa Margarita watershed were conducted in 1997, 1998, and 1999 both on and off-Base resulting in no detection of steelhead. The portions of San Mateo Creek and Santa Margarita River within Base boundaries are thought to serve as a migration corridor (December–March) to spawning habitat off-Base, with limited potential for rearing in the estuaries; however, USFWS noted spawning habitat in the upper reaches of San Onofre Creek in a 1998 steelhead habitat study (USFWS 1998). Due to limited spawning habitat on Base, persistent presence of steelhead on Base is not expected, although migrations may take place annually that support off-Base reproduction and persistence.

The Base Training Regulations/Environmental Operations Map (EOM) prescribes procedures and general considerations for range and training area users that limit impacts to this species by restricting activities in and adjacent to riparian habitat. a water management project that may impact steelhead; the *Final Biological Opinion on the Construction and Operation of the Santa Margarita River Conjunctive Use Project at Marine Corps Base Camp Pendleton* was issued on 28 September 2016 and considered the potential effects to construct and rehabilitate various facilities for the diversion, transport, treatment, storage, and recharge of water from the Santa Margarita River and Fallbrook Creek on the endangered Southern California Coast DPS of steelhead. A 250-foot inflatable weir was built to replace the stationary weir that draws water off the Santa Margarita River to Lake O'Neill for water storage. The installed weir includes design features focused on facilitating steelhead fish passage and a more natural sediment transport regime. (NMFS 2016).

Southern Tidewater Goby (*Eucyclogobius kristinae*)

The tidewater goby is a small fish that is a California endemic species and is unique in that it is restricted to coastal brackish water habitats. The major threats affecting the tidewater goby are loss of estuarine habitat, degraded water quality, and predatory and competitive introduced fish species (USFWS 2005). In July of 2016, University of California, Los Angeles published literature that proposed to designate the southernmost populations of tidewater goby as a new species, southern tidewater goby (*Eucyclogobius kristinae*), based on morphological and genetic distinctions from northern populations (Swift et al. 2016). The new species designation is widely accepted in the scientific community, and USFWS is expected to formalize the change in the Federal Register in 2023. Southern tidewater goby is currently endemic to Camp Pendleton, having been extirpated from all other historic locations. The Base is actively working with USFWS on evaluating locations off-Base for potential future translocation of the species.

Camp Pendleton Distribution and Management

On Camp Pendleton, the extirpation and recolonization of gobies annually fluctuates between lagoons (Swift and Holland 1998). At the time of listing in 1994, the species was thought to be present in only four of the eight drainages on Base; however, in 2000, the southern tidewater goby had been detected in all eight lagoons on Base (Figure 3-7); lagoon occupancy has fluctuated annually since that time. The most recent surveys conducted in 2021, along with incidental observations during aquatic exotic species removal, detected southern tidewater goby in San Onofre, Las Flores, Hidden, Cockleburr and San Mateo creek lagoons, as well as in the Santa Margarita River estuary.

PHOTO 4 TIDEWATER GOBY

Until environmental DNA detection in 2021, southern tidewater gobies had not been observed in the Santa Margarita River since 2001. The mouth of the river was closed in 2004 and in fall 2010 and open in 2002, 2003, and 2005–2009 (USGS 2013). Sampling efforts were not funded during 2014-2015, or 2019-2020 so presence/absence is unknown in lagoons where incidental capture did not occur during these years. The mouth has been open continuously since February of 2019, and the lack of a persistent sand bar most likely precludes the long-term persistence of tidewater gobies at this location.

The San Mateo, San Onofre, and Las Flores Creek populations are considered by USFWS as the largest and most persistent populations of southern tidewater gobies remaining in the region, and potentially serve as important source populations for dispersal into suitable waterbodies in the area (e.g., Buena Vista Lagoon and Agua Hedionda Lagoon) (USFWS 2000).

The Base implements programmatic instructions and habitat enhancement measures specified in the Estuarine and Beach Ecosystem Conservation Plan and the Riparian BO for protection and management of southern tidewater goby. The conservation plan describes estuarine management zones for the specific protection of this species. The Base also conducts monitoring of southern tidewater goby in accordance with the conservation plan and BO. Although goby monitoring is only required once every 3 years, Camp Pendleton has generally been monitoring annually since

2002. In addition, the Base Training Regulations/ Environmental Operations Map prescribe regulations and general precautions for range and training area users that limit impacts to this species by restricting activities in and adjacent to estuarine habitat.

Arroyo Toad (*Anaxyrus californicus*)

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

Camp Pendleton Distribution and Management

On Camp Pendleton, arroyo toad occurs in Talega, Cristianitos, San Mateo, San Onofre, De Luz, and Roblar creeks, and in the Santa Margarita River (Figure 3-8). The arroyo toad is a habitat specialist, that require availability of shallow and slow-moving streams for egg strands and larva. Natural fluctuations in precipitation can positively or negatively impact breeding success. As such, surface water availability is highly variable along these freshwater streams and yet the overall extent of breeding toads in wetted areas on- Base remained relatively stable from 2003 through 2012 (77 to 95 percent of wet areas in a given year) with no significant change over this 10-year period. The population in the lower Santa Margarita River drainage is the largest and most stable on Base; however, from 2014–2016, a negative population trend was observed, probably a response to severe drought.

During 5 years of drought between 2010 and 2016, there was little to no detection of arroyo toad breeding in the northern watersheds on Base. Toads have been verified to breed up to 6 years of age; therefore, in 2017, the Base partnered with USGS and USFWS to establish a short-term salvage effort for toads occurring in stranded pools to increase probability of breeding success in affected watersheds.. Arroyo toad resumed breeding in 2018 when winter rains supported good breeding conditions across the Base, therefore salvage was not necessary. In 2022, severe drought again resulted in very low breeding detection, which only occurred in the Santa Margarita River; the other major streams on Base dried up in mid-May, which is historically early in the season.

The Base implements programmatic instructions and habitat enhancement measures specified in the Riparian Ecosystem Plan and the Riparian BO for the protection and management of arroyo

toad (Appendix I). The Base conducts annual monitoring of arroyo toads in accordance with the conservation plan and BO. The Base also consulted with USFWS regarding management of water resources, which evaluated arroyo toad habitat in relation to diversion of water at the Lake O'Neill weir and pumping of drinking water. The SMR-CUP ESA consultation resulted in an Adaptive Management Plan which analyzes potential impacts to arroyo toad as a result of water management and identifies triggers for changing habitat conditions put in place to protect persistence of arroyo toad in the Santa Margarita River. In addition, the Base Training Regulations and published Environmental Operations Map book prescribes regulations and general precautions for range and training area users that limit impacts to this species by restricting activities in and adjacent to riparian arroyo toad habitat during the breeding season.

PHOTO 5 ARROYO TOAD

California Least Tern (*Sternula antillarum browni*)

The California least tern is a small pelagic bird that breeds in beach colonies along the coastline. California populations have diminished from loss of habitat and periodic weather disturbances (e.g., El Niño). Anecdotal evidence suggests terns may be having to fly further distances to catch anchovy, the preferred food fish, when ocean temperatures are elevated from El Niño weather events. As a colonially beach-nesting species, California least tern is also at risk from avian and mammalian predators, especially on sites where there is no predator management in place. Because California least tern are too small to carry satellite transmitter receivers, scientists do not know where they overwinter, or what overwintering site pressures may exist for this species.

PHOTO 6 CALIFORNIA LEAST TERN

Camp Pendleton Distribution and Management

On Camp Pendleton, California least tern nesting sites (Figure 3-9) are located on the beaches and salt flats at the mouth of the Santa Margarita River (Blue Beach, previously known as North Beach North and North Beach South), and at the mouths of French and Aliso Creeks (White Beach). Since 2003, nesting sites have also been observed at the mouth of Las Flores Creek (Red Beach), and at the mouth of Cocklebur Creek. Between 2007 and 2015, the tern colony on Camp Pendleton represented a significant portion (approximately 18 percent) of the total tern population breeding in California, with the peak occurring in 2010 (Boylan et al. 2015). However, in 2018 the least tern population was hard hit by avian and mammalian predators, plunging the returning population to just 304 pair and 414 nests. By 2021, the population had started growing again and biologists estimated 590 pair and detected 628 nests on installation beaches.

Additionally, the Base has investigated fledgling estimates methods to improve productivity data. We concluded a 3-year study in 2015 that showed previous fledgling count efforts were unreliable. The results allowed the Base to implement alternative methods that are more accurate, and biologists continue to refine methodologies.

The Base implements programmatic instructions and habitat enhancement measures specified in the Estuarine and Beach Ecosystem Conservation Plan and the Riparian BO for the protection and management of California least tern (Appendix I). This includes annual habitat enhancement in the fenced tern colonies, and implementation of predator control on nesting beaches. The Base also conducts annual monitoring of California least tern in accordance with the conservation plan and BO. In addition, the Base Training Regulations/ Environmental Operations Map prescribes regulations and general precautions for range and training area users that limit impacts to this species by restricting activities in and adjacent to suitable habitat and breeding/nesting areas during the breeding season.

Western Snowy Plover (*Charadrius nivosus nivosus*)

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

Camp Pendleton Distribution and Management

On Camp Pendleton, western snowy plover nesting (Figure 3-9) typically occurs in the Santa Margarita River estuary salt flats and along open beaches and dunes from Del Mar Recreation Beach to just north of Aliso Creek. The breeding population of plovers on Camp Pendleton

increased steadily from a total of 36 breeding pairs in 1994 to a high of 94 pairs in 2012; however, nest pair estimation methods have varied over the years.

PHOTO 7 WESTERN SNOWY PLOVER

In 2014, there were minimally 69 breeding pairs based on counting the maximum active nests at one time during the season; however, maximum active nests in 2019 only numbered 35, indicating the minimum number of females breeding on Base. By 2021, we detected 123 SNPL nests and estimated 34 of breeding females, which is equivalent to the maximum number of simultaneously active nests across all sites. Snowy plover populations have fluctuated on Base since onset of monitoring in 2001, possibly owing to local and long-range migration patterns. Continued threats for snowy plover on Base include nest loss from high tide events, military training at the rack line, and recreation activities.

The Base implements programmatic instructions and habitat enhancement measures specified in the Estuarine and Beach Ecosystem Conservation Plan and the Riparian BO for the protection and management of western snowy plover (Appendix I). The Base also conducts annual monitoring of western snowy plover in accordance with the conservation plan and BO. Western snowy plovers on-Basebenefit from habitat enhancement and predator control on installation beaches. In addition, the Base Training Regulations/ Environmental Operations Map prescribe regulations and general precautions for range and training area users that limit impacts to this species by restricting activities in and adjacent to this species' habitat and breeding/nesting areas during the breeding season (MCBCP 2013a). Conservation Law Enforcement began issuing citations in 2017 to recreations entering the Santa Margarita River Endangered Species Management Zone, which has significantly reduced recreational disturbances at that tern colony.

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

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

Camp Pendleton Distribution and Management

PHOTO 8 LIGHT-FOOTED RIDGWAY'S RAIL

Light-footed Ridgway's rail (formerly light-footed clapper rail) has been recorded on Camp Pendleton since 1982 when two pairs were detected in the Santa Margarita River estuary; one pair at the Cocklebur estuary, and a single rail in Las Flores Lagoon (Figure 3-9). Since then, they have been detected in the Santa Margarita River with one or two pairs present from 1982 through 1988, and again from 2002 through 2007 (Zembal et al. 2008). In addition, one adult Ridgway's rail and three chicks were detected in the Santa Margarita River estuary during 2009 predator control activities confirming nesting on Base. One rail was detected at San Onofre Creek Estuary in 2013 but has not been detected since. One or two Ridgway rails continue to be detected in the Santa Margarita River during biennial surveys, but have not been detected in other lagoons since 2013.

The Base implements programmatic instructions and habitat enhancement measures specified in the Estuarine and Beach Ecosystem Conservation Plan and the Riparian BO (Appendix I), which assists in the protection and management of light-footed Ridgway's rail. The Base also conducts monitoring of light-footed Ridgway's rail on Base every 2 years. In addition, the Base Training Regulations/ Environmental Operations Map prescribe regulations and general precautions for range and training area users that limit impacts to this species by restricting activities in and adjacent to riparian habitat and nesting areas during the breeding season.

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

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

PHOTO 9 LEAST BELL'S VIREO

Camp Pendleton Distribution and Management

On Camp Pendleton, the least Bell's vireo breeds along rivers, creeks, and tributaries of the Santa Margarita River and Cristianitos, San Mateo, San Onofre, Piedra de Lumbre, Las Flores, Aliso, French, De Luz, Fallbrook, Pueblitos Canyon, Windmill Canyon, and Pilgrim creeks (Figure 3-10). The least Bell's vireo arrives at Camp Pendleton from mid-March to early April and generally leaves for its wintering ground in southern Baja California in late September, although individual birds may begin departing by late July (USFWS 1998b). Stragglers have been noted in October and November, and occasionally individuals overwinter in California (USFWS 1998b).

The vireo population in 2009 and 2010 was the largest recorded on Base over a 15-year period (1,013 and 1,068 territories, respectively), but decreased from 2011 (784 territories) to 2012 (636 territories). In 2021, biologists detected 659 territories, and the population remains stable. Least Bell's vireo banded on Base have been detected in other watersheds in the region, and Camp Pendleton is considered a source population for species recovery.

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

To achieve greater mission flexibility in the Santa Margarita River (including the ability to conduct limited military training, maintenance activities, and infrastructure projects), the plan calls for the maintenance of suitable least Bell's vireo habitat in the Santa Margarita River basin and other major drainages on Base; enhancement of degraded areas in these drainages; maintenance of the least Bell's vireo population at a minimum of 400 singing males; and promoting expansion of the population above the 1994 level of 22 singing males. In addition, the Base Training Regulations/ Environmental Operations Map prescribe regulations and general precautions for range and training area users that limit impacts to this species by restricting activities in and adjacent to riparian habitat during the breeding season.

Southwestern Willow Flycatcher (*Empidonax traillii extimus*)

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

PHOTO 10 SOUTHWESTERN WILLOW FLYCATCHER

Camp Pendleton Distribution and Management

On Camp Pendleton, transient willow flycatchers are found on the following rivers, creeks, and tributaries: Santa Margarita River, Newton Canyon, Hidden Canyon, Cristianitos, San Mateo, San Onofre, Piedra de Lumbre Creek, Las Flores, Aliso, French, De Luz, Fallbrook, Roblar, Windmill Canyon, and Pilgrim creeks (Figure 3-10). Transient willow flycatchers cannot be confirmed as the southern subspecies unless they are heard calling; however, it is assumed that many of the transient are southwestern willow flycatchers; therefore, nonbreeding transitory habitat is considered for impacts during project planning. Southwestern willow flycatcher breeding has been detected in the Santa Margarita River, Lake O'Neill, San Mateo Creek, and the Sierra Training Area ponds. In past years, the breeding population of southwestern willow flycatcher on Camp Pendleton has shown a precipitous decline between 2007 (16 established territories) and 2022 (zero established territories). The 10 territories in 2012 consisted of two polygynous pairs (two males and 10 females) limited to the lower Santa Margarita River. Since 2015, only one breeding male has been detected on Base, and in 2017 the Base detected zero flycatcher males for the first time. In response to potential extirpation of flycatchers from Camp Pendleton, Base biologists established three artificial seeps in the Santa Margarita River adjacent to recent breeding territories. The multiyear decline on Camp Pendleton is not well understood and is consistent with regional decline of this species in Southern California. The Base is investigating whether removal of settling ponds and/or implementation of water conveyance improvements that reduce seeps are contributing to decline via loss of access to perennial water through the breeding season.

The Base implements programmatic instructions and habitat enhancement measures specified in the Riparian Ecosystem Plan and the Riparian BO for the protection and management of southwestern

willow flycatcher (Appendix I), which include 100 percent nest monitoring and banding of chicks. The Base also conducts annual cowbird trapping and removal, and monitoring of flycatcher in accordance with the conservation plan and BO. In addition, the Base Training Regulations/ Environmental Operations Map prescribes regulations and general precautions for range and training area users that limit impacts to this species by restricting activities in and adjacent to riparian habitat during the breeding season. The Base is currently in consultation with USFWS regarding management of water resources, which is taking southwestern willow flycatcher habitat into consideration for improvement of seeps or other access to perennial water through the breeding season.

Yellow-billed Cuckoo (*Coccyzus americanus*)

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

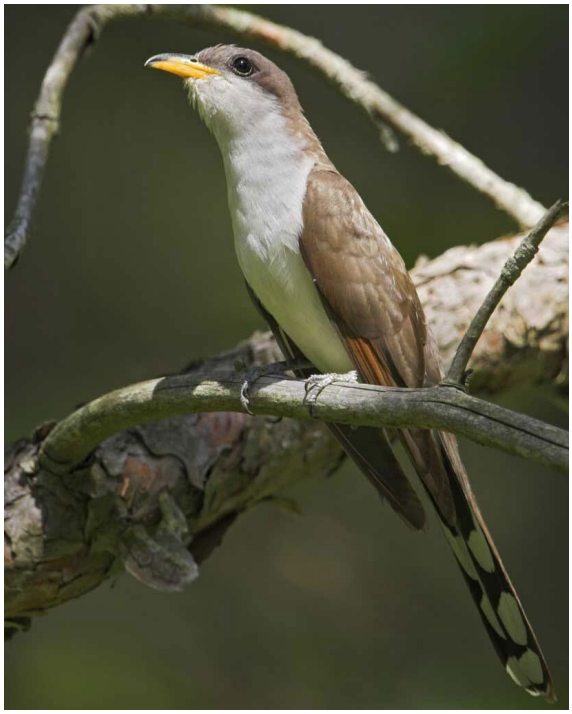


PHOTO 11 YELLOW-BILLED CUCKOO

Camp Pendleton Distribution and Management

The yellow-billed cuckoo is rarely detected on Camp Pendleton (Figure 3-10); however, focused surveys have not been conducted. The Santa Margarita River represents the largest block of intact riparian vegetation suitable for yellow-billed cuckoos to breed, although breeding has not been documented to date within Camp Pendleton. However, there is a potential for breeding and use of the Santa Margarita River for dispersal. Additionally, cuckoos may migrate through the Base, along various drainages and creeks. The yellow-billed cuckoo has only been recorded on Camp Pendleton on four occasions since 1980: (1) along the Santa Margarita River at the upper end of Ysidora Basin on 4–5 July 1984 (Unitt 2004); (2) along the Santa Margarita River at the upper end of Ysidora Basin on 7–11 July 2000 (Unitt 2004); (3) a carcass was recovered at the mouth of the Santa Margarita River on 25 June 2005 (Davenport 2012); and (4) yellow-billed

cuckoo calls were detected three times during gnatcatcher surveys along the Santa Margarita River at the De Luz Creek confluence on 18 July 2008 (Davenport 2012). Although focused surveys for yellow-billed cuckoo have not been conducted on Base, there were no incidental detections of breeding yellow-billed cuckoos during annual monitoring of the least Bell's vireo and southwestern willow flycatcher conducted in Camp Pendleton riparian habitat from 1988 to 2022. In 2023, two yellow-billed cuckoo were detected by USGS biologist conducting vireo surveys (Howell, S. pers. comm. June 2023). Additional emphasis on identifying and recording yellow-billed cuckoo occurrence in riparian areas was added to the least Bell's vireo annual monitoring effort in 2015 following listing.

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

Coastal California Gnatcatcher (*Polioptila californica californica*)

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

PHOTO 12 COASTAL CALIFORNIA GNATCATCHER

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

On Camp Pendleton, the coastal California gnatcatcher's distribution (Figure 3-11) is primarily within coastal sage scrub habitat, in areas of the Base with gradual slopes, with concentrations in the northern (State Parks), coastal, and southern (inland) portions of the Base (Hercules 2020). The Base has been conducting coastal California gnatcatcher (CAGN) surveys every 3 to 5 years since 1989 and the last survey was in 2019. These surveys suggest the

gnatcatcher population on Camp Pendleton can fluctuate substantially among years. However, methods often varied among surveys, so the amount of that fluctuation is not well measured.

A habitat assessment conducted in 2019 showed that approximately 19,734 acres of suitable gnatcatcher habitat occurs on Base (Hercules 2020). Since 2006, several wildfires have altered large expanses of high-quality coastal sage scrub habitat located in areas that typically supported large numbers of gnatcatchers on Base. Despite the loss of suitable habitat, many areas of vacant unoccupied habitat remain, and further investigation is needed to determine why gnatcatchers are not using these apparently suitable areas.

The Base has instituted measures for avoidance and minimization of impacts to the gnatcatcher and its preferred habitat, especially during the breeding season. The Base Training Regulations/ Environmental Operations Map prescribes regulations and general precautions for range and training area users that limit impacts to natural resources, including restrictions in foot traffic during the breeding season, keeping vehicle/equipment on existing roads, prohibiting digging (including construction of fighting positions) and distance restrictions to occupied CAGN habitat. Additionally, in 2022, the Base consulted on a gnatcatcher Recovery Crediting System through the REPI program (Section 2.6.2) that provides added training flexibility in Tango training area while providing assurances for gnatcatcher conservation at off-base sites (USFWS 2021). Management and conservation of California gnatcatchers on Base would benefit from a programmatic plan developed in collaboration with the USFWS. Camp Pendleton will produce a management plan for gnatcatchers and consult with the USFWS after finalizing plans for other listed species including fairy shrimp, Stephens' kangaroo rat, and Pacific pocket mouse.

Pacific Pocket Mouse (*Perognathus longimembris pacificus*)

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

Camp Pendleton Distribution and Management

Once thought extinct, the critically endangered Pacific pocket mouse has been detected on Base in the following three areas (Figure 3-12): the Oscar One, Oscar Two and Edson Range training areas (Santa Margarita population), east of the San Onofre housing area (South San Mateo population), and in the northwest corner of the Base between the Base boundary with the City of San Clemente and Cristianitos Road (North San Mateo population, currently extirpated).

PHOTO 13 PACIFIC POCKET MOUSE

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

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

Disturbances that include light military training and the creation of walking paths by trainers and biologists are detrimental to Pacific pocket mouse (USGS 2014b). This is likely much more of a

problem for Pacific pocket mouse occupying friable, sandy soils compared to PPM occupying harder clay soils because burrows in sandy soils are more easily crushed by foot traffic.

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

To promote conservation and recovery of Pacific pocket mouse, Camp Pendleton is committed to expanding the distribution and abundance of Pacific pocket mouse on and off Base. To promote PPM that are located off-Base, through REPI, the Base has provided funding for habitat management at Dana Point Preserve benefiting the PPM. On Base management includes the thinning and removal of vegetation at the south San Mateo population, which has promoted pocket mouse use in areas where they were not previously detected. Additional work to manage vegetation to benefit Pacific pocket mouse started at Oscar 1 in 2022 and is planned for Edson Range and south San Mateo. Weed treatment has started at Wire Mountain and San Mateo North to improve the conditions for a future translocation of pacific pocket mouse to establish a new population on Base. The Edson prescribed fire in 2020 reduced thatch and improved PPM habitat within over 900 acres at the Edson Range Impact area. Similarly, Camp Pendleton is planning the Edson Expansion Burn to remove additional grass thatch on twenty acres in Oscar 1 to benefit Pacific pocket mouse. Both of those prescribed fires were included in the MCB Camp Pendleton Wildfire Prevention Plan (MCBCP 2018). When conducted in training areas, many of these measures place temporary burdens on trainers including scheduling coordination and competing use of areas. However, the ultimate effect of this conservation work will provide benefits to training through compensation credit for unavoidable impacts of training on PPM.

The Base Training Regulations/ Environmental Operations Map prescribes regulations and general precautions for range and training area users that limit impacts to natural resources. In addition, the terms and conditions of the consultation and BO for the construction, operation, and maintenance of the Crucible Challenge Course in the Oscar One and Edson Range areas of Camp Pendleton, issued on 14 August 1996, provide monitoring and adaptive management for the Pacific pocket mouse population. The Base is also partnering with the San Diego Zoo, Institute for Conservation Research, and USFWS to sponsor a captive breeding program for the eventual establishment of new populations. The Base completed a Pacific Pocket Mouse Management Plan

in December 2019; as the Base implements actions described in this plan, Section 7 consultation is completed with the USFWS.

Stephens' Kangaroo Rat (*Dipodomys stephensi*)

PHOTO 14 STEPHENS' KANGAROO RAT

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

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

Camp Pendleton Distribution and Management

The western core population area consisted of occupied habitat located within Ranges 115, 225, 227, 407, 408, and 409, and along Roblar Road (Figure 3-12). Based on surveys conducted in 1996, the western core population area was estimated to contain approximately 470 acres of occupied Stephens' kangaroo rat habitat (USFWS 2011). The central core population area consisted of occupied habitat located within AFA 22 in Kilo One, AFA 23 and Combat Town in Kilo Two, and AFA 24 in south India and was estimated to contain approximately 103 acres (USFWS 2011). The eastern core population area located in the Juliet Area was estimated to contain approximately 110 acres (USFWS 2011).

As part of the Stephens' kangaroo rat management and conservation, the Base has funded on-going monitoring for Stephens' kangaroo rat. Monitoring for this species is conducted annually across the Base by the USGS to inform conservation and management. In 2005, USGS estimated that 148 acres of high suitability habitat was occupied by Stephens' kangaroo rat on Base; in 2006, they estimated 175 acres; in 2007, they estimated 323 acres; and in 2008, they estimated 364 acres. Thus, the greatest amount of occupied Stephens' kangaroo rat habitat estimated by USGS (i.e., 364

acres in 2008) is only about half of that estimated by Tetra Tech, Inc. in 1996 (USFWS 2011). It is possible that Stephens' kangaroo rat was more widely distributed in 1996 than in 2008, but it is also possible that different methods for calculating occupied habitat have generated different estimates.

In 1992, the Base created a conservation bank for Stephens' kangaroo rat in Juliet training area (Figure 3-12) after consultation with the USFWS. As compensation for range improvements at R-210E to the Base enhanced 24.4 acres of currently unoccupied, but potentially suitable, Stephens' kangaroo rat habitat occurring in the Juliet. A utility upgrade project in 1997 required the Base to expand the Stephens' kangaroo rat management area by 28.7 acres. Trapping results from 2019 detected 20 Stephens' kangaroo rats at the Juliet management area. The Base has periodically burned the Juliet area to reduce grass thatch with the most recent prescription burn occurring 2020. The Base also hires contractors to control weeds, seed native plants, and aerate compacted soils.

The Base Training Regulations/ Environmental Operations Map prescribes regulations and general precautions for range and training area users that limit impacts to natural resources including restrictions in large training exercises, keeping vehicle/equipment on existing roads, and prohibiting digging (including construction of fighting positions).

The Juliet Training Area is regularly used by military training per the Biological Opinions issued by the USFWS (USFWS 1992; USFWS 1997), however, periodically, restoration work may temporarily exclude trainers to protect newly planted areas until the young plants are established. Future projects may require deductions from the Juliet bank. REPI lands have and will also provide compensation for unavoidable impacts to Stephens' kangaroo rats range improvement projects R-409A, R-408, and R-407 series, as discussed in Section 2.6.2. As of 2023, through REPI the Base has provided funding that conserved SKR occupied Montecito Ranch contributing to species recovery and providing regulatory relief for training within installation SKR management areas. Camp Pendleton plans to complete and consult on a programmatic management plan for Stephens' kangaroo rat by 2028.

3.2.2.2 Federally Listed Plant Species

Brief species accounts for the five federally listed threatened or endangered plant species known to occur on the Base are provided below. More detailed species accounts are provided in Appendix J. For further species information, please refer to the USFWS' Environmental Conservation Online System available at http://ecos.fws.gov/ecp/. In the below discussion, populations for vernal pool endemic species (San Diego button-celery, spreading navarretia, and California Orcutt grass) are per occupied vernal pool, and populations for upland species (thread-leaved brodiaea and Encinitas baccharis) are per the 7-meter mapping rule. For example, all thread-leaved brodiaea plants that

are within 7 meters of each other would be considered one population. This definition of population was developed by the Base and represents a method to define boundaries of groupings of individuals and is not necessarily a biological distinction. An occurrence are all plants of the same species that are within a quarter-mile of each other. This definition of occurrence is the same as the California Natural Diversity Database's definition of Element Occurrence.

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

PHOTO 15 SAN DIEGO BUTTON-CELERY

San Diego button-celery is a perennial or biennial herb arising from a taproot, which occurs in vernal pools. San Diego button-celery historically ranges from as far north as Los Angeles County south to Lagunas Invernales in Baja California, Mexico. In the United States, San Diego button-celery has been detected in Los Angeles, Orange, Riverside, and San Diego counties. The Los Angeles County occurrence is believed to be extirpated.

The species is threatened region-wide by urbanization, foot traffic, off-road vehicles, insect herbivory, loss of pollinators, altered fire regimes, fragmentation, grazing, agriculture, invasive plants, climate change and drought, and watershed alteration (drainage).

Camp Pendleton Distribution and Management

San Diego button-celery has been found in 94 vernal pools (Figure 3-13) at Camp Pendleton that are located within 6 occurrences with 1,398,713 individuals and occupying 1.8 acres after the 2021 monitoring. San Diego button-celery occurs on the Base at 21 Area-Del Mar, White Beach Training Area, and Wire Mountain. The number of known occupied pools on the Base has increased over the years from one occupied pool detected in the 1980s, to an additional 54 pools in the 1990s, 11 additional pools in the 2000s, 18 additional pools in the 2010s, and 12 additional occupied pools in the 2020s.

San Diego button-celery is included in the Camp Pendleton Rare Plant Management Plan (MCBCP 2017). The goal for San Diego button-celery in the Rare Plant Management Plan is to manage San Diego button-celery populations to be self-sustaining with no net loss of occupied vernal pools as a result of anthropogenic causes. Management actions for San Diego button-celery include the following: 1) manage for no net loss of occupied vernal pools as a result of anthropogenic actions;

2) maintaining EOM restrictions; 3) Reduce the EOM buffer for federally listed plants from 164 feet to 16 feet; 4) remove thatch and invasive plants that impair pool hydrology; 5) maintain fences and Carsonite signage around all occupied vernal pools and determine areas where additional physical barriers for occupied pools are needed; 6) continue to ensure that topography and soils are not disturbed to result in altered hydrology and repair anthropogenic damages to pool hydrology; 7) establish six new populations in existing unoccupied pools and supplement existing populations in two currently occupied pools; 8) NEPA actions will require a 2:1 ratio of adding plants to existing unoccupied pools; and 9) provide all information gained from monitoring and management activities to USFWS to be incorporated into their formal 5-year review for this species.

The Rare Plant Management Plan lists four monitoring objectives: 1) use a sampling strategy over the life of the Plan to demonstrate that populations are self-sustaining and stable; 2) determine if the Range Regulations are being adhered to for the federally listed plants and whether human activity causes a significant decline or extirpation of any population; 3) determine whether human activity causes a significant decline or extirpation of populations of non-listed rare plants in this Plan not covered by the Range Regulations; and 4) monitor for success of new populations. The Rare Plant Management Plan has been implemented and the first year of monitoring began in 2019.

Since this species was listed, the Base has instituted measures for avoidance and minimization of impacts to vernal pools and all vernal pool species, including San Diego button-celery. The Base Training Regulations requires that military units and all personnel that access the Base ranges and training areas are in possession of the Base Environmental Operations Map (EOM). The EOM lists the following restrictions for vernal pools: (1) keeping bivouac/command post/field support activities at least 50 m from vernal pools year-round; (2) keeping vehicle/equipment on existing roads (foot traffic is authorized year-round); and (3) prohibiting digging (including construction of fighting positions).

Spreading Navarretia (*Navarretia fossalis*)

Spreading navarretia is a low, annual herb that occurs in vernal pools. Spreading navarretia ranges from as far north as San Luis Obispo County south to San Quintin in Baja California, Mexico. In the United States, Spreading navarretia has been detected in San Luis Obispo, Los Angeles, Riverside, and San Diego counties. Spreading navarretia abundance varies from year to year depending on precipitation and the saturation/drying time of the vernal pool soil. Similar to all annual plants, this year-to-year variation has a wide range of individuals from none to thousands. Spreading navarretia is threatened by urbanization, foot traffic, off-road vehicles, grazing, agriculture, invasive plants, climate change and drought, and watershed alteration (drainage).

Camp Pendleton Distribution and Management

On Camp Pendleton, spreading navarretia has been found in 61 vernal pools within 8 occurrences with 572,098 individuals and occupying 0.65 acre after the 2021 monitoring (Figure 3-13). Spreading navarretia occurs on Base at 21 Area-Del Mar, Oscar One Training Area, San Onofre Management Area, White Beach Training Area, and Wire Mountain. The number of occupied pools on the Base has increased over the years from one occupied pool in the 1980s, to an additional nine pools in the 1990s, eight additional pools in the 2000s, 25 additional pools in the 2010s, and 18 additional occupied pools in the 2020s.

PHOTO 16 SPREADING NAVARRETIA

Spreading navarretia is included in the Camp Pendleton Rare Plant Management Plan (MCBCP 2017). The goal for spreading navarretia in the Rare Plant Management Plan is to manage spreading navarretia populations to be self-sustaining with no net loss of occupied vernal pools as a result of anthropogenic causes. The management actions for spreading navarretia are the same as for San Diego button-celery mentioned above except for number 7. For spreading navarretia, 13 new spreading navarretia populations will be established in existing unoccupied pools. The monitoring objectives for spreading navarretia are the same as for San Diego button-celery. The Rare Plant Management Plan has been implemented and the first year of monitoring began in 2019.

The Base has instituted measures for avoidance and minimization of impacts to vernal pools and all vernal pool species, including spreading navarretia. The Base Training Regulations requires that military units and all personnel that access the Base ranges and training areas are in possession of the Base Environmental Operations Map (EOM). The EOM lists the following restrictions for vernal pools: (1) keeping bivouac/command post/field support activities at least 50 m from vernal pools year-round; (2) keeping vehicle/equipment on existing roads (foot traffic is authorized year-round); and (3) prohibiting digging (including construction of fighting positions).

California Orcutt Grass (*Orcuttia californica*)

According to the Consortium of California Herbaria, California Orcutt grass occurs in the California Central Valley (Glenn, Sacramento, Yolo, Stanislaus, and Madera counties), and in Southern California in Ventura, Los Angeles, San Bernardino, Riverside, Orange, and San Diego

counties. California Orcutt grass also occurs in Baja California, Mexico. Threats to California Orcutt grass include loss and degradation of its vernal pool habitat caused urban and agricultural development, grazing, herbivory, altered hydrology, off-road vehicle use, trampling, invasive plants, and climate change and drought.

PHOTO 17 CALIFORNIA ORCUTT GRASS

Camp Pendleton Distribution and Management

Currently, California Orcutt grass is only known from one vernal pool on the Base at the San Onofre Management Area (Figure 3-13), which is a vernal pool restoration site immediately north of the San Onofre Nuclear Generating Station. California Orcutt grass was discovered on the Base in June of 2020. To encourage the proliferation of the small population at that site Camp Pendleton provides protection from herbivory by rabbits and is coordinating with USFWS for future planting efforts at vernal pool conservation sites on Base to promote the conservation and recovery of this species.

California Orcutt grass will be added to the Rare Plant Management Plan. The management actions and monitoring objectives will be similar to the actions mentioned above for San Diego button-celery and spreading navarretia.

The Base has instituted measures for avoidance and minimization of impacts to vernal pools and all vernal pool species, including California Orcutt grass. The Base Training Regulations requires that military units and all personnel that access the Base ranges and training areas are in possession of the Base Environmental Operations Map (EOM). The EOM lists the following restrictions for vernal pools: (1) keeping bivouac/command post/field support activities at least 50 m from vernal pools year-round; (2) keeping vehicle/equipment on existing roads (foot traffic is authorized year-round); and (3) prohibiting digging (including construction of fighting positions).

Thread-leaved Brodiaea (*Brodiaea filifolia*)

Thread-leaved brodiaea is a perennial herb that typically blooms April through early June. The northernmost thread-leaved brodiaea occurrences are located in Los Angeles and San Bernardino counties. Thread-leaved brodiaea also occurs in Riverside, Orange, and San Diego counties to the south. There are no thread-leaved brodiaea occurrences in Mexico per The Flora of Baja California or the California Consortium of Herbaria websites. This species is highly influenced by rainfall and the observed number of plants can vary significantly depending on the amount of precipitation for the year.

PHOTO 18 THREAD-LEAVED BRODIAEA

Thread-leaved brodiaea is threatened by urbanization, foot traffic, off-road vehicles, firebreak and road maintenance, grazing, agriculture, invasive plants and thatch, climate change and drought, and possibly increased fire frequency.

Camp Pendleton Distribution and Management

Thread-leaved brodiaea is included in the Camp Pendleton Thread-Leaved Brodiaea Management Plan (MCBCP 2017) and distributed widely on Base (Figure 3-13). The overarching goal for thread-leaved brodiaea is to maintain or enhance existing occurrences to ensure multiple conserved occurrences with self-sustaining populations to increase resilience to environmental and demographic stochasticity, maintain genetic diversity, and ensure persistence over the long term. The three largest thread-leaved brodiaea occurrences were designated as thread-leaved brodiaea Management Units and are located within the Finch, Juliet, and Lima training areas. The thread-leaved brodiaea located within the three thread-leaved brodiaea Management Units and the three State Park Lease thread-leaved brodiaea occurrences remain under the existing range regulation protections and are displayed on the Environmental Operations Map, while the other 46 occurrences were released from training restrictions. The three thread-leaved brodiaea Management Units are also displayed on the Environmental Operations Map. The Environmental Operations Map lists the following restrictions for thread-leaved brodiaea occurrences that remain on the Environmental Operations Map and three Management Units: (1) keeping bivouac/command post/field support activities at least 50 m from thread-leaved brodiaea locations

and Management Units year-round; (2) keeping vehicle/equipment on existing roads (foot traffic is authorized year-round); and (3) prohibiting digging (including construction of fighting positions).

The Thread-Leaved Brodiaea Management Plan has three monitoring objectives for the plants within the Management Units: 1) within the three Management Units, demonstrate that thread-leaved brodiaea is self-sustaining; 2) monitor threats within the three Management Units; and 3) determine if high fire frequency is impacting or enhancing the plant within the Finch Management Unit. The Thread-Leaved Brodiaea Management Plan has two monitoring objectives for the plants located outside the Management Units: 1) monitor to prevent the loss of the occurrences located outside of the three Management Units and 2) monitor threats. As part of the Management Plan, all thread-leaved brodiaea will be monitored including mapping population extents, counting individuals and phenophases, and recording threats. All populations within the three Management Units are monitored annually and the populations outside the Management Units are on a 3-year rotation. However, the populations outside the Management Units will be visited annually for a threat assessment and a thread-leaved brodiaea presence/absence survey. The Thread-Leaved Brodiaea Management Plan has been implemented and the first year of monitoring began in 2019. In addition, through REPI, the Base proactively conserved Mauro Preserve with two Brodiaea populations that may offset impacts to Brodiaea on Base with future Section 7 consultation with the USFWS.

Encinitas Baccharis (*Baccharis vanessae*)

Encinitas baccharis is a low-growing perennial shrub that flowers generally in summer and fall. It occurs on coastal sandstones and rocky hillsides, often on unusual soil substrates. All 50 known occurrences of Encinitas baccharis are from San Diego County. Of the 50 occurrences, 35 are considered presumed extant, nine are possibly extirpated, and six are extirpated. Of the 35 extant occurrences, five occurrences are located at Camp Pendleton. In northern San Diego County, Encinitas baccharis also occurs in the Cleveland National Forest. Further south, Encinitas baccharis has been mapped in Carlsbad, San Marcos, Encinitas, vicinity of San Dieguito Regional Park, Del Mar, Escondido, Rancho Santa Fe, 4S Ranch, Miramar Peak, Poway, Gibson Highlands Preserve, and Otay Mountain Wilderness Area.

The species is threatened by urbanization, hillside agriculture, fuel reduction activities (e.g., disking, brush removal, and thinning), altered fire regimes, road maintenance, utility pole/line maintenance, invasive plants, and climate change and drought.

Camp Pendleton Distribution and Management

PHOTO 19 ENCINITAS BACCHARIS

The first specimens found on Base were discovered when conducting the San Diego Plant Atlas Inventories in the Delta Training Area during September 2013. Prior to conducting the inventories, this species was not known to occur on Base. As a result of the findings, the Base initiated surveys for Encinitas baccharis in August 2015. Surveys to date at Camp Pendleton have found 218 individuals, 40 populations, and five occurrences (Figure 3-13). All Encinitas baccharis plants detected on the Base are located in the Delta Training Area in generally undisturbed chaparral habitat, an area with very rugged terrain adjacent to the Cleveland National Forest San Mateo Canyon Wilderness Area. Additional plants occur just off-Base within the Cleveland National Forest.

Encinitas baccharis is included in the Camp Pendleton Rare Plant Management Plan (MCBCP, 2017). The goal for Encinitas baccharis in the Rare Plant Management Plan is to inventory all potential habitat and collect distribution, abundance, ecological, and natural history data for Encinitas baccharis within 5 years for the purpose of developing management recommendations and to manage for no net loss of populations as a result of anthropogenic causes. Management actions for Encinitas baccharis include the following: 1) maintain EOM restrictions; 2) reduce the EOM buffer for federally listed plants from 164 feet (50 meters) to 16 feet (5 meters); 3) inventory all potential habitat on-Base by Year 5 of this Plan, if funded; 4) re-inventory burned chaparral the second or third year after a wildfire; 5) collect phenology, age class, and sex ratios during the inventories; 6) develop and refine inventory and monitoring methods during the first 5 years of implementing this Plan; 7) develop a study to determine effects of wildfire on the species by the Year 5 of this Plan. Implement if a wildfire moves through occupied habitat; 8) require bio-monitors for road maintenance, fire break grading/disking, and utility line/pole maintenance in occupied habitat; 9) provide all information gained from inventorying and phenology data collection to USFWS to be incorporated into their formal 5-year review for this species; and 10) require a 2:1 mitigation ratio for NEPA projects. The monitoring objectives for Encinitas baccharis are the same as for San Diego button-celery.

The Base has instituted measures for avoidance and minimization of impacts to federally listed plant locations, including Encinitas baccharis. The Base Training Regulations requires that military units and all personnel that access the Base ranges and training areas are in possession of

the Base Environmental Operations Map (EOM). The EOM prescribe regulations and general precautions for range and training area users that limit impacts to this species by restricting activities in and adjacent to Encinitas baccharis.

3.2.2.3 Marine Species and Essential Fish Habitat

The Base is situated along the Pacific Ocean with 17 miles of coastline, and actively manages federally listed species inland from the mean-high tide line. Military training actions in the ocean, extended from the mean-high tide line out, are under the jurisdiction of the U.S. Navy. Camp Pendleton does not actively manage marine species covered under ESA or the MMPA, as they are transitory, and do not breed, forage, or rest on Camp Pendleton other than occasional strandings. However, a limited amount of Essential Fish Habitat (EFH) occurs offshore or within the Boat Basin of Camp Pendleton and is monitored and protected by the Base.

Sea Turtles

Off the shores of Camp Pendleton, potentially loggerhead sea turtle, green sea turtle (species account in Appendix J), olive ridley sea turtle, and leatherback sea turtle transit and forage along the coastline. Should sea turtles begin using Camp Pendleton beaches (e.g., resting), Camp Pendleton will be committed to monitoring and management. Future management actions could include: protecting and restoring seagrasses, including eelgrass, and marine algae; providing protection while turtles are resting on beaches and in the ocean; improving fishing gear to reduce bycatch and entanglement; and conducting surveys to monitor populations, foraging habits and tracking individuals to collect data on growth and age to maturity. Aboard Camp Pendleton, there are Standard Operating Procedures (SOP) for strandings of turtles on beaches. Stranded turtles are reported to NMFS, and, as necessary, to SeaWorld® San Diego for rehabilitation. Additionally, large scale ship-to-shore military exercises are often required to have a "spotter" for sea turtle and marine mammal boat strike avoidance; conservation measures for those exercises are determined by the U.S. Navy lead, in consultation with NFMS.

Marine Mammals

Off the shores of Camp Pendleton, marine mammals – including pinnipeds and cetaceans - transit and forage along the coastline (Appendix F). Marine mammals are generally not known to use beach or estuarine habitats along Camp Pendleton's coast except when stranded. However, the presence of cetaceans and pinnipeds is fairly common offshore. Approximately 30 known species of cetaceans are found off the coast of southern California. However, abundance and diversity of cetaceans along the south coast can vary depending on continental slope, upwelling, and mixing of four different water masses on a seasonal and interannual basis (Leatherwood et al. 1987;

Carretta et al. 2006). Cetacean species include toothed whales or odontocetes, such as sperm whales, beaked whales, dolphins, and porpoises. Baleen whales or mysticetes include six rorqual species, the northern right whale (*Eubalaena glacialis*), and the California gray whale (*Eschrichtius robustus*). Off Camp Pendleton's coast, six species of cetaceans occur in moderate to high numbers, either regularly or seasonally. These include the California gray whale, short-beaked common dolphin (*Delphinus delphis*), long-beaked common dolphin (*Delphinus capensis*), the coastal and offshore stocks of the bottlenose dolphin (*Tursiops truncatus*), Risso's dolphin (*Grampus griseus*), and Dall's porpoise (*Phocoenoides dalli*). Of the pinnipeds that regularly occur off the coast of southern California, only the Pacific harbor seal (*Phoca vitulina richardii*) and California sea lion (*Zalophus californianus*) are likely to occur off Camp Pendleton, though in small numbers. Camp Pendleton does not own or manage open ocean habitat.

Camp Pendleton gets occasional strandings of individuals and follows internal Standard Operating Procedures (SOP) for strandings on beaches. For example, Camp Pendleton works with Sea World to grant them access and safely capture wounded or sick pinnipeds. Occasionally, marine mammals utilize the Del Mar boat basin, but Environmental Security staff has not recently conducted much wildlife conflict management with marine mammals. In May of 2022, a juvenile gray whale was found in the boat basin and adjacent Oceanside Harbor for approximately one week (this is the first report on record of a whale in the boat basin in the last twenty years to Environmental Security staff). Environmental Security staff worked with the U.S. Navy to use their training guidelines and offsets for Camp Pendleton military training and reported the whale to NOAA Fisheries. Camp Pendleton remained in compliance with MMPA.

Should marine mammals begin routinely using Camp Pendleton beaches (e.g., resting) or wildlife conflict increases, Camp Pendleton will be committed to monitoring and management. To comply with the Marine Mammal Protection Act, offshore training adheres to protection measures emplaced by the U.S. Navy.

Essential Fish Habitat

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

Camp Pendleton monitors the EFH along the coastline of the Base through their estuary monitoring and nearshore surveys and inventories. If project or training impacts are projected to occur to EFH, the Base carries out consultation with NOAA Fisheries.

3.2.2.4 Species of Special Concern

Wildlife

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

Plants

Camp Pendleton has a total of 79 sensitive plant species that have been ranked to identify if they may require special surveys and/or management using the California Native Plant Society (CNPS) California Rare Plant Ranking System (formerly known as CNPS lists). The heart of the California Rare Plant Ranks (CRPR) is an assessment of the current conservation status of each of California's rare, threatened, and endangered plants, with an emphasis on plants that are rare in California. See Appendix K for a list of the California rare, threatened, and endangered plants mapped on Base along with their CNPS, state and global ranking, and a summary of the number of individuals, populations, and occurrences recorded on Base. The Base manages sensitive plant species through rare plant inventories, monitoring, and various data collection. Focused surveys and management are conducted for Pendleton button-celery (*Eryngium pendletonense*), Brand's phacelia (*Phacelia stellaris*), and Nuttall's acmispon (*Acmispon prostratus*). All potential on-Base habitat for Brand's phacelia and Nuttall's acmispon has been surveyed. In the below discussion, a population is defined as all plants of the same species that are within 4-meters of each other for Brand's phacelia, and 7-meters of each other for Pendleton button-celery and Nuttall's acmispon. An occurrence are all plants of the same species that are within a quarter-mile of each other.

Pendleton Button-Celery (*Eryngium pendletonense*)

PHOTO 20 PENDLETON BUTTON-CELERY

Pendleton button-celery is included in the Camp Pendleton Rare Plant Management Plan (MCBCP 2017). The goal for Pendleton button-celery in the Rare Plant Management Plan is to maintain self-sustaining populations in the long term, reduce encumbrances to military training, maintain Pendleton button-celery distribution and abundance through monitoring and active planting if populations are lost due to military training. Management actions within the Rare Plant Management Plan for Pendleton button-celery include the following: 1) manage invasive species that are impairing Pendleton button-celery; 2) if a population is lost due to training or other anthropogenic reasons, the population will be replaced; 3) 10 new Pendleton button-celery populations with at least 10 individuals each will be established by Year 5 of the Plan to offset potential losses; 4) use ongoing wildfire mapping database to investigate the connection between fire and observed populations, while considering the influence of varying precipitation, and if populations are found negatively affected by fire, then adjust future management to address this threat; 5) include this species in NEPA assessments to avoid, if possible, and if plants cannot be avoided, they will be replaced at a 1:1 ratio; and 6) reanalyze the species using the Five-Point Policy at Year 10 to determine if it continues to support the species not being federally listed.

The Rare Plant Management Plan has the following three monitoring objectives for Pendleton button-celery: 1) use a sampling strategy over the life of the Plan to demonstrate that populations are self-sustaining, and stable; 2) determine whether human activity causes a significant decline or extirpation of populations of non-listed rare plants in this Plan not covered by the Range Regulations; and 3) monitor for success of new populations. Monitoring includes visiting all known populations every other year. During the monitoring visits, the population extents will be mapped, the individuals, phenophases, and age classes will be counted, and the threats will be assessed. Phenology and age class data is collected for 20 percent of the populations each year and all populations will have this data collected by the end of Year 5 of this Plan. The Rare Plant Management Plan has been implemented and the first year of monitoring began in 2019.

Brand's phacelia (*Phacelia stellaris*)

Brand's phacelia was removed as a candidate for federal listing by USFWS on 22 November 2013 following development and signature of a Candidate Conservation Agreement (CCA) between the USFWS, Camp Pendleton, Naval Base Coronado, U.S. Customs and Border Protection, and California State Parks (July 2013). An updated CCA was signed in January 2022. Commitment to the conservation actions proposed in the CCA reduces threats to the species, which has since been removed from the USFWS list of candidate species. However, monitoring and management strategies continue to protect this species on Camp Pendleton. Brand's phacelia was first documented on Base in 1993; at that time, 88 plants were found within a 484-square-foot area of the back dune north of the Santa Margarita River outflow. Currently, Brand's phacelia occurs within a roughly 0.34-acre area in the same location and over 103,936 individuals have been documented (2020) at the peak of the population. In 2021, botanists detected 22,862 individual plants during a below average rainfall year. An increase in occurrence distribution is most likely the result of recent dune restoration efforts and because the range of this species on Base occurs within an area protected and fenced for the federally and state-listed endangered California least tern. Monitoring the known populations detected nearly a third fewer plants in 2015 (2,532) than in 2014 (3,252) but with the same number of occurrences and populations. However, although there were fewer individuals, the extent of the area occupied was larger. Annual plants are dependent on yearly weather patterns and the lower numbers were probably due to the severe drought being experienced in the region.

Nuttall's acmispon (*Acmispon prostratus*)

Nuttall's acmispon is a native annual included in the CNPS Inventory of Rare and Endangered Plants on List 1B.1. It primarily occurs in beaches and coastal scrub habitats. At Camp Pendleton, Nuttall's acmispon is known to occur on the coastal area at the southern end of the Base, adjacent to the Del Mar South Jetty and within the Blue Beach Training Area. A total of 81,599 individuals, occupying 14.93 acres, have been observed on Base after the 2021 surveys, and new surveys are ongoing in 2023.

3.2.3 Critical Habitat

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

provides adequate special management or protection to obviate the need for critical habitat designation as follows:

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

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

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

While Camp Pendleton developed its management programs and INRMP to focus on ecosystems on the Base, both the Riparian Ecosystem Conservation Plan and the Estuarine and Beach Ecosystem Conservation Plan were developed in coordination with USFWS and finalized with the

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

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

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

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

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

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

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

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

3.2.3.4 Designated Critical Habitat

As of 2023, critical habitat has been designated by USFWS for 12 of the 19 federally listed species (Table 3-10) known to occur on Camp Pendleton. However, the Base is exempted/excluded or no designation proposed in the Federal Register from final critical habitat designation for all 12 species; note, 11 species are under regulation of the USFWS, with the southern California steelhead under NOAA Fisheries purview.

TABLE 3-10 CRITICAL HABITAT DESIGNATION FOR LISTED SPECIES ON CAMP PENDLETON

Species	Federal Register # (Date) for Final Critical Habitat Designation, including Revisions	Acres on Camp Pendleton
San Diego Button-celery	None	--
Spreading Navarretia	70 FR 60658 (18 October 2005) and 75 FR 62192 (10 June 2009)	2005: 0 (Exempted) and 2009: 0 (Exempted)
Thread-leaved Brodiaea	70 FR 73820 (13 December 2005) and 76 FR 6848 (8 February 2011)	2005: 0 (Exempted) and 2011: 0 (Exempted)
Encinitas Baccharis	None	--
California Orcutt Grass	None	--
California Least Tern	None	--
Coastal California Gnatcatcher	65 FR 63680 (24 October 2000) and 72 FR 72010 (19 December 2007)	2000: 0 (Exempted) and 2007: 0 (Exempted)
Least Bell's Vireo	59 FR 4845 (2 February 1994)	0 (Exempted)
Light-footed Ridgway's Rail	None	--
Southwestern Willow Flycatcher	62 FR 39129 (21 August 1997), 70 FR 60886 (19 October 2005) and 78 FR 344 (3 January 2013)	1997: 0 (Exempted), 2005: 0 (Exempted) and 2013: 0 (Exempted)
Western Snowy Plover	64 FR 68508 (7 December 1999), 70 FR 56970 (29 September 2005) and 77 FR 36727 (19 June 2012)	1999: 0 (Exempted), 2005: 0 (Exempted) and 2012: 0 (Exempted)[1]
Yellow-billed Cuckoo[2]	86 FR 20798 (21 April 2021)	0 (None Proposed)
Pacific Pocket Mouse	None	--
Stephens' Kangaroo Rat	None	--
Southern California Steelhead[3]	70 FR 52488 (2 September 2005)	0 (Excluded)

Species	Federal Register # (Date) for Final Critical Habitat Designation, including Revisions	Acres on Camp Pendleton
Tidewater Goby[4]	65 FR 69693 (20 November 2000), 73 FR 5920 (31 January 2008) and 78 FR 8745 (6 February 2013)	2000: 0 (Exempted), 2008: 0 (Exempted) and 2013: 0 (Exempted)
Arroyo Toad	66 FR 9414 (7 February 2001, corrected in 66 FR 13656, 7 March 2001), 70 FR 19562 (13 April 2005), and 76 FR 7245 (9 February 2011)	2001: Acreage not specified but State Parks lease and Agricultural leases were included as critical habitat[5], 2005: 0 (Exempted)[6], and 2011: 0 (Exempted)
Riverside Fairy Shrimp	66 FR 29384 (30 May 2001), 70 FR 19154 (12 April 2005), and 77 FR 72069 (4 December 2012)	2001: 770 acres[7] 2005: 0 (Exempted), and 2012: 0 (Exempted) [8]
San Diego Fairy Shrimp	66 FR 29383 (30 May 2001), 70 FR 19153 (12 May 2005), and 72 FR 70647 (12 December 2007)	2001: 770 acres[7] 2005: 0 (Exempted), and 2012: 0 (Exempted)

FR = Federal Register

1 77 FR 36727 states that critical habitat for western snowy plover on the State Parks lease on Camp Pendleton is exempted because "CDPR is required to conduct its natural resources management consistent with the philosophies and supportive of the objectives in the revised 2007 INRMP".

2 Camp Pendleton was omitted within the federal register altogether in the discussion of critical habitat, presumably since breeding has not been verified on Base.

3 The Base was excluded from critical habitat designation by NOAA Fisheries because they concluded that, as implemented, the INRMP provides conservation benefits greater than or equal to what would be expected to result from an ESA Section 7 consultation. NOAA Fisheries also concluded that the Base was to be excluded due to potential impacts on national security.

4 Critical Habitat (CH) designation for southern tidewater goby has not yet been determined; this table show CH exemption for tidewater goby vice southern tidewater goby.

5 66 FR 9414 arroyo toad critical habitat exclusion does not include that part of Camp Pendleton leased to the State of California and included within San Onofre State Park (including San Mateo Park) and those agricultural leased lands adjacent to San Mateo Creek since a final INRMP wasn't in place in 2001.

6 66 FR 13656 states that critical habitat for arroyo toad on the State Parks lease on Camp Pendleton is exempted "because they are within the area covered by Camp Pendleton's INRMP".

7 66 FR 29384 and 66 FR 29383 included 770 acres on Camp Pendleton as critical habitat because the INRMP was not completed by the time of designation. Areas that were included were those not used for military training: vernal pool complexes in the Wire Mountain Housing Area, within the Cockleburr Sensitive Area, and lands leased to the State of California and included within San Onofre State Park.

8 77 FR 72069 states critical habitat for Riverside fairy shrimp on the State Parks lease on Camp Pendleton is exempted because "lessees are required to manage the natural resources on the lands leased for their use consistent with the philosophies and supportive of the objectives of the MCB Camp Pendleton INRMP"; and the lessees are

required to generate and submit a natural resources management plan for their leased lands for approval by the Base within 1 year of establishment of their lease or renewal.

3.2.4 Invasive/Nonnative Species (Exotics)

Although Camp Pendleton supports much high-quality habitat for many species, invasive and other nonnative species are found in all ecosystems on Base.

3.2.4.1 Animals

Exotic animals may pose a threat to native species and communities on Camp Pendleton (e.g., competitively excluding native species, altering the habitat in a manner that favors other exotics, predation, nest parasitism, disease, etc.). The introduction and spread of invasive nonnative animals has been particularly prevalent in riparian and aquatic habitats on Camp Pendleton (USDA 1999). Nonnative birds and aquatic species can be both invasive and damaging to natural ecosystems and specifically to federally listed species. Nonnative invasive animals have the potential to cause vast ecological and economic damage (e.g., flooding by beaver dammed rivers). Potential adverse impacts caused by invasive animal species include:

- A decrease in biodiversity of native communities as a result of competitive exclusion, and disease;
- A reduction in habitat quantity and quality for native species (including threatened, endangered, and sensitive species) through the alteration of forage, shelter requirements, and water availability/quality;
- Direct predation or parasitism of native species; and
- The impairment of ecosystem functions as a result of increased soil erosion, stream sedimentation, clogged waterways, altered nutrient cycling, and increased flooding.

The most harmful animal species on Camp Pendleton and ones that the Base actively manages – not including those addressed in Section 3.2.4.3 – are the following: brown-headed cowbirds, bullfrogs, crayfish, beavers, and centrarchid fishes. These nonnative species alter ecosystems for native species, are believed to have displaced some native species in the region, directly predate native species, or conduct brood parasitism.

3.2.4.2 Plants

Over 1,800 nonnative plant species have become naturalized in California wildlands since the late 1700s when European settlement began (Cal-IPC 2006). Of the 2,447 vascular plant species documented in San Diego County, 758 (31 percent) are non-native and naturalized (Rebman and

Simpson 2014). The plants of Camp Pendleton are represented by 131 families, 519 genera, 1,074 species, and 1,132 taxa including subspecies and varieties.

Of the 1,132 plant taxa documented (vouchered) on Base, 384 (34 percent) are nonnative to California. While many of these nonnative plants have caused little impact to the environment, others can be both invasive and damaging to natural ecosystems. Nonnative invasive plants have the potential to cause vast ecological and economic damage, and sometimes pose human health impacts in infested areas. Potential adverse impacts caused by invasive plant species include:

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

Most of the plants that occur on Camp Pendleton are considered native to the region (Table 3-11), but as many as 34 percent are nonnative, and often are invasive species introduced during the period of European settlement. These nonnative species are believed to have displaced some native plant species in the region. A comprehensive list of the native and nonnative plant species documented on Base as of 2021 is in Appendix L.

TABLE 3-11 NUMBER OF NATIVE AND NONNATIVE PLANT SPECIES AT CAMP PENDLETON, GROUPED BY GROWTH FORM

Growth Form	# Native Species	# Nonnative Species	TOTAL
Forb	472	201	673
Grass	94	82	176
Half-shrub	28	9	37
Shrub	108	33	141
Tree	16	43	59
Tree/Shrub	1		1
Vine (Forb)	21	11	32
Vine (Shrub)	8	5	13
Total	**748**	**384**	**1,132**

3.2.4.3 Forest Diseases and Pests

Southern California has nonnative tree pests that threaten forest and ornamental trees. Camp Pendleton is currently monitoring for goldspotted oak borer (GSOB, *Agrilus auroguttatus*), invasive shot hole borers (ISHB, *Euwallacea* sp.), and South American palm weevil (SAPW, *Rhynchophorus palmarum*). There are also several native forest pests and diseases that kill trees that are drought stressed, including the 5-spine Ips bark beetle (*Ips paraconfusus*) and the golden oak pit scale (*Asterodiapsis variolosa*).

GSOB is an insect pest that was first detected in San Diego County in 2004 where it has caused extensive mortality in coast live oak, canyon live oak (*Quercus chrysolepis*), and California black oak (*Quercus kelloggii*) (USFS 2010) and is a major potential threat to the oak woodland community at Camp Pendleton. GSOB primarily attacks red oak species and causes mortality in trees larger than 5 inches in diameter. White oak species such as Engelmann oak are less susceptible to attack and, to date, no mortality has been detected in white Engelmann on Base (Lawson 2015).

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

South American palm weevil has extended its range relentlessly from South America, through central America, and has now invaded southern California. It prefers to attack Canary Island palms (*Phoenix canariensis*) by laying it eggs in the newly developing tops of the palms. Larvae of the SAPW feed on the crown of the palm and destroy young fronds before they can develop, which eventually kills the plant. Canary Island palms grow as ornamental trees, and they sporadically invade wildlands. Environmental Security is monitoring for SAPW on Base but will not act to contain SAPW when they are detected, because the weevils only attack nonnative palms.

Ips bark beetles live in and feed on the phloem in the inner layer of bark on trees and particularly attack pine and spruce. They usually inhabit dead, dying, and stressed trees, including fallen trees, cut logs, and slash. They can be found in trees already damaged by drought, lightning, human activity, or pest infestation. The California 5-spined Ips occurs from southern Oregon to southern

California west of the summit of the Cascade Mountains and Sierra Nevada. All species of pines within this range may be attacked (University of Georgia 2015).

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

3.2.4.4 Bison

In 1973, plains bison (*Bison bison*) were introduced onto Camp Pendleton as a gift from the San Diego Zoo because of limited space at the San Diego Zoo (Lee 2008). Between 1973 and 1979 as part of this release program, 14 bison were presented to Camp Pendleton. From 1979, the bison herd grew from 14 to approximately 85-95 individuals, according to recent in-house surveys in 2023.

Most of California is not part of the bison's original range. The San Diego Natural History Museum, however, has 11 fossil records of an extinct species of bison that lived in the area about 100,000 years ago. The climate was likely much wetter and had more grasslands during that period (Lee 2008). Therefore, bison are considered non-native to Camp Pendleton.

Camp Pendleton completed a Bison Management Plan in 2015 (MCBCP 2015c) to support monitoring and management of the population. Maintaining a small conservation herd of bison on Base supports the United States Marine Corps' commitment to land stewardship without impeding the training mission. Effective bison conservation requires an interstate and multiagency effort that includes herds on federal lands. Maintaining a sustainably sized bison herd on Base where it can provide ecological value in natural grasslands will contribute to the broader goal of bison conservation while supporting the Base's goals for ecosystem management. The bison herd is not intensively managed, and it is one of only two bison conservation herds in California; the other herd is on Santa Catalina Island (Gates et al. 2010). Management of bison on Base includes: monitoring the herd's size, growth rate, sex composition, and age structure; hazing bison away from ranges that are actively firing and away from Basilone Road when traffic is heavy; euthanizing badly injured animals; and collecting samples for disease and genetic screening from dead animals.

3.2.5 Habitat Linkages and Wildlife Corridors

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

While Camp Pendleton may be large enough to serve as a core area and maintain self-sustaining populations of some species for a reasonably long period of time, the long-term sustainability of most species (both within the region and on Base) will likely be threatened if habitat linkages between the Base and surrounding preserved natural areas are removed by development projects. Many of the open space areas within and adjacent to Camp Pendleton to the northeast within the Cleveland National Forest are generally large enough to support varied and abundant resident plant and wildlife populations and provide for unrestricted movement between the Base and adjacent open space lands. Also, the large habitat areas on Base generally allow unrestricted access to the north toward permanently designated open space areas of the Cleveland National Forest, Casper's Wilderness Park, O'Neill Regional Park, Rancho Mission Viejo Land Conservancy, and Thomas F. Riley Wilderness Park.

While there are preferred travel routes and landscape features that larger and more mobile wildlife species may use to move within and between permanent open space areas, wildlife "corridors" have not been formally studied and documented within the open space habitat areas on Camp Pendleton nor surrounding the Base, except for the Santa Ana – Palomar Mountain Linkage (see Section 1.8.3). This is essentially because Camp Pendleton and adjacent, permanently designated open space areas (parks and national forests) have generally not been constrained or reduced to the point of artificially creating or necessitating development of wildlife corridors. However, current and future development is planned for many of the areas between open spaces such as parks and national forests. Open spaces remaining on Camp Pendleton and will become more important as wildlife corridors that can assist species respond to a changing climate. On Base, the USMC will manage lands to ensure no net loss to training capability while conserving movement corridors for wildlife.

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

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

CHAPTER 4.0
NATURAL RESOURCES MANAGEMENT

This chapter presents the natural resources management programs for Camp Pendleton. The primary drivers for each program are summarized, as well as other background information applicable to the program (e.g., responsible entities, relevant ecosystems, and program background). Each program presented in this chapter includes one or more elements that address specific management components of the program. Each program and element has a goal, and each element includes one or more objectives intended to meet program and element goals. Goals are broadly visionary, ideal, and provide long-term guidance in defining direction and purpose of the program. Objectives provide a more concise statement of what must be achieved to meet program and element goals. Finally, specific actions were developed to support each objective that is identified in this chapter. Actions represent specific efforts (in-process single events or periodic and ongoing) that are implemented or are proposed by the Base to support each natural resources management program. In addition to outlining the specific programs, elements, and associated goals and objectives, this chapter summarizes the actions required for the success of each natural resources management program. Refer to Appendix M for a complete list of actions planned for the current INRMP term (i.e., 2023-2028).

Furthermore, implications and strategies of climate-related impacts and vulnerabilities detailed in Chapter 2 will be addressed in this chapter. As outlined in Appendix B and DoD 2019 (the "INRMP adaptation planning process"), the implications of climate change ("step 3") to the INRMP's program elements and potential strategies ("step 4") to reduce these climate risks will be outlined. The spatial scope for addressing climate-related issues at the installation (20, 30, 50 years) is much greater than 5-year cycle of the INRMP; that being said, steps can be taken now on a small scale to start assessing and addressing these impacts. This first step on focusing on natural resource-related goals, as climate impacts and risk increase, could have further implications on the installation's ability to meet its core military training requirements (DoD 2019). Note that this iteration of the INRMP is the Base's first attempt in identifying these vulnerabilities and solutions, with future iterations of the INRMP to become more robust when addressing climate change. The next five years of the INRMP cycle will implement climate adaptation actions and projects ("step 5") and monitor and adjust these actions ("step 6"); steps 5 and step 6 will not be further addressed in this INRMP.

As climatic conditions change, one of the most obvious challenges and risks will be related to threatened and endangered species management as it becomes more costly and difficult to sustain populations and as new species get listed (DoD 2019). This could add higher regulatory

compliance costs and restrictions to the military mission. DoDD 4715.21 ("Climate Change Adaptation and Resilience"; DoD 2016) defines climate adaptation as the process of adjusting to the changing environment "in a way that effectively uses beneficial opportunities or reduces negative effects". Actions named below for this 5-year INRMP cycle (and in Appendix B) potentially add to our knowledge and begin the process of mitigating climate risks.

4.1 THREATENED, ENDANGERED, AND RARE SPECIES PROGRAM

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

Camp Pendleton's philosophy is that natural resource management should be ecosystem based, with special emphasis on managing federally threatened and endangered wildlife/plant species and their habitats to assist in the conservation and recovery of those species. The Threatened, Endangered, and Rare Species Program addresses management of species afforded protections under the ESA (i.e., federally listed species) as well as species of concern. Species of concern are defined broadly to include plant and wildlife species afforded protections under other federal laws (e.g., MBTA, BGEPA); California Endangered Species Act (CESA), California Department of Fish and Wildlife (CDFW) Species of Concern; and other species that are regionally rare or of limited distribution (see Chapter 3.2.2.4 Species of Special Concern).

This program is driven primarily by the requirements of MCO P5090.2A CH 4 (USMC 2018) and DoDM 4715.03 (DoD 2018b). Chapter 11 of MCO P5090.2A CH 4 states the following:

> "3. Fish and Wildlife Management a. Endangered Species (1) Each installation shall survey and take other appropriate actions to document the presence of candidate species and endangered or threatened species on the installation and identify their currently used and periodically-or indirectly used habitats. Each installation shall assist FWS in determining whether any such habitats may be included or excluded from critical habitat designation. Each installation shall also survey and take other appropriate actions to document the presence of state or territory rare and endangered species."

DoDM 4715.03 further requires INRMPs to incorporate inventory, monitoring, and management of ESA listed species and agreed-upon elements of specific ESA consultations. Camp Pendleton regularly consults with United States Fish and Wildlife (USFWS) or National Oceanic and Atmospheric Administration (NOAA) Fisheries to ensure that Marine Corps actions (i.e., proposed species and habitat management actions or proposed construction projects and related operations and maintenance actions) are not likely to jeopardize the continued existence of any endangered

or threatened species and are within compliance with Sections 7 and 9 of the Endangered Species Act (ESA). Pursuant to Section 7 of the ESA, federal agencies such as the Marine Corps must consult with USFWS or NOAA Fisheries if their action may affect a federally listed endangered or threatened species (50 Code of Federal Regulations [C.F.R.] 402). Such consultations may be formal or informal. When required by Section 7 of the ESA, Camp Pendleton prepares a Biological Assessment (BA) of the effects of a proposed action on listed species. Section 9 of the ESA prohibits the "take" of a threatened or endangered species. Take includes the direct killing, harming, or harassing of a species, or destruction of habitat that may be important for the species' survival or recovery. Additionally, Section 10 permits are required by biologists performing many of the natural resources monitoring and research efforts under Section 7(a)1 of the Act.

The Threatened, Endangered, and Rare Species Program is implemented by Camp Pendleton's Resource Management Branch and includes all ecosystems occurring on Base. Beyond management of federally listed species, Camp Pendleton also monitors non-federally listed species of concern under this program to better understand the distribution and abundance of these species and assist with management that promotes conservation of the species at an appropriate level that may preclude federally listing status.

The program is organized into two elements as discussed in Sections 4.1.1 and 4.1.2, respectively: (1) ESA Listed Species Management Element and (2) Regional Species Management Element. These elements and their associated goals and objectives are discussed further in the following subsections.

4.1.1 ESA Listed Species Management Element

- ELEMENT GOAL: Adaptively manage sustainable populations of federally threatened and endangered species to achieve conservation goals and promote their recovery under ESA while providing maximum training flexibility.

Camp Pendleton maintains sufficient habitats to sustain existing populations of listed animals while also allowing for potential growth of those populations. The Marine Corps recognizes the importance of maintaining natural landscapes, wherever possible, as a mission-essential element in training and views effective conservation and management of natural resources to assist in the conservation and recovery of federally threatened and endangered species as compatible with the long-term viability of the military training mission itself. This element provides for management of federally listed wildlife species in all ecosystems. The Coastal and Riparian Ecosystem section (CRE) is responsible for implementation of management actions for arroyo toad, tidewater goby, southern California steelhead, western snowy plover, California least tern, light-footed Ridgway's rail, least Bell's vireo, southwestern willow flycatcher, and yellow-billed cuckoo. Similarly, the

Uplands Management section (UPL) implements management actions for five listed animal species including Riverside and San Diego fairy shrimp, Pacific pocket mouse, Stephens' kangaroo rat, and CA gnatcatcher. Inherent in the management of threatened and endangered species is using adaptive management in response to predicted or concurrent climate impacts. Current management practices already account for predicted changes to listed species' habitat(s) and will be adjusted in the future as more climate-related information is gathered.

Camp Pendleton's approach for management of federally listed species includes (1) monitoring listed species to gauge effectiveness of management actions; (2) managing species and their habitats in a manner that promotes species recovery, including the implementation of management plans; (3) considering vulnerabilities from climate change and other outside factors to inform future management strategies; and (4) keeping staff that are knowledgeable of issues related to federally listed species found on Base.

4.1.1.1 Objective 1: Monitoring

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

To meet this objective, Resource Management Branch (comprised of CRE and UPL) staff arrange monitoring surveys for listed species, collect results of those surveys and maintain a comprehensive GIS database of natural resources data. For listed bird species, the general goal of annual monitoring surveys is to document presence/absence, nest locations, nest success, and/or nest fecundity through the use of established protocols. These species include least Bell's vireo, southwestern willow flycatcher, California least tern, and western snowy plover. However, nest monitoring and nest fecundity studies are only conducted for least Bell's vireo in special study areas to test effects of fire or weed removal. Coastal California gnatcatcher monitoring surveys in the past were conducted every 3 to 4 years, during which nest monitoring is conducted on a subset of gnatcatchers to obtain information on breeding trends; Camp Pendleton is pursuing a subset of California gnatcatcher surveys annually in this iteration of the INRMP, as funding allows. Presence/absence and breeding status data are also recorded for light-footed Ridgway's rail and yellow-billed cuckoo, but nesting data are not recorded.

For arroyo toad, Stephens' kangaroo rat, and Pacific pocket mouse annual monitoring on Base tracks patterns of occupancy. Monitoring surveys for these species use Proportion of Area Occupied (PAO) methods developed for Camp Pendleton by the United States Geological Survey (USGS).

Fish species are monitored annually, or as funding allows, to detect presence/absence and suitability of habitat. Southern tidewater goby surveys consist of seining in Base estuaries until the species is detected and conducting secondary surveys if not detected during seining. Southern California steelhead are currently surveyed through evaluation of environmental DNA, however, the survey methodology for southern California steelhead will be updated by 2024 to include ability to use traditional electrofishing technology and will be implemented annually thereafter, or as funding allows.

The strategy for fairy shrimp management has been to determine distribution and abundance of basins that host Riverside fairy shrimp and San Diego fairy shrimp basewide; this task cannot be completed however if annual rainfall is insufficient to allow fairy shrimp to mature completely and be identified. However, after decades of effort, surveyors have determined fairy shrimp occupancy in most vernal pools and ephemeral basins on Base. The distribution and abundance of both listed fairy shrimp have been adequately documented such that all large groups of pools have been located and initially surveyed. All pools known to be occupied by Riverside fairy shrimp and San Diego fairy shrimp have been mapped and included in the Base GIS environmental data management system. Currently, the Base has documented 3,507 vernal pools, depressions, and road ruts that temporarily pond. Surveys have been conducted on 83 percent of these pools and have found that San Diego fairy shrimp occupy 559 pools and Riverside fairy shrimp occupy 205 pools. The Vernal Pool and Fairy Shrimp Conservation Plan for Camp Pendleton was finished in December 2019 (MCBCP 2019b). ESA consultation with the USFWS on that Plan was initiated in May 2021, with an associated Biological Opinion expected in 2024 due to competing priorities. On-going monitoring of vernal pools seeks to improve data on shrimp occupancy of lone, isolated pools and smaller basins within pool complexes that pond less frequently.

Camp Pendleton conducts annual monitoring of listed plants species including San Diego button-celery, California Orcutt grass, spreading navarretia, thread-leaved brodiaea, and Encinitas baccharis. Mapping methods have been standardized using the 7-meter mapping rule to identify separate populations of plants, e.g., clusters of plants are mapped as different populations if they are separated by at least 7 meters. Monitoring tracks "occurrences" defined as populations within 0.25 mile from each other, which is a method also used by USFWS. Results of plant surveys are added to GIS layers for analysis and reference.

Quino checkerspot butterfly (*Euphydryas editha quino*) is known to occur in the region but has not been detected on Camp Pendleton. Camp Pendleton will periodically arrange contracted surveys for Quino checkerspot butterflies on Base as due diligence for that listed species.

Monitoring will become increasingly significant of effective climate adaptation planning to understand how conditions are changing, and to respond to that change (DoD 2019). Camp

Pendleton already supports a robust monitoring program, including monitoring to support climate-informed decisions in the riparian system for water management (Section 4.2.4.1). Monitoring currently provides data to see if management is meeting the INRMP goals, and already is analyzed to demonstrate short and long-term impacts of climate to species (e.g., many species' population numbers, fecundity, etc. are already tied to drought).

4.1.1.2 Objective 2: Management Plans

OBJECTIVE 2: Develop and implement management plans for listed species and implement adaptive management studies to meet Camp Pendleton's ESA responsibilities to conserve listed species while providing maximum training flexibility.

Management of riparian, beach and estuarine species is guided by the two primary ecosystem-based conservation plans that were discussed in Chapter 3, the Base's Estuarine and Beach Ecosystem Conservation Plan (Appendix G) and the Riparian Ecosystem Conservation Plan (Appendix H) and their associated USFWS Biological Opinion (USFWS 1995). The Pacific Pocket Mouse Management Plan (MCBCP 2019a) describing management actions for that species on Base was completed in December 2019; the Base conducts Section 7 consultation under ESA with USFWS on portions of that plan as they are ready for implementation. The Base will produce and consult on a basewide programmatic management plan for PPM that includes effects to PPM from training and maintenance actions after associated NEPA for training actions is complete. As mentioned above, the Vernal Pool and Fairy Shrimp Conservation Plan for Camp Pendleton was finished in December 2019 with USFWS consultation initiated. A Stephens' Kangaroo Rat Management Plan will be developed, consulted on, and updated in future INRMP iterations when complete.

Birds

- Annual maintenance and improvement of listed shorebird (i.e., California least tern and western snowy plover) nesting habitat is conducted prior to 15 March each year, including installation of a protective perimeter fence. The fence is maintained 15 March through 15 September. Annual beach briefs are provided to military training units that regularly train on beaches occupied by listed shorebirds, and ESA compliance signage is installed at access points to the beaches and along the temporary fence line. California least tern fledgling success studies, concluded in 2018, were ultimately ineffective at providing more accurate fledgling counts; therefore, fledgling count methodologies will continue to be investigated. Western snowy plover chicks and fledglings are re-sighted using colored leg bands to obtain accurate reproductive success data. Lastly, predation and competition threats to the survival and recovery of listed shorebirds are assessed annually, and strategies

are developed and implemented to reduce and effectively manage the populations of potential predators in the vicinity. For example, in 2022 highly effective traps were developed for capturing American crow, and harnesses were tested on bait mice in combination with alarm calls to lure in raptors.

- Riparian habitat weed removal and restorations projects focus on habitat important to listed passerines, including those federally listed. A study to determine efficacy of three artificial seeps created in the Santa Margarita River to provide adequate foraging for flycatchers will continue through 2027 using least Bell's vireo as a surrogate study species. Additionally, recordings of southwestern willow flycatcher song playback are deployed during the early breeding season to try to attract males to the river.
- Management of coastal California gnatcatchers (CAGN) includes monitoring and habitat conservation including the following:
    - Beginning in 2022, Camp Pendleton started a modified version of the basewide CAGN surveys that were historically performed every several years. To better track trends of CAGN on Base, the revised methods include surveying annually for CAGN in core areas and including additional survey areas each year on a rotating basis.
    - Contracts are in place to evaluate coastal sage scrub (CSS) as habitat for CAGN and treat patches of CSS that are at risk of type conversion from frequent disturbance (usually fire) and weed intrusion. If type conversion of CSS has occurred, contractors can provide more intense treatment to replant and establish CSS vegetation. The treatment and restoration of CSS patches are judged successful if CAGN occupy and use those areas.
    - A basewide, programmatic management plan for CAGN is needed but will be delayed until the completion and consultation of management plans for other listed uplands species on Base including (in order) listed fairy shrimp, listed plants, Stephens' kangaroo rat, and a comprehensive PPM management plan.

Mammals

- Management of Stephens' kangaroo rat (SKR) on Base includes annual monitoring and habitat conservation as follows:
    - Annual basewide monitoring for SKR estimates occupancy as the proportion area occupied (PAO). The PAO procedure incorporates a measure of detection probability and other factors to reduce bias and improve estimates of occupancy.
    - Contracted workers continue to enhance SKR habitat at the Juliet Stephens' kangaroo rat Mitigation Area. This work includes weed treatment, removing accumulated grass thatch, and planting native forbs and grasses. Intensive training at this site (e.g., bivouacking, driving off road, excavation) is incompatible with

maintenance of a compensation site for Stephens' kangaroo rat. However, lighter forms of training, e.g., foot patrols, will remain compatible indefinitely. Additionally, restoration work for native plants may require the temporary exclusion of foot traffic until the seedling plants have matured.

  - The Camp Pendleton Fire Department (CPFD) implements prescribed burns to improve SKR habitat by reducing thatch and maintaining open ground. Recently, prescribed burns in Juliet, R-409A, and R-116/117 have improved habitat for SKR. Fuel reduction burns at firing ranges are performed annually, while a conservation burn in Juliet is scheduled at 3 to 4-year intervals. Uplands staff are collaborating with CPFD to approve a new prescribed fire adjacent to the R-407 series of ranges to enhance SKR habitat.
  - Camp Pendleton will revise and consult on a comprehensive management plan for Stephens' Kangaroo Rat after finishing consultations for management plans of listed fairy shrimp and listed plants.

- Management of Pacific pocket mouse (PPM) on Base includes annual monitoring, habitat conservation, and translocation as follows:
  - Pacific pocket mouse (PPM) is monitored annually basewide to estimate occupancy as the proportion area occupied (PAO). As stated above, the PAO procedure estimates detection probability, which reduces bias of occupancy estimates for PPM.
  - Contracted workers dethatch grassy areas, remove woody debris in shrublands, plant native forbs, and treat weeds to promote open spaces and enhanced vegetation conditions for PPM habitat.
  - Camp Pendleton is working with partners to establish new populations of PPM on Base. Multiple sites have been evaluated and judged feasible for PPM translocation. Contracted workers will prepare vegetation at the proposed translocation sites. Camp Pendleton plans to consult with USFWS on these proposed actions in 2023.
  - The PPM Management Plan was written in December of 2019 and describes conservation objectives for PPM on Base. Portions of that plan have been and will be consulted on with the USFWS as those projects are nearing initiation, *e.g*. habitat enhancement for PPM at Oscar 1, Edson Range, and south San Mateo. After completion of a management plan for Stephens' kangaroo rat, Camp Pendleton will develop and consult on a programmatic management plan for PPM that addresses effects from training and maintenance actions basewide.

Amphibians

- To maintain a stable population of arroyo toad on Camp Pendleton, the Base conducts an analysis of trend data every five years to develop subsequent adaptive management

strategies. Surveys are conducted in all historic breeding locations, including Cristianitos, Talega, San Mateo, San Onofre and DeLuz Creeks, as well as the Santa Margarita River.

- Camp Pendleton monitors developing life stages of arroyo toad in the Santa Margarita River annually to determine impacts of Base water management activities, per MCBCP 2015b and the Conjunctive Use Project Section 7 consultation with the USFWS (USFWS 2016). Environmental Security also coordinates with Lake O'Neill water managers during water uptake and release events at the Lake O'Neill weir and surrounding water infrastructure.
- Environmental Security additional provides annual briefs to military training units to deter unauthorized off-road traffic and species violations.

Fish

- Management of southern tidewater goby on Base includes annual monitoring, habitat conservation, and translocation as follows:
  - Environmental Security provides annual briefs to military units training in the vicinity of estuaries, lagoons and streams to deter unauthorized vehicle and foot traffic.
  - Feasibility for the translocation of tidewater goby individuals to suitable habitat off Camp Pendleton will be identified in coordination with federal and State regulatory agencies by 2024 in support of the anticipated federal ESA listing of southern tidewater goby.
  - Annual presence/absence surveys con ducted in all eight installation lagoons.
  - Aquatic exotic species removed from lagoons annually, from spring to fall.
- Management of southern steelhead on Base includes monitoring, habitat conservation, and adaptive management of water resources as follows:
  - Environmental Security provides annual briefs to military units training in the vicinity of estuaries, lagoons and streams to deter unauthorized vehicle and foot traffic.
  - Presence surveys using eDNA occur, as funding allows, at designated sampling stations in the Sant Margaritta River and San Mateo Creek.
  - Aquatic exotic species removed from streams, ponded water and lagoons annually, from spring to fall.
  - Monitoring of fish ladder after significant rain events to ensure no stranding of SCS occurs; salvage as necessary to upstream or downstream locations as needed.
  - Coordination with Facilities staff on the SMR-CUP Adaptive Management Plan to determine whether water management activities have positive or negative impacts on SCS presence and persistence.

Fairy Shrimp

Working collaboratively with USFWS, Camp Pendleton developed a Conservation Plan for vernal pool habitat and listed fairy shrimp (Riverside and San Diego fairy shrimp). The Conservation Plan (MCBCP 2019b) establishes differing levels of conservation that consider the distribution of listed fairy shrimp, suitable habitat, and the training requirements at a site. Discrete vernal pool conservation projects identified in the plan have been consulted on, which have allowed implementation of management objectives outlined in the plan prior to final completion of Section 7 consultation with the USFWS. In 2022, Camp Pendleton started a full Section 7 consultation of the plan that will allow full management actions and relief of training restrictions once completed. Effectiveness of the plan will be judged by the results of monitoring required under that plan and revised as necessary. Camp Pendleton has started implementing portions of the plan including the following vernal pool restoration projects:

- Vernal Pool Group 68. Phase 1 work started in 2021 and included placing boulders to prevent vehicles driving through vernal pools. Phase 2 work is scheduled for 2026 and will include expanding vernal pool habitat for listed fairy shrimp.
- Cocklebur Mesa. Phase 1 work started in 2018 with dethatching and weed treatment. Phase 2 is scheduled for funding in 2023 and will expand habitat for listed fairy shrimp.
- SOMA. Phase 1 work started in 2019 with dethatching and weed treatment. Phase 2 is scheduled for funding in 2023 and will expand habitat for listed fairy shrimp at the site in 2024.

Plants

Camp Pendleton conducts management and conservation of listed plants across all ecosystems to support the recovery of those listed species including San Diego button-celery, California Orcutt grass, spreading navarretia, thread-leaved brodiaea, and Encinitas baccharis. This work includes habitat analysis, monitoring plant phenology, and monitoring the distribution and abundance of listed plants. To further support plant biodiversity on Base, voucher specimens for all vascular and non-vascular plants occurring on Camp Pendleton are collected; a thread-leaved brodiaea management plan has been completed and the Base aims to create an additional management plan for listed species; and for listed and rare plants has been enhanced.

- Camp Pendleton is implementing a thread-leaved brodiaea management plan in cooperation with USFWS (USFWS 2019). Management of thread-leaved brodiaea on Base includes increased protection and management of core populations of thread-leaved brodiaea while relaxing restrictions to training at non-core populations. The plan includes active management of three large, core populations that include 88% of all thread-leaved

brodiaea individuals on Base. There are an additional 49 populations of thread-leaved brodiaea that are small and dispersed, which will be monitored for disturbance after training restrictions are relaxed. When disturbance is detected, the first response is to surround the brodiaea plants with Carsonite markers to warn people and limit further disturbance. If any of the 49 populations are lost to human disturbance, then new replacement populations will be created by planting thread-leaved brodiaea within management units that have been designated for conservation of this listed plant. Since finalizing the plan, the Base has already created two new population of thread-leaved brodiaea in Lima TA totaling over 1,000 plants as pre-compensation for the possible, future loss of one of the 49 satellite populations. All information gained from monitoring, studies, and management activities will be provided to USFWS to be incorporated into their formal 5-year review for this species. The thread-leaved brodiaea management plan will be updated every 10 years, if required.

- In the next five-year cycle of the INRMP, Camp Pendleton will update their Listed Plant Management Plan that will include three vernal pool plants (San Diego button-celery, California Orcutt grass, and spreading navarretia) and Encinitas baccharis. Objectives in the plan will support management and conservation actions to protect those listed plants and contribute to their recovery under ESA. The plan includes monitoring programs, habitat enhancement, and the establishment of new populations for each species. After revision of the plan is complete it will receive consultation from the USFWS, be implemented on CPEN, and updated every 10 years. All information gained from monitoring and management activities will be provided to USFWS to be incorporated into their formal 5-year review for this species. Listed plants also benefit from other ecosystem management programs such as invasive, nonnative vegetation control and erosion control (see Section 4.2.9).

Multi-Species

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

- Informational Carsonite markers will be installed in sensitive habitat. Additionally, unauthorized recreational usage of training beaches will be minimized by posting signage, taking enforcement actions, and issuance of ESA non-compliance citations by Conservation Law Enforcement, as needed.
- Creek crossings, stream water quality, and storm frequency and volume will be monitored to assess immediate and long-term impacts to listed species so that the degradation of listed species habitat does not occur.

- The Riparian Ecosystem Conservation Plan and Estuarine and Beach Conservation Plan will be amended, as needed, to incorporate newly listed species and/or new occurrences of listed species.

4.1.1.3 Objective 3: Identify Vulnerabilities from Climate Change

OBJECTIVE 3: Identify vulnerabilities from climate change on species-specific management to meet Camp Pendleton's ESA responsibilities to sustain and enhance the conservation potential of listed species while providing maximum training flexibility.

Resource management objectives in the INRMP are defined in short-term (5-year) increments; however, Camp Pendleton has already implemented an adaptive management strategy for our federally listed species, with climate effects on ecological systems built into that strategy, that could assist in combating the long-term effects of climate change.

As noted in Chapter 2/Appendix B through the current management practices of monitoring species and their environments, increasing native habitat, and removing non-native species, Camp Pendleton increases the resiliency of federally listed species to climate change, with small-scale actions named below.

Birds

- California least tern and western snowy plovers are at risk from sea level rise and associated beach erosion, ocean warming, tidal fluctuations and flooding events. Researchers have already detected deficiencies in food fish availability in the nearshore, as they hypothesize warmer waters are impacting anchovy populations, causing them to school further offshore (pers. comm. T. Wooten). Recent tern foraging studies support that terns are trying to feed chicks inappropriate fish food (2015 Robinette et. al.). In 2022, 28% of tern eggs failed to hatch, presumably related to fitness.
    - Camp Pendleton is working closely with researchers, land managers and wildlife agencies to obtain data related to food availability, including sponsoring San Diego Zoo Wildlife Alliance to obtain a federal grant to study this issue in 2023-2025. Increased storm surges could bring more food availability to snowy plovers, however, due to increased seaweed and kelp rack bringing in forage insects.
    - Reduced beach area from sand loss, estuarine changes from increased flooding and sea level rise will negatively impact both species, however, terns may have opportunities to nest at inland lakes. Camp Pendleton is starting to explore ideas for alternative nesting sites for least terns.

    - Currently annual monitoring of both species and good management of dune systems will help mitigate these climatic events for both species.
- Least Bell's vireo (LBVI) and southwestern willow flycatcher (SWFL) breed in riparian forest where climate change models predict flashier flooding interspersed with longer droughts. Although riparian vegetation grows back relatively quickly after flooding, repeated instances and dry, hot periods may lengthen recovery period and reduce nesting habitat for these listed passerines. Higher temperature could change breeding phenology by altering nest initiation dates and reduce nesting season for species that rely on aquatic insect availability.
    - The Base installed three artificial seeps in the Santa Margarita River and are monitoring them annually in conjunction with LBVI and SWFL surveys. The goal of the seeps is to increase surface moisture near nesting areas and therefore increase forage insect availability. An ongoing study initiated in 2020 will attempt to determine whether the seeps are having a positive impact on LBVI fecundity, and by inference, potential for SWFL fecundity.
    - The riparian forest is being evaluated using the Riparian Ecosystem Health Monitoring program discussion in Section 4.2.4.1.
    - In addition, the Base currently does extensive brown-headed cowbird trapping and non-native plant removal in the riparian areas to assist with resiliency of these species.
- To identify vulnerabilities for coastal California gnatcatchers on Base caused by climate change, Camp Pendleton conducts population monitoring for gnatcatchers and monitoring and conservation of their habitat. Gnatcatcher habitat is at risk from increased wildfire frequency, which can degrade coastal sage scrub vegetation enough that it is unsuitable for gnatcatcher use. Climate change predictions for California include increased fire frequency, which will cause increased risk to gnatcatcher habitat. In addition, to conserve patches of gnatcatcher habitat that are at risk of loss after fire, contracted workers treat and restore coastal sage scrub communities after fires to prevent type conversion. This work includes weed control and revegetation of native shrubs using seed and container plants.

Mammals

- Possible threats to Pacific pocket mouse from climate change, may be inferred from the results of data collected during annual monitoring of PPM and their habitat. Analysis of those results show that PPM are threatened by non-native grass intrusion, which produces dense grass thatch that impedes the movement and foraging of PPM while supporting rodent competitors such as harvest mouse (*Reithrodontomys megalotis*) (USGS 2018). Climate change may bring increasingly variable annual rainfall patterns characterized by many years of drought that are interspersed by a year with abundant and intense rainfall.

Heavy rain promotes abundant growth of non-native annual grasses and forbs, which may produce thatch dense enough to exclude PPM.

  - Prescribed fire may be used to reduce thatch accumulation and benefit PPM in a few places such as Edson Range. Increased droughts may bring increased wildfires, which may sometimes benefit PPM if those fires clear excessive thatch and plant debris. Camp Pendleton currently has an approved prescription burn plan for the PPM Santa Margarita population (USFWS 2020) with the last prescription burn for PPM in 2020. In addition, Environmental Security is coordinating with the Camp Pendleton Fire Department to approve well-planned wildfire implementation burn plans and new prescribed fire burn plans that will guide fire crews to try and contain wildfires within predetermined boundaries that will promote conservation benefits for species such as PPM.
  - Managing Pacific pocket mouse for resilience to climatic events should include establishing new populations. Global climate change will produce future weather patterns and conditions that cannot be precisely predicted, e.g. the specific timing of 500-year flooding or catastrophic wildfires. Each population will have differing ability to survive and endure events such as wildfire, torrential rains, and extended droughts. Increasing the number of PPM populations will reduce the overall extinction risk to the species under most scenarios. Camp Pendleton's objective of establishing new PPM populations (Section 4.1.1.2) via translocation to suitable but unoccupied habitat and performing vegetation management at areas adjacent to PPM-occupied sites to allow dispersal of mice and expand populations.

- Possible threats to Stephens' kangaroo rat with climate change include the abundance of non-native grasses and thatch vegetation.
  - Like Pacific pocket mouse, SKR is a species that can benefit from future wildfires that are likely to be more frequent on Base due to global climate change. Currently the Base implements prescription burns that benefit the species (Section 4.1.1.2). Environmental Security is collaborating with the Camp Pendleton Fire Department to develop new prescribed fire burn plans to promote bare ground and forb diversity in areas nearby existing SKR populations to provide suitable habitat for colonization.
  - In addition to fire, mowing may be used to reduce grass thatch. Increasing and maintaining connectivity among SKR populations by treating vegetation is a management objective at SKR populations in Juliet and the 400 series ranges west of Roblar Road. Making it possible for SKR to disperse to adjacent, suitable areas will promote resiliency of that species on Base.

Amphibians

- Arroyo toad (ARTO) are at risk from increased drought, warmer temperatures, flash floods and conditions favorable to non-native aquatic species, such as bullfrogs. Flash floods may increase sediment movement in streams and clear vegetation near the thalwag where toads breed, providing better habitat conditions for toads.
    - In support of a Biological Assessment for the rehabilitation of existing facilities and the construction of new facilities for the conjunctive use of surface water and groundwater resources within the Lower Santa Margarita Basin, Camp Pendleton modelled current operations and future operations under climate change (MCBCP 2015). As part of the proposed action, an Adaptive Management Plan (AMP), followed by a separate Facility Operation Plan (FOP) has been developed by MCB Camp Pendleton to manage project diversion, recharge, production, and delivery facilities. An important feature of adaptive management is the ability to adjust water management operations based on measured and observed data that describe the relationship between hydrology and environmental and physical constraints, as it relates to arroyo toad.
    - Timing of flood events coinciding with breeding season could wash out ARTO egg strands and tadpoles impacting productivity. Prolonged drought has a profoundly negative impact on arroyo toad productivity by drying out streams, with little to no reproduction during the drought years of 2012 to 2017. The Base has been collaborating with regional researchers to identify opportunities for translocation or *in situ* rearing of eggs and tadpoles in case of future prolonged drought and will continue to pursue this from a practical and regulatory perspective.
    - Removal of exotic aquatic fish and amphibian species from base watersheds will continue to improve habitat conditions for toads.
    - Removal of beaver and associated dams vastly improve arroyo toad habitat by removing inundation of shallow breeding habitat.

Fish

- Southern California steelhead and southern tidewater goby are fully aquatic species that are at risk from increased drought, warmer temperatures, flash floods and conditions favor able to non-native aquatic species, such as bullfrogs. Drought and warmer ambient temperatures may to temporal drying of streams causing stranding of steelhead and inability for both species to migrate to the ocean (steelhead) or to adjacent lagoons (goby). Increased fire frequency may increase sedimentation in lower basins impacting refugia for steelhead and increasing water temperatures in pools. Sea level rise could increase river

connectivity with the ocean, thereby providing more opportunity for steelhead to migrate upstream, but this could be offset by significant drying trends.

- The Base is prepared to move stranded steelhead as a function of water management activities on the Santa Margarita River as part of the Santa Margarita River Conjunctive Use Project Biological Opinion (NMFS 2016). In addition, the Base will pursue stranding options with NMFS for San Mateo Creek.
- Camp Pendleton working with USFWS and CDFW to identify off-Base locations to translocate southern tidewater goby to increase resiliency in the metapopulational.
- The Base continues to monitor estuarine and lagoon function on Base, restoring habitat as needed to maintain adequate functionality to support these species.

Fairy Shrimp

- Global climate change will produce extreme weather patterns including longer drier droughts in addition to more severe wet years that produce atmospheric rivers with very abundant rainfall. Fairy shrimps are adapted to dry periods but need ponding to successfully survive.
    - Current vernal pool restoration projects promote ponding frequency and expand surface area in selected vernal pools by recontouring the pools to benefit both San Diego and Riverside fairy shrimps. When vernal pools pond sufficiently for fairy shrimp to breed, their egg banks are replenished with new resting eggs. Recontouring carefully removes loamy soils from within a pool and lowers the pool basin closer to the restrictive clay layer. This reduces the ability of soil layers above the clay layer to absorb water and prevent ponding within the basin. Additionally, recontouring can extend the hydroperiod of a pool, which benefits Riverside fairy shrimp because that species needs eight weeks of continuous ponding to mature and reproduce. Treating non-native plants within a vernal pool will reduce the accumulation of thatch that can absorb water and discourage ponding of the pool.

Plants

- Listed plants will be affected by climate change including recruitment failure during prolonged drought, increased susceptibility to pests or pathogens, type conversion of vegetation communities, increases in non-native competitor species, increased fire, etc.
    - To track changes in listed plant distributions associated with climate change, Environmental Security staff review records of rare plant observations in public data such as the California Natural Diversity Database (CNDDB) and SD Natural History Museum online plant voucher database. Using those historic records,

Environmental Security staff revisit and search the reported locations to verify if those plant species are still detectable.

- As discussed in the Brodiaea Management Plan (MCBCP 2017) it is not certain how much risk increased fire poses to thread-leaved brodiaea (BRFI). That species reproduces by seed and vegetatively by corms. Seeds may be burned while still in the capsule if fire occurs at that time. However, after BRFI seed is on the ground and in soil cracks, some seed will likely survive a fire and may benefit from the reduction of non-native grass thatch nearby. Thread-leaved brodiaea can survive years of low rainfall by remaining as dormant corms underground. There is a limit to how long those corms can survive, especially the smallest ones, but the tolerance of BRFI corms to extended droughts is not well known. Currently, through the BRFI management Plan, the Base establishes new thread-leaved brodiaea populations. Each population will exist in slightly different habitat conditions and by luck, some site will likely survive droughts better than others. For example, coastal sites such as Cocklebur Mesa and the San Onofre Management Area (SOMA) should receive extra moisture from fog, which can reduce drought stress and reduce the risk of fire damage.
- Current ongoing restoration in vernal pools mitigates the effects of climate change. To reduce the undesirable effects of weeds in vernal pools that would impact listed vernal pool plant species, the Base treats non-native plants in vernal pools and the surrounding uplands areas. Camp Pendleton oversees the planting of new populations of vernal pool plants, which increases the likelihood that those listed plants will propagate and survive.
- Risks to Encinitas bacharris from increased fire and drought caused by climate change are not well established. However, it's possible that those plants may be killed by drought stress, especially on south and west facing slope in chaparral communities. These sites are also at increased risk of wildfire because of increased solar heating and drying of woody fuels. To mitigate risks from both drought and wildfire Camp Pendleton proposes to evaluate the benefit of planting Encinitas baccharis at new sites on north facing slopes of chaparral after basewide surveys for Encinitas baccharis are completed.

Multi-Species

Other monitoring and management activities that build resiliency of federally-listed species to climate change and benefits multiple species include:

- Creek crossings, stream water quality, and storm frequency and volume are currently monitored to assess immediate and long-term impacts to listed species so that the degradation of listed species habitat does not occur.

- The Riparian Ecosystem Health Monitoring (REHM) program prescribed by USFWS 2016 will provide adequate data for this watershed to determine whether changes in riparian forest acreage could have an impact on arroyo toad, least Bell's vireo, southwestern willow flycatcher and migrating yellow-billed cuckoo. Data from the REHM program could infer climate impacts to other watersheds on base, however, ability to distinguish between water pumping impacts and climate change impacts may be difficult.
- The Riparian Ecosystem Conservation Plan and Estuarine and Beach Conservation Plan will be amended to incorporate newly listed species and/or new occurrences of listed species.

4.1.1.4 Objective 4: Current and Emerging Issues

OBJECTIVE 4: Maintain awareness of current and emerging issues related to federally listed species and other species of concern with potential implications to Camp Pendleton.

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

4.1.2 Regionally Sensitive Species Element

- ELEMENT GOAL: Monitor sensitive species that are not federally listed to better understand their distribution and abundance on Camp Pendleton.

MCO P5090.2A CH 4 (USMC 2018) and DoDM 4715.03 (DoD 2018b) provide key guidance on the management of non-federally listed species. MCO P5090.2A CH 4 directs the installations to conduct surveys to document the presence of state endangered and rare species and, to the maximum extent practicable and where it does not conflict with the installation mission, to survey and take other appropriate measures to identify, monitor, and manage other species at risk. DoDM 4715.03 requires the identification of state-listed species and other sensitive species, stressing that INRMPs address regional conservation issues and priorities, including regional species of concern.

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

International, MOU between the United States Marine Corps and multiple agencies for the Conservation of the Western Pond Turtle, and the Strategic Plan for Amphibian and Reptile Conservation and Management on DoD Lands (as referenced in Section 1.4).

To comply with these drivers, Camp Pendleton monitor selected species that are not federally listed to better understand the distribution and abundance of these species on Base. Given the stresses that climate change and human development put on local ecological communities it is possible that more species occurring on Camp Pendleton will get listed under ESA. Monitoring on species-specific levels can help identify species' populations that are declining and may need federal listing in the future. Monitoring of non-federally listed species may also occur as part of listed species monitoring and management (see Section 4.1.1), as data is collected for entire ecosystems.

4.1.2.1 Objective 1: Sensitive Wildlife Species Monitoring

OBJECTIVE 1: Monitor sensitive wildlife species by conducting inventory surveys and studies as needed to comply with military order to participate in and contribute to regional conservation efforts.

As funding allows, Camp Pendleton arranges inventory surveys for regional species of concern including bats, raptors, reptiles and amphibians. Generally, at least 2 years of data are collected for each species of concern selected for inventory. Base biologists also evaluate management techniques to promote conservation of pollinating species of bird and insect and their habitats per the 2015 MOU between DoD and the Pollinator Partnership and for the monarch butterfly (*Danaus plexippus plexippus*) specifically, which is under review for federal listing (USFWS 2015). Environmental Security staff conducts "in-house" surveys of winter roosts for monarchs along with mapping milkweed and surveying for monarch larvae in the summer months on Base. There are plans for western monarch breeding surveys during the 5-year period of this document revision, starting with in-house surveys and conducting formal, contracted protocol surveys as funding allows.

Environmental Security staff monitors grunion activity on installation beaches and provides data for inclusion in Statewide assessments. Southwestern pond turtle was inventoried on Base in 2009-2011, and the inventory was repeated in 2022-2023 with an added element of telemetry of gravid females to identify nest locations. The Base inventoried for western spadefoot toad in 2014 and continue in-house investigations for this species. In 2022, the Base funded an inventory of California glossy snake, California red-sided garter snake and coast horned lizard to serve as a Baseline in case these species become federally listed. In collaboration with the SD Natural History Museum, Environmental Security staff perform limited surveys for bat species that use the Base

including pallid bat (*Antrozous pallidus*). Although monitoring efforts are focused on the species of concern listed in Appendix K, this is not an exhaustive list of species of concern that may receive monitoring on Base.

Environmental Security staff routinely engage with regional partners (including researchers) to support limited research. Environmental Security provides access to Camp Pendleton, when compatible with military training, safety, and natural resources management goals, for qualified research projects that are regional in nature. Such projects often support one or more of the natural resources management program goals and objectives, as well as contribute to Camp Pendleton's overarching natural resources management goal of encouraging regional plans and incentives that address conservation of native biodiversity, ecosystem sustainability, and watershed management issues. Through various sponsored, unfunded studies the Base is contributing to the collective regional knowledge about species and habitat management, and applying this information to the adaptive, ecosystem-based management process.

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

Monitoring and partnerships for wildlife species of concern promotes resiliency of the species with climate change by establishing baseline data for adaptive management and identifying management strategies early. When wildlife species of concern are observed and monitored on the Base, Camp Pendleton can also pursue management actions that fit into the realm of existing federally listed species management plans and Biological Opinions, if they don't conflict with the military mission; this management can assist in the resiliency and recovery of the species to potentially even preclude future federal listing.

4.1.2.2 Objective 2: Sensitive Plant Species Monitoring

OBJECTIVE 2: Monitor rare plants and manage selected species in accordance with their Candidate Conservation Agreements (CCA) to ensure their continued survival and preclude their listing under ESA.

A CCA was developed for Brand's phacelia in 2013 in coordination with USFWS, Naval Base Coronado, California State Parks and U.S. Customs and Border Protection; an updated Agreement was signed by all parties in 2021. The purpose of the CCA is to ensure the long-term conservation of Brand's phacelia through implementation of conservation actions and the minimization of threats to its persistence, and to preclude federally listing the plant. The participants in the CCA anticipated that successful and continued implementation of conservation actions would be

sufficient to improve the status of this species thereby precluding the need to list it within the foreseeable future as threatened or endangered under the ESA.

To meet this objective, Camp Pendleton monitors all known populations and collects data on species phenology annually, for the duration of the CCA (through 2026). Habitat enhancement is conducted annually in the back-dune habitat north of Santa Margarita River estuary. The Base coordinates once a year with other CCA members to write a combined yearly report documenting progress made implementing the plan. Since implementation commenced, occurrence of Brand's phacelia on Base have increased from five to 32 times in size, depending on year and rainfall.

The Base inventoried all potential habitat in 2016 to determine distribution, abundance, and phenology of Nuttall's acmispon. Environmental Security is evaluating the need and periodicity for future surveys and will coordinate with regional land managers, researchers and USFWS to determine what actions are needed to prevent federal listing.

Camp Pendleton plans to develop a management plan for selected rare uplands plants that are not federally listed and will collaborate with USFWS for technical assistance on the development of this document. Rare plants such as Pendleton button-celery (*Eryngium pendletonense*) and Blochman's dudleya (*Dudley blochmaniae*) are disproportionately benefitted by conservation on Base because Camp Pendleton provides some of the last coastal areas in the region with clay soils that were not lost to development. Active monitoring and management of these species may successfully preclude ESA listing in the future.

Camp Pendleton will periodically, as funding is available, arrange plant inventories using methods from the San Diego Plant Atlas project. During these surveys, all detections of rare plants are recorded and added to the rare plant GIS database. The primary benefit of this survey is an inventory and mapping of plant diversity on Base. Plant diversity surveys provide additional due diligence for detecting new locations of federally listed or candidate plants that are not currently known to occur on Camp Pendleton. These surveys will provide added monitoring for non-native plants. Early detection of invasive weeds may enable early management responses for treatment and control. Results of these surveys will be available to the public through the SD Natural History Museum.

4.2 SUSTAINABLE ECOSYSTEM MANAGEMENT PROGRAM

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

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

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

An important component of ecosystem management is adaptive management. Since knowledge of ecological systems and processes is inherently limited (due in part to changing conditions), learning how to manage better is continuous. Flexibility and adaptation in the face of uncertainty are critical (Nature Conservancy 1996). At the heart of adaptive management is the need to approach all management decisions as experiments to be tested (Nature Conservancy 1996). Assessing the efficacy of management techniques and incorporating the knowledge gained are key to successful adaptive management. Adaptive management is an important tool for carrying out climate adaptation and already built into the natural resources program of Camp Pendleton; planning for and adapting to climate change is essential for ecosystem management. The goal of working towards optimal and sustainable environmental conditions (under the pressure of changing climatic conditions) will maximize the benefits of ecosystem services consistent with DoDI 4715.03 (DoD 2018a).

The Sustainable Ecosystem Management Program is implemented by the Resource Management Branch of Environmental Security and is organized into 11 elements: (1) Recording Species Observations Element; (2) Exotic Wildlife Control Element; (3) Ecosystem Mapping Element; (4) Ecosystem Monitoring Element; (5) Forest Pest and Disease Management Element; (6) Wetland, Aquatic and Marine Ecosystem Management Element (7) Vernal Pool Management Element; (8) Nonnative and Invasive Species Management Element; (9) Erosion Control Element;

(10) Wildland Fire Management Element; (11) Habitat Restoration and Enhancement Element; (12) Climate Change Monitoring and Data Collection Element; and (13) Climate Resiliency Element. These elements and their associated goals and objectives are discussed further in the following subsections.

4.2.1 Recording Species Observations Element

- ELEMENT GOAL: Collect and share incidental observations of species on Camp Pendleton with the public.

The establishment and maintenance of a natural resources inventory is an essential component of conservation and adaptive management (DoD 1996). While not collected during standardized survey efforts, incidental observations of plants and animals (including listed and nonlisted species) can provide useful supplemental data to inform conservation and adaptive management.

4.2.1.1 Objective 1: Submit Incidental Observations

OBJECTIVE 1: Submit incidental observations of species from Camp Pendleton to a public database.

Environmental Security staff members post incidental observations of species to online applications such as iNaturalist. The ease of use and shareability of data makes public databases much more useful for advancement of public knowledge of the species.

In addition, to promote collaboration and to enhance bird conservation, the U.S. Marine Corps has committed into entering avian data into the Avian Knowledge Network (AKN). The AKN is a collaborative effort between a multitude of federal, state, NGOs and other stakeholders where a single database will collect avian data to analyze collectively. Camp Pendleton will start entering data into the AKN in 2024.

4.2.2 Exotic Wildlife Control Element

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

Exotic animals may pose a threat to native species and communities on Camp Pendleton (e.g., competitively excluding native species, altering the habitat in a manner that favors other exotics, predation, nest parasitism, disease, etc.). The introduction and spread of invasive nonnative animals has been particularly prevalent in riparian and aquatic habitats on Camp Pendleton (USDA 1999). These infestations often coincide with habitat disturbance, making it

difficult to separate the influence of one from the other. For example, introduced fish and amphibians tend to thrive in highly modified habitats, confounding habitat degradation with the exotic predators as the primary source of native amphibian declines. However, observations of successful breeding activity by native amphibians in extremely modified breeding sites that were free of exotics support the interpretation that the exotic species themselves are an important problem (USDA 1999). These observations have helped lead Camp Pendleton's ecosystem management to maintain an aggressive program element for the control and removal of invasive exotics.

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

4.2.2.1 Objective 1: Submit Incidental Observations

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

As required by the Riparian BO (USFWS 1995) and other consultations, exotic aquatic species control and removal have been and are primarily conducted in the Santa Margarita, San Onofre, and San Mateo watersheds. Exotic species control was done as part of the tidewater goby reintroduction carried out as mitigation for the North County Transit District Emergency Repairs of San Mateo Bridge and incorporated as a conservation measures into the Biological opinions for the ongoing P-637 Infantry Squad Course & Bridge military construction project. Species routinely removed from San Mateo Creek include mosquitofish, crayfish, black bullhead, and bullfrog tadpoles and egg masses. In 2022, Camp Pendleton expanded efforts to include removal of exotic

species in Base estuaries outside of the three main watersheds and are therefore treating all estuaries and lagoons.

In addition, the Camp Pendleton cowbird control program was initiated in 1983. Its purpose is to benefit the federally endangered least Bell's vireo, southwestern willow flycatcher, and other host species by removing brown-headed cowbirds from riparian nesting habitat. Forty traps are installed throughout the installation annually; cowbirds are lethally removed and non-target passerines are released.

4.2.3 Ecosystem Mapping Element

- ELEMENT GOAL: Map Camp Pendleton vegetation using a method that is compatible with vegetation data from other agencies.

Consistently mapping vegetation is important to determining sustainability of lands to support military training and prevent invaluable training acres from becoming degraded. Vegetation mapping is fundamental to the understanding of species distribution and managing ecosystems. Land managers, planners, and decision makers require a consistent and repeatable hierarchical system to organize distinct plant assemblages.

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

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

A riparian habitat monitoring program was developed in the Riparian BO (USFWS 1995) for riparian areas of the Base. It uses geographical areas of plant communities that are weighted by

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

4.2.3.1 Objective 1: Map Vegetation

OBJECTIVE 1: Map Camp Pendleton vegetation using the USNVC every 10 years.

To meet this objective, high-quality aerial imagery is collected during the appropriate season to achieve an accurate representation of current vegetation cover. Vegetation mapping of Camp Pendleton will be conducted using a methodology conforming to the most current guidance and standards outlined by the NPS Vegetation Inventory Program and the USNVC. The classification system is being cross-walked to previous mapping efforts. Vegetation will be mapped to the alliance level, except where the association level is necessary to capture nonnative species or to meet requirements of the Riparian BO (USFWS 1995) or other agreements.

4.2.4 Ecosystem Monitoring Element

- ELEMENT GOAL: Monitor ecosystem conditions within vegetation communities to promote the sustainability of ecological function and inform adaptive management.

Long-term monitoring of ecological conditions is essential to ensuring the sustainable use of the training environment at Camp Pendleton while protecting sensitive resources. As such, the Base has conducted ecological monitoring of habitats that support listed species in coastal sage scrub, perennial grasslands, riparian areas, wetlands, streams, estuaries, vernal pools, oak woodlands, and dunes since the late 1980s and assessments of general ecosystem trends since the 1990s.

4.2.4.1 Objective 1: Implement Vegetation Monitoring

OBJECTIVE 1: Implement monitoring protocols for each vegetation community.

To meet this objective, Camp Pendleton has developed and implemented vegetation monitoring programs for riparian, dune and strand, wetland and estuary, perennial grassland, oak woodlands, vernal pools, coastal sage scrub and chaparral. Current efforts for monitoring key ecological communities on Camp Pendleton are summarized in the following subsections. This work will inform development and implementation of improved monitoring protocols.

Riparian Habitat

In addition to BO-required geographically mapping-based change analysis and point system for riparian areas as discussed in Section 4.2.3, the Riparian BO (USFWS 1995) requires further analysis to assess the effectiveness of exotic vegetation removal and habitat function and value. Camp Pendleton initiated a new riparian monitoring protocol in 2017 per a requirement of the Santa Margarita River - Conjunctive Use (SMR-CUP) Project BO (USFWS 2016). The Riparian Ecosystem Health Monitoring (REHM) program uses various processes for collecting riparian community health data, which included establishing permanent transects through the lower SMR and collecting data on hydric indicator plants, soil moisture, tree canopy, and conditions of sensitive species nesting habitat. Data collection occurred over a three-year period from 2018 to 2021 and will serve as a baseline for tri-annual data collection going forward. This information will be evaluated per the Terms and Conditions of the SMR-CUP BO (USFWS 2016) to determine whether water management on Base is impacting riparian health and supported species but will also provide good data in support of species management actions in response to climate change and other anthropogenic threats.

Dune and Strand Habitat

The Riparian BO (USFWS 1995) requires dune vegetation monitoring on a 5-year basis to assess the effectiveness of the Base Estuarine and Beach Conservation Plan (Appendix G), the conditions of which have been met and are being updated in a new plan.

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

Additional monitoring in the Santa Margarita dunes located near the mouth of the river has also been conducted as part of the Base's invasive plant program and the phacelia monitoring program and, in 2015, more intensive mapping was conducted in the back dune portions of the dune and

strand community. During this inventory, the dominant plant species were recorded, which are the most abundant species in the community and contribute more to the character of the community than the other non-dominant species present. Current efforts are more focused on dune management vice monitoring.

Estuaries

Invasive plant species are targeted for removal as part of the riparian and dune weed removal programs, and levels of iceplant *(Carbobrotus edulis)*, arundo *(Arundo Donax)*, tamarisk *(Tamarix spp.)* and perennial pepperweed *(Lepidium latifolium)* have been reduced to less than 1 percent cover. Estuary habitat function is monitored through benthic invertebrate sampling and water quality sampling. A CRAM inventory was conducted in 2016 in conjunction with a robust estuary function assessment for the Santa Margarita River and demonstrated good functionality of the estuarine system. Removal of exotic wildlife species occurs per Section 4.2.2 Exotic Wildlife Control Element.

Coastal Sage Scrub

Camp Pendleton collaborated with the USFWS and other regional partners to develop the Camp Pendleton Coastal Sage Scrub and Chaparral Monitoring Protocol. This protocol is designed to evaluate the ecological condition of CSS through monitoring and identify areas that would benefit most from treatments to improve habitat for CAGN and other species that rely on CSS for habitat.

Native Perennial Grasslands

Native perennial grasslands on Camp Pendleton are generally found at lower elevations and may contain vernal pool ecosystems. Grasslands can be degraded due to invasion and competition from nonnative grasses and forbs, which reduces the carbon storage capacity at those sites (Koteen 2011). Prescribed burning is a preferred method for maintaining native grasslands on Base. Published research suggests that a native perennial grassland may offer more resilient storage of carbon than a forest because most forest carbon is stored above the ground and is at risk of release after wildfire. In contrast, native grasslands store most of their carbon below the surface (Dass et. al 2018).

A change analysis of vegetation on Base in 2019 identified 9,281 acres of non-native grassland on Base that may have been converted from native grassland since 1994. However, a change in mapping methods may account for some of that estimate. Starting in 2023, Environmental Security staff will refine the results of the 2019 change analysis to remove the biased result from different

mapping methods and use those improved results to plan native grassland restoration projects on Base. Similar change analyses will be done as new vegetation data is available.

Oak Woodlands

Camp Pendleton performs disease monitoring in oak forests, as described below in section 4.2.5, and surveyed the condition of oak forests in 2010-2011. Analysis of oak recruitment data collected from the same stands of oaks between 1984 and 2011 showed that oak woodlands on Base increased in density over the 24-year study period (Lawson 2015). The Base surveyed the stands of Engelmann oak (*Quercus engelmannii*) to evaluate the response of that species to wildfire and drought (Lawson 2015). Results of the 2011 oak condition study found that the high fire frequency on Camp Pendleton has not historically impeded the expansion of oak woodlands on Base. However, recruitment of large sapling and adult size classes may not be sufficient at low elevations to compensate for mortality caused by severe wildfires if drought years prevent the successful establishment of new seedlings after fires.

4.2.5 Forest Pest and Disease Management Element

- ELEMENT GOAL: Prevent pests and disease from damaging the function and biodiversity of forested ecosystems on Camp Pendleton.

MCO P5090.2A CH 4 (USMC 2018) requires that installations with forest resources fully cooperate in the planning, coordination, and execution of field operations to prevent and suppress forest damage and insect disease outbreaks. Conservation of forests on Base maintains habitats for many wildlife species and protects valuable stocks of carbon storage.

Camp Pendleton developed and currently implements a monitoring protocol for forest pests including gold spotted oak borer (*Agrilus auroguttatus*, GSOB), invasive shot hole borers (*Euwallacea* sp, ISHB), and South American palm weevil (*Rhynchophorus palmarum*, SAPW). No GSOB or SAPW have been found on Base. In contrast, ISHB has been detected in a relatively short section of Pilgrim Creek on Base in the Lima training area. Environmental Security staff watch for information on emerging pests in the area and will expand the program to cover monitoring and treatment as needed.

4.2.5.1 Objective 1: Implement Forest Pest and Disease Monitoring

OBJECTIVE 1: Implement a monitoring program for forest pests and disease.

Environmental Security coordinates with organizations on and near Camp Pendleton that have responsibility for tree and forest health in the region. As new pests or disease organisms emerge, the Base will update the GSOB monitoring protocol to include those concerns. Annual monitoring for pest beetles currently includes locally intensive surveys for goldspotted oak borer, invasive shot hole borer, and cursory surveys for damage that may indicate South American palm weevil. Environmental Security staff also educates Marines, dependents, and civilians about monitoring programs and actions such as prohibiting the movement of firewood on- or off-Base to help limit the spread of tree pests and disease on Camp Pendleton.

4.2.5.2 Objective 2: Forest Pest and Disease Response

OBJECTIVE 2: Anticipate and respond to the detection of forest pests.

Once detected, rapid response measures, including taking immediate steps to cut, chip, and tarp infested trees and monitor adjacent trees, may be required to prevent the spread of forest pests. To be prepared and able to quickly implement necessary control strategies, Camp Pendleton will renew, as appropriate, and ensure that there is current NEPA approval to support the emergency removal and treatment of infected trees and wood. Additionally, the Base will coordinate with USFWS on disease response actions to avoid and minimize effects to listed species.

To prevent an infestation of forest pests the existing early detection and rapid response (EDRR) plan integrates several strategies, including education and outreach, monitoring, and developing and implementing new Base policies. The EDRR plan for oak borer and shot hole borer beetles has four components including 1) prevention through education, 2) early detection by annual trapping and inspections, 3) rapid Response to treat discovered infestations, and 4) eradication is the initial objective for new infestations.

4.2.6 Wetland, Aquatic, and Marine Ecosystem Management Element

- ELEMENT GOAL: Conserve and enhance the natural and beneficial uses of regulated wetlands and ledger/manage no net loss of size, function, and value of wetlands.

Wetlands are highly productive and complex ecosystems that provide a variety of services such as flood control, pollution abatement, prevention of saltwater intrusion, and fish and wildlife habitat. Wetland management is a challenge nationally where more than 50 percent of wetlands have been lost, and particularly in California where more than 90 percent of wetlands have been converted to agriculture, developed, or drained for other land use (USGS 1996). Wetlands on Camp Pendleton include lakes, ponds, rivers, creeks, estuaries, and vernal pools (see Section 3.2.1).

Drivers for this element are the CWA, EO 11990 – Protection of Wetlands, MCO P5090.2A CH 4 (USMC 2018), and DoDI 4715.03 (DoD 2018a) guide wetlands protection on the installations. MCO P5090.2A CH 4 and DoDI 4715.03 require the Marine Corps to comply with the national policy of no net loss of wetlands and avoidance of loss of size, function, or ecological value of wetlands. Further, this guidance requires that the Marine Corps preserve and enhance the natural and beneficial values of wetlands while conducting its activities. EO 11990 addresses federal agency actions required to identify and protect wetlands, minimize the risk of wetlands destruction or modification, and preserve and enhance the natural and beneficial values of wetlands. This EO further requires federal agencies to avoid any new development in wetlands unless there is no practicable alternative. Wetlands contribute to the biodiversity on Base and are valuable as habitat for listed and other species and as habitat for game species that are part of the Base's hunting program. Wetlands also provide important military training conditions and provide functions that benefit the region's water quality.

Management actions at Camp Pendleton are taken to ensure that all facilities and operational actions avoid, to the maximum degree feasible, wetlands destruction or degradation regardless of wetland size or legal necessity for a permit. These actions include (1) developing and publishing avoidance and minimization measures in the Base Training Regulations (MCBCP 2022) and other Base Orders; and (2) providing oversight or conducting wetland repair/restoration for impacts. Current wetland restoration activities include the restoration of an alkali marsh at Ysidora flats at Camp Pendleton. The following objectives are implemented to provide for no net loss of size (Objective 1), function (Objective 2), and value of wetlands on Camp Pendleton.

4.2.6.1 Objective 1: Assess Wetlands

OBJECTIVE 1: Assess the distribution and extent of wetlands using the NVCS by 2018 and update every 5 years.

To meet this objective, Camp Pendleton is conducting wetlands mapping using the standard NVCS. This will allow and ensure that change analysis can be consistently and reliably performed, and the goal of no net loss be assessed every 5 years. A GIS database will be updated along with the standardized classification and mapping to ensure the ability to accurately report and show where wetlands are located and what changes are taking place, and to help determine if the changes are the results of natural or anthropomorphic actions.

4.2.6.2 Objective 2: Assess Estuaries

OBJECTIVE 2: Assess the ecological function of estuaries annually using the EPA's *Rapid Bioassessment Protocols for Use in Streams and Wadeable Rivers: Preiphyton, Benthic Macroinvertebrates and Fish*.

To meet this objective, Camp Pendleton measures trends in water chemistry and monitor benthic habitat to detect ecological integrity and fluctuations in biotic composition for individual coastal lagoon and estuarine habitats using the EPA's *Rapid Bioassessment Protocols for Use in Streams and Wadeable Rivers: Preiphyton, Benthic Macroinvertebrates and Fish* (EPA 2015). This lagoon and estuarine habitat monitoring is conducted once quarterly to obtain a seasonal annual assessment of ecological functions and values in these habitats.

4.2.7 Vernal Pool Management Element

- ELEMENT GOAL: Conserve and enhance vernal pools for no net loss of amount, ecological function, and value including the conservation of listed vernal pool species.

To meet the Base's goal for conservation and management of vernal pools, Camp Pendleton developed and is implementing a Vernal Pool and Fairy Shrimp Conservation Plan (MCBCP 2019). The plan will assure the conservation of vernal pools and listed fairy shrimp while earning relief from restrictions for training activities that occur near vernal pools. The Base requested formal consultation with USFWS on this plan in 2022.

4.2.7.1 Objective 1: Implement the Vernal Pool and Fairy Shrimp Conservation Plan

OBJECTIVE 1: Implement the Vernal Pool and Fairy Shrimp Conservation Plan.

The Base will need to complete consultation with the USFWS before fully implementing the Vernal Pool and Fairy Shrimp Conservation Plan. However, Camp Pendleton has started tasks that support objectives for vernal pool and fairy shrimp conservation as stated in the Plan. Tasks include the following 1) annual surveys of listed fairy shrimp, 2) CRAM surveys of vernal pools to assess their ecological condition, and 3) preparation of restoration sites at Cocklebur Mesa and VPG 68 for the expansion of habitat to support listed fairy shrimp well protected conservation units. Work performed for this Plan will complement ongoing work for Camp Pendleton's Rare Plant Management Plan, which include tasks to protect, and conserve listed vernal pool plants on Base. Successful implementation of the Plan will greatly benefit the training mission on by relieving or reducing many areas on Base from training restrictions related to avoiding listed fairy shrimp avoidance. Additionally, maintenance actions such as repairing training roads and

environmental reviews of projects near vernal pools will be simplified by predetermined compensation ratios and banking of compensation for impacts to listed fairy shrimp.

4.2.8 Nonnative and Invasive Plant Management Element

- ELEMENT GOAL: Minimize harm from nonnative plant species, by rapidly responding and treating new detections of invasive plants monitoring invasive plant populations to limit their spread; restoring invaded ecosystems and educate people on how to prevent spreading invasive plants in native ecosystems.

The purpose of invasive plant management is to implement a strategy to control invasive plants on Camp Pendleton. "Control" is considered, as appropriate:

- Eradication, suppression, reduction, or management of invasive species populations.
- Prevention of invasive species introductions and their spread from previously infested areas; and
- Reduction of potential adverse effects of invasive species through techniques such as the restoration of native species.

Subject to the availability of funds and staff, invasive plant management activities on Base include (1) detecting and rapidly responding to new detections of invasive plants, (2) reducing invasive plants in the uplands, (3) monitoring and managing populations of invasive plants in riparian habitat, (4) managing invasive exotic plants in dune and bluff habitats, and (5) promoting education and awareness of invasive species.

To pass information about preventing the spread of invasive plants on Base staff provide posters and brochures to Base patrons. Staff also participate in off Base weed management meetings/forums and groups (e.g., California Invasive Weed Symposium and California Invasive Plant Council [Cal-IPC]) to get new information about invasive plants. Camp Pendleton has a Basewide Exterior Architecture Plan (MCBCP 2010) that includes, as part of the Base-wide Master Plant List, a list of prohibited plants to ensure invasive exotics are not purposely introduced to Camp Pendleton during landscaping activities.

The Base's EDRR program monitors and treats the introduction and spread of invasive plant species within the Base. Of the known invasive plant species from Camp Pendleton, approximately 52 are targeted for eradication, 96 are targeted for management, and 87 are surveillance species, which are nearby but not on the Base. There is zero tolerance for all of these species in restoration sites. The remaining invasive species are considered naturalized and are not managed. Appendix L identifies the nonnative species and their designated control levels.

4.2.8.1 Objective 1: Early Detection Rapid Response Program

OBJECTIVE 1: Continue to implement invasive plant Early Detection Rapid Response Program to prevent the spread of new populations of highly invasive exotic plants on Camp Pendleton to prevent long-term costs associated with controlling larger infestations.

Initiated in 2004, the EDRR program is essential to preventing new infestations of invasive plants from establishing on Camp Pendleton. If overlooked, new infestations have the potential of becoming larger infestations that may prove more costly for the Base to remove in the future. The primary component of the EDRR program is an annual program that incorporates roadside, firebreak, and boundary invasive plant mapping and monitoring of all highly traveled roads with a rapid response treatment element that targets all identified invasive plant species. After target species are positively identified as an undesirable exotic plant, contract personnel are directed to treat the infestation usually within 2 weeks of discovery.

4.2.8.2 Objective 2: Upland Invasive Plant Removal

OBJECTIVE 2: Reduce cover of selected invasive plants in the uplands including artichoke thistle, yellow star thistle, chrysanthemum, and fennel.

Artichoke thistle (*Cynara cardunculus*), chrysanthemum (*Glebionis coronaria*), fountain grass (*Cenchrus setaceum*), and pampas grass (*Cortaderia jubata*) are selected because of their negative ecological impact, invasive potential, and wide distribution on Camp Pendleton and in southern California. As of 2013, artichoke thistle is under control throughout most areas of Camp Pendleton, except for several impact areas designated as off-limits and the State Parks lease area where artichoke thistle continues to be a problem. Treatment costs are expected to decline. However, this species will likely require annual monitoring and treatment. One of the most widespread invasive plants on Camp Pendleton is fennel (*Foeniculum vulgare*). A perennial species with high seed production, fennel is particularly invasive within Camp Pendleton's grasslands and habitat transition zones. Due to the extent of the infestation, management must be directed toward sites that have or are within sensitive resources (e.g., listed species habitats) where treatment will be most valuable.

4.2.8.3 Objective 3: Riparian Invasive Plant Removal

OBJECTIVE 3: Maintain cover of riparian type-converting invasive plants, including salt cedar, giant reed and perennial pepperweed, to <1 percent cover.

The Riparian Invasive Weed Control Program focuses on control and/or eradication of invasive species listed in Appendix L within riparian habitats on Base. Since 1995, the Base has allocated more than $10 million toward riparian invasive plant removal efforts in 1,300 acres (526 hectares), the majority going toward removing large infestations of giant reed and salt cedar mostly from the Santa Margarita River corridor. The final stretch of river infested with giant reed and salt cedar was treated from 2010 through 2011 and is now on a yearly maintenance schedule. Some areas that are not passively restoring to riparian habitat are actively being restored in the Habitat Restoration Program Element, Section 4.2.11.

Following initial treatments, most sites require at least 4 years of intensive treatments to achieve target control goals. Thereafter, a yearly maintenance contract is in place to ensure no new infestations occur. Maintenance treatments are primarily accomplished through an annual riparian weed maintenance program in the Santa Margarita River corridor yearly and other riparian areas on a rotating schedule. The program targets mainly high-priority exotic species like giant reed, tamarisk, and perennial pepperweed and serves as a monitoring program for any newly discovered riparian weeds.

Management of these invasive exotics in riparian habitats is the primary method of compensation that the Base employs to mitigate for permanent impacts to riparian habitats identified in the Riparian Ecosystem Conservation Plan (MCBCP 1995). The Riparian HMP has showed giant reed, tamarisk, and perennial pepperweed have been treated to less than 1 percent cover.

4.2.8.4 Objective 4: Dune Invasive Plant Removal

OBJECTIVE 4: Manage invasive exotic plants in coastal dune, strand habitats, and bluffs, and restore with native dune and bluff plants.

Because of the extent of sensitive natural resources within Camp Pendleton's coastal dune habitats (i.e., California least tern and western snowy plover nesting sites, and rare plant populations), the Dune Management program was created to control and/or eradicate exotic plant species and their thatch that are detrimental to those habitats. Conditions of the initial Dune Study and Management Plan by the Nature Conservancy (TNC 1994a, TNC 1994b) have been met and future invasive plant control will be addressed in a base-wide invasive plant monitoring plan being developed under Objective 1. The program currently includes initial treatments within areas that have never been treated and maintenance treatments within previously treated sites.

Intensive initial treatments, which began in 2004, typically occur within 40- to 50-acre sites for a period of 3 years. The sites are then moved into a weed management maintenance yearly treatment schedule. Treatments target exotic invasive plants that are particularly damaging to coastal dune

habitats, including devil's thorn (*Emex spinosa*), which is targeted for eradication and iceplant or hottentot-fig, New Zealand spinach (*Tetragonia tetragonioides*), European sea rocket (*Cakile maritima*, nonnative), wild radish (*Raphanus sativus*), and perennial pepperweed, which are targeted for reduction to less than 1 percent of cover. An annual maintenance program was initiated in 2011 to re-treat sites that have already undergone initial treatments. The Base also creates and/or enhances dune and strand habitat by sand replenishment and following with native dune plantings.

4.2.8.5 Objective 5: Support Invasive Plant Eradication Education

OBJECTIVE 5: Support regional invasive plant information sharing.

Participation in information-sharing events off-Base can help to educate staff on current problems and solutions. Therefore, Camp Pendleton participates in the San Diego Weed Management Area steering committee.

4.2.9 Erosion Control Element

- ELEMENT GOAL: Conserve soil resources that support the training landscapes and their ecosystems.

Erosion and sedimentation are natural processes caused by the actions of wind, water, and gravity, which can also be accelerated due to human disturbances. Training and construction activities near surface waters can cause water pollution or stream degradation, if the proper erosion and sediment control measures are not implemented. Valuable training lands may be lost to severe erosion, which can also threaten infrastructure by undermining foundations or exposing utility lines. It is Marine Corps policy to prevent soil erosion and to restore eroded sites where possible in accordance with MCO 5090.2A CH 4 (USMC 2018):

> "The Marine Corps will manage its land to control and prevent soil erosion and to preserve natural resources by conducting surveys and implementing soil conservation measures. Altered or degraded landscapes and associated habitats are to be restored and rehabilitated whenever practicable."

Camp Pendleton does not perform dedicated scouting surveys for erosion areas. Instead, sites for possible erosion treatment are evaluated after they are discovered during other surveys nearby. Treatments are prioritized at sites where erosion threatens infrastructure such as roads or at sites where erosion threatens the loss of listed species habitat. Using field survey data, Environmental Security has identified and prioritized locations with erosion that need treatment. Erosion and

sediment control activities are focused on specific sites based on criteria such as proximity to training, transit routes, and waters of the U.S. Other factors include:

- Safety, such as for emergency or military vehicle access on secondary roads;
- Potential impacts on high-value facilities or crucial training areas;
- Erosion that threatens listed species habitat or significant cultural resources;
- Volume of potential soil loss; and
- Cost-effectiveness of the control measure.

Part of the Erosion Control Element emphasizes avoiding the creation of erosion problems through review of project plans, mainly projects that concentrate water flow. This review determines if a project has the potential to create erosion problems during or after the project and provides direction to help prevent erosion problems, e.g., best management practices during construction and recommended design changes to prevent post-project erosion.

Camp Pendleton has expended substantial time, effort, and funds to adequately address erosion issues. The restoration projects undertaken by Environmental Security directly benefit natural resources through (1) military training by returning training lands to usable conditions and reducing safety hazards; (2) potential expansion of habitats for native species; and (3) nonnative plant reduction and control.

4.2.9.1 Objective 1: Conduct Erosion Control Projects

OBJECTIVE 1: Maximize the capability of the landscape to support military training and conserve sensitive habitats.

Camp Pendleton will meet this objective by contracting erosion control projects that support training needs and conservation needs. For example, the most recent contract for erosion treatment (FY22) on Base includes a site at the Assault Craft Unit 5's Landing Craft Air Cushion (LCAC) facility that was chosen because gully erosion threatens a perimeter fence is degrading adjacent habitat for California gnatcatcher. Another location that the Base will contract for erosion repair is the San Onofre Management Area, which has a few head-cutting gullies threatening vernal pools with federally listed species.

4.2.10 Wildland Fire Management Element

- ELEMENT GOAL: Manage fire potential to minimize harm to highly valued natural resources, cultural resources, and human structures.

Camp Pendleton has established multiple avenues to meet the element goal and minimize impacts from wildfire. The Base has created a Fire Danger Rating (FDR) system that is DoD compliant; with the Fire Danger Rating, the Camp Pendleton Fire Department and G-3/5 (the Base's Range and Training Department) then determine what training is authorized. Environmental Security informs the FDR through supporting Remote Automatic Weather Stations (RAWS) stations and conducting fuel moisture surveys.

In 2018, Camp Pendleton completed the Wildfire Protection Plan Environmental Assessment (MCBCP 2018), which describes prescribed burning, mowing, and a series of firebreaks and fuel breaks that can limit the spread of fires; an associated biological opinion was issued by the USFWS (USFWS 2020). Prescribed burns on Camp Pendleton often achieve desired objectives for conservation. Prescribed burning mainly occurs in grasslands, both nonnative annual and perennial. In addition, Camp Pendleton conducts conservation burns that reduce invasive grass thatch, which enhances habitat for Pacific pocket mouse and Stephens' kangaroo rat. Annual fuel reduction burns in X-ray Impact Area help to maintain native perennial grasslands by reducing the abundance of non-native annual grasses.

4.2.10.1 Objective 1: Implement a Fire Danger Rating System

OBJECTIVE 1: Implement a Fire Danger Rating System that complies with National Wildland Fire Management standards.

To meet this objective weather and plant fuels data are systematically collected on Base to develop regularly update Fire Danger Ratings (FDR). Remote automated weather stations provide daily weather data from representative areas on Base. At each of those six sites, monthly live and dead fuel moistures are measured using standard methods. These weather and fuels data are used daily in nationally accepted fuel models to determine a local FDR. Each daily FDR is sent to the Camp Pendleton Fire Department for review and adjustment. Fire Department staff evaluate the FDR results given currently available firefighting resources and adjust the FDR as needed to protect natural resources and human development. The Fire Department then provides the FDR to the Range Operations Department for implementation. Range Operations widely advertises the daily FDR and will adjust base training activities if needed to mitigate the risk of wildfire as determined by the daily FDR.

4.2.10.2 Objective 2: Conduct Fuels Management

OBJECTIVE 2: Support fuels management to enhance the condition of grassland ecosystem and prevent coastal sage scrub habitat type conversion to a disturbed state.

The Base currently conducts fuel treatments (including prescription burns and the creation of fuel and firebreaks per MCBCP 2018) adjacent to coastal sage scrub to reduce wildfires in these areas and reduce type conversions. Grasslands typically improve with prescribed burning and will be monitored to track their health. Camp Pendleton actively uses weed treatment and seeding of native plants to slowly restore nonnative grasslands to native perennial grasslands after fires.

Camp Pendleton maps all prescribed burns and wildfires each year to track the frequency of fire in coastal sage scrub and perennial grasslands and determine if management actions are necessary to conserve the integrity of those vegetation communities after fires. Map data prepared by the Environmental Security department is also reported to the Camp Pendleton Fire Department for their internal reporting mechanisms.

Conservation treatments after wildfires may include erosion control, restoring temporary firebreaks created while suppressing the fire, weed treatment planting native plants, and reducing disturbance at the site by installing Carsonite markers. Post-suppression fire management actions generally occur where a fire has burned occupied habitat of a listed species or other sensitive areas. These reduce potential long-term negative effects of fire and the effects of fire suppression actions. At burn sites with listed species habitat, these actions often require Section 7 consultation with USFWS, which the Base completes prior to treatment. Camp Pendleton plans to collaborate with USFWS and NOAA to cover these actions with a programmatic consultation in the next 5-year cycle of the INRMP.

4.2.10.3 Objective 3: Conduct Prescribed Burns for Conservation

OBJECTIVE 3: Conduct prescribed burns for conservation to improve habitat for wildlife in accordance with species management and ecosystem management goals.

Species management goals of the INRMP identify the need for prescribed burns in several ecosystems mainly to reduce nonnative grass and thatch cover. The Camp Pendleton Fire Department will conduct prescribed burns as needed, with guidance from Environmental Security, to improve habitat conditions for the Stephens' kangaroo rat and Pacific pocket mouse. Prescribed fires were performed in Juliet and Oscar 1 to benefit these species in 2020. Burns at these sites will be repeated and new burns are planned for additional sites to benefit these listed rodents. The Base collaborates with USFWS to plan conservation burns and performs monitoring to assess the benefits provided to habitats from burning. Prescribed burning has been proposed in Oscar 2 to dethatch and enhance grasslands that have vernal pools with listed fairy shrimp outlined in the Wildfire Prevention Plan (MCBCP 2018).

4.2.10.4 Objective 4: Respond to Wildfires and Prepare for Prescribed Fires

OBJECTIVE 4: Assist the Fire Department in responding to wildfires and conducting prescribed fires.

RMB staff support the Camp Pendleton Fire Department prior to, during, and after both wildfires and prescribed fires. Prescribed fires are most often conducted to safely reduce plant fuels and provide defensible space against wildfires, although conservation burns are conducted by the Fire Camp Pendleton Fire Department at the request of Environmental Security (Section 4.2.10.3). The data collection and environmental review task described in the above section are examples of this support. Environmental Security provides contracted workers that perform vegetation clearing prior to prescribed fires and do weed maintenance as needed after prescribed fires and wildfires. In addition, Resource Management Branch (RMB) staff serve as resource advisers during fires and prior to prescribed fires to protect sensitive natural and cultural resources. In 2024, Camp Pendleton Environmental Security will submit a Section 7 ESA consultation for post fire activities that may harm listed species in uplands, e.g., replacing soil berms on temporary firebreaks in Stephens' kangaroo rat habitat. In addition, Camp Pendleton Environmental Security will explore a Section 7 ESA programmatic consultation for wildfire response during a wildfire (e.g., fire retardant) with the USFWS and NOAA Fisheries.

4.2.11 Habitat Restoration and Enhancement Element

- ELEMENT GOAL: Implement habitat restoration to support sustainable landscapes.

Many of the USFWS Biological Opinions (BOs) issued to Camp Pendleton include mitigation/compensation requirements for impacts to federally listed wildlife species. ES Planning Branch is responsible for implementation of on Base project-related restoration mitigation projects. Similarly, RMB oversees projects to enhance habitats for listed and non-listed species.

4.2.11.1 Objective 1: Restoration

OBJECTIVE 1: Support completion of restoration projects required by BOs, sustainable habitat goals, and disturbed areas, as needed.

Camp Pendleton routinely restores natural sites that may be used for mitigation or to conserve functioning ecosystems. Current examples of restoration projects to compensate for impacts to occupied listed species habitat include: the Sierra IV buffer project and Vernal Pool Group 68 restoration project. In addition to conducting restoration as a mitigation requirement, Environmental Security (as implemented by the Resource Management Branch) also conducts

habitat restoration as part of its land stewardship activities. For example, the Ysidora flats alkaline salt marsh is actively being restored to ensure the future sustainability of this habitat in this area. Similarly, restoration has begun at the San Onofre Mesa vernal pool habitat (basins and surrounding uplands), and the Cocklebur Vernal Pool. See Section 4.8.1 for habitat restoration information related to repair and restoration of impacts associated with unplanned and/or unauthorized events, i.e., environmental incidents.

4.2.12 Climate Change Monitoring and Data Collection Element

- ELEMENT GOAL: Provide data to understand future climate change-induced impact to natural resources and the military mission.

The following objectives were developed to inform Camp Pendleton with data to understand climate change-induced impacts to natural resources (see Appendix B for a full description on vulnerabilities to the Base with climate change). Actions associated with these objectives are implemented by RMB and apply to all ecosystems.

4.2.12.1 Objective 1: Collect Climate Informed Data

OBJECTIVE 1: Collect climate informed data.

To meet this objective and gather data related to the climate, information is gathered from several sources already outlined in this INRMP. For example, extensive monitoring data is collected during wildlife monitoring efforts (Section 4.1.1.1) that will support future analysis of climate change impacts to wildlife species; data includes stream typing, water temperature, temporal surface water presence and flow measurements. As a follow-up to past insect biodiversity surveys on Base, Camp Pendleton is conducting an invertebrate survey in coastal sage scrub plant communities. During insect surveys on the Base, weather data will also be collected. Together, these data may document impacts of climate change on insect communities and their habitat.

Changing weather patterns and resulting fire patterns will likely impact sensitive plant communities such as coastal sage scrub that hosts substantial biodiversity and is habitat for the threatened CA gnatcatcher; therefore, as outlined in Section 4.2.10, RAWS will be maintained every year to monitor the weather and fuel moisture and wildfire mapping will also continue yearly.

As outlined in Appendix B and Section 4.1.1.2, As part of the proposed action of the Conjunctive Use Project (CUP), an Adaptive Management Plan (AMP), followed by a separate Facility Operation Plan (FOP) has been developed by MCB Camp Pendleton to manage project diversion,

recharge, production, and delivery facilities. Monitoring data on arroyo toad, least Bell's vireo, and Riparian Health (Section 4.2.4) is collected annually to determine impacts of Base water management activities, per MCBCP 2015b and the Conjunctive Use Project Section 7 consultation with the USFWS (USFWS 2016).

4.2.13 Climate Resiliency Element

- ELEMENT GOAL: Develop/implement short-term and long-term solutions to build resiliency of the Base's natural resources and military mission to climate change.

As discussed in Section 2.6.4 and Appendix B, the INRMP adaptation planning process (DoD 2019) consists of the following steps (Figure Appendix B-1):

- Set context for adaptation planning: document current and future climate projections, including uncertainties;
- Identify potential climate impacts and vulnerabilities, risks to natural resources and mission;
- Evaluate the implications of climate-related changes to INRMP goals, objectives, and actions;
- Identify opportunities, develop strategies and actions to reduce climate-related risks and vulnerabilities (Actions are discussed in Element 4.2.13);
- Implement climate adaptation actions and projects. Link natural resource adaptation concerns/responses with other installation projects/planning (Actions are discussed in Element 4.2.13); and
- Monitor and adjust climate adaptation actions (Actions are discussed in Sections 4.1.1, 4.2.2, and 4.2.12).

Adaptation strategies and actions should be capable of mitigating key climate risks to the natural resources under management, and ultimately to the military mission of the installation. For this 5-year cycle of the INRMP, Camp Pendleton will focus on restoring and maintaining the current systems and ensuring that monitoring protocols are climate informed (Section 4.2.12).

4.2.13.1 Objective 1: Continue with Actions to Build Resiliency

OBJECTIVE 1: Continue with management actions that build resiliency of ecosystems to climate change.

The management actions that Camp Pendleton has taken over the last 40+ years, continues to implement, and plans to implement over the next 5 years focuses on maintaining or restoring current systems, which ultimately combats climate change by maintaining ecological function and diversity. Those actions specific to an ESA listed species, such as restoration of habitat for thread

leaved brodiaea are outlined in Section 4.1.1. Resiliency is built into ecosystems through the Sustainable Ecosystem Management Program (Section 4.2) via actions such as exotic wildlife control, forest pest and disease management, nonnative and invasive plant management, erosion control, wildland fire management (including prescription burns), and habitat restoration. Proposed actions include the following:

- Evaluate coastal wetlands associated with installation lagoons to determine opportunities for wetland restoration.
- Restore up to 20 acres of coastal wetland habitat for carbon sequestration and protection against future sea level rise.
- Evaluate the need for kelp forest management for carbon sequestration and resiliency of fish, marine mammal and green sea turtle foraging habitat.
- Determine feasibility of restoring and/or developing eelgrass habitat in the Del Mar Boat Basin and near the mouth of the Santa Margaritta River estuary.

4.2.13.2 Objective 2: Partnering to Develop Base Infrastructure Projects

OBJECTIVE 2: Partner with Base departments (e.g., Public Works, Range and Training, Public Liaisons Office) to develop infrastructure projects supporting the resiliency of natural resources, Base infrastructure, and training lands.

Camp Pendleton's natural resources program is building resiliency to climate change with current and proposed short term management actions (Section 4.2.13.1); long term actions will require partnerships with internal Departments and external organizations (e.g., State, not for profits) to use science and engineering for creative climate change resiliency projects.

For example, in 2021, Camp Pendleton's Public Works Department initiated a shoreline feasibility study on San Onofre Beach, with input from Environmental Security. San Onofre Beach has experienced beach erosion that affects infrastructure at the San Onofre recreation and training beaches. Recreation has been affected due to the loss of recreational campsites and pending loss of the main lifeguard tower from storm surges. Training is negatively affected when sand erosion causes increased shoreline steepness and beach width. In 2021 the Camp Pendleton Public Works Department funded the United States Army Corps of Engineers to conduct a coastal study to examine future conditions on the Base's segment of San Onofre beach under various climate change and sea level rise scenarios. The project includes a costal study, development of project alternatives to address beach erosion (including no-action, managed retreat, and various engineered solutions), and include impact evaluation on coastlines in and surrounding the study area (from Dana Point Harbor to Oceanside Harbor within the Oceanside Littoral Cell). The draft coastal study was completed in March 2023 and presented results from data gathering, an updated hydraulic study of San Onofre creek, sediment production and transport modeling, and preliminary

project alternatives. Follow-up actions are for the Base to decide which alternatives to forward for more complete analysis, including environmental impacts, cost estimates, and coordination with stake holders (e.g., surfers, lifeguards, campsite users, training personnel, and other Base departments).

The Army Corps of Engineers has initiated a climate resiliency initiative to enable more sustainable delivery of economic, social, and environmental benefits associated with infrastructure. Projects involve multiple entities - including federal, state, local and non-governmental partners - to create projects such as levees, living shorelines, coastal carbon capture via beach nourishment projects, and bank stabilization projects. Drawing from the collaborative method of the Army Corps of Engineers, Camp Pendleton will explore these partnerships internally and externally in the next 5-year iteration of the INRMP to use science and engineering for creative climate change resiliency projects.

4.3 MIGRATORY BIRD AND RAPTOR MANAGEMENT PROGRAM

- PROGRAM GOAL: Provide that populations of migratory birds and raptors are conserved in compliance with legal drivers while ensuring maximum flexibility to the Marine Corps military training mission.

Camp Pendleton's varied habitat assemblage supports a rich diversity of resident and migrant bird species. To date, 358 bird species have been recorded on Camp Pendleton, including resident breeders, migrants, and vagrants (i.e., birds wandering from their normal home range). Because birds are specialized, differ in environmental requirements and tolerances, and are easily monitored, they can provide insight into ecosystem integrity.

Several policies guide the migratory bird conservation on Camp Pendleton. The primary consideration regarding the conservation and management of migratory birds is compliance with the Migratory Bird Treaty Act (MBTA) and Bald and Golden Eagle Protection Act (BGEPA). Guidance for compliance with these federal laws is provided under EO 13186 (EO 2001) and the resulting MOU between the DoD and USFWS (2006) and the Final Rule for the Take of Migratory Birds by the Armed Forces (Federal Register 72 FR 8931).

The Migratory Bird and Raptor Conservation Element and its associated goals and objectives are discussed further in the following subsections.

4.3.1 Migratory Bird and Raptor Conservation Element

- ELEMENT GOAL: Promote the conservation of migratory birds and raptors through MBTA compliance, population monitoring, and habitat management.

Camp Pendleton's approach for conserving migratory birds and raptors seeks to ensure (1) compliance with the Base's policies, programs, and procedures with the MBTA and (2) monitoring and management of species' populations. The MBTA prohibits the taking, killing, or possessing of migratory bird populations unless permitted by regulations promulgated by the Secretary of the Interior. EO 13186 (EO 2001) directs that federal agencies take responsibility for the protection of migratory birds. Pursuant to this EO, the DoD entered an MOU with USFWS on 31 July 2006 (DoD and USFWS 2006), with a ten-year renewal in 2016. This MOU is designed to promote the conservation of migratory birds by ensuring DoD operations (except for military readiness activities) are consistent with the MBTA and avoid the take of migratory bird populations. Military readiness activities are defined as all training and operations of the Armed Forces that relate to combat, including but not limited to, the adequate and realistic testing of military equipment, vehicles, weapons, and sensors for proper operation and suitability for combat use. The MOU does not authorize "take" of migratory birds but outlines the responsibilities of DoD personnel during installation activities that pertain to natural resources management, installation support functions, operation of industrial activities, construction of facilities, and hazardous waste cleanup. The MOU requires that management activities, such as prescribed fire, fuels management, and invasive species control, consider the impacts of such efforts on migratory bird populations and that monitoring be used to assess these impacts. The MOU requires that such planning efforts for such activities consider the impacts on migratory bird populations.

Responsibilities identified in the MOU specific to DoD include:

- Incorporating conservation measures addressed in Regional or State Bird Conservation Plans in INRMPs;
- When consistent with safety and security, allowing USFWS and other partners reasonable access to military lands for conducting surveys;
- Engaging in early planning and scoping with USFWS prior to starting any activity likely to affect populations of migratory birds to proactively address migratory bird conservation and initiate appropriate actions to avoid or minimize the take of migratory bird populations; and
- Managing military lands and nonmilitary readiness activities in a manner that supports migratory bird conservation.

The MOU does not address incidental take resulting from military readiness activities or active DoD airfield operations. Military readiness activities are covered by Final Rule for the Take of

Migratory Birds by the Armed Forces (Federal Register 72 FR 8931). Conditions of this authorization are the obligation of DoD installations to confer and cooperate when military readiness activities may have a significant adverse effect on migratory bird populations. To avoid reaching the threshold that could revoke this authorization, DoD should engage in early planning and scoping, involve USFWS in planning, develop a list of conservation measures for migratory birds, and include comprehensive migratory bird management objectives in planning documents. To operators in the field, this provision provides significant benefit as training activities were previously subject to potential litigation and injunction. Camp Pendleton will, through this INRMP and NEPA review processes, continue to identify measures to avoid and minimize—to the extent practicable—adverse impacts to migratory birds that may be attributable to military readiness activities.

4.3.1.1 Objective 1: Monitor MBTA Compliance

OBJECTIVE 1: Monitor the compliance of Camp Pendleton policies, programs, and procedures with the MBTA, and develop measures to avoid and minimize impacts to bird populations, as well as conservation measures.

There is no authorization for the intentional or unintentional take of migratory birds during actions that are not considered military readiness activities. Thus, projects that are not actual military readiness activities must be reviewed for potential impacts to migratory bird populations through the NEPA process.

Per the MOU between USFWS and DoD (DoD and USFWS 2006), prior to implementing any activity that has, or is likely to have, a measurable negative effect on migratory bird populations, the Base shall:

- Identify the migratory bird species likely to occur in the area of the proposed action, and determine if any species of concern could be affected by the activity;
- Assess and document, through the project planning process (e.g., NEPA), the potential effects of the proposed action on species of concern. Use best available demographic, population, or habitat-association data in the assessment of effects upon species of concern; and
- Engage in early planning and scoping with USFWS to proactively address migratory bird conservation, and to initiate appropriate actions to avoid or minimize the exposure of birds and their habitats to avian stressors that may result in the take of migratory birds.

As needed, Environmental Security will monitor and interpret any new policies related to migratory birds and will coordinate with the Western Area Counsel Office (WACO) for legal

guidance and consistency; applicable measures will be incorporated into environmental review documents.

4.3.1.2 Objective 2: Monitor MBTA Compliance

OBJECTIVE 2: Identify activities on Camp Pendleton having population-level effects on migratory bird populations through annual and as-needed monitoring.

To determine whether activities on Camp Pendleton are having an impact (positive or negative) on migratory bird populations, RMB staff performs or participates in monitoring efforts to obtain data on the status of migratory birds. Examples of regular monitoring efforts implemented on Camp Pendleton include:

- Annual neotropical migratory bird studies for listed species and species of concern
- Christmas bird counts
- Annual surveys to map great blue heron (*Ardea herodias*) nesting colonies
- Periodic surveys of coastal cactus wren (*Campylorhynchus brunneicapillus*)
- Periodic surveys of Belding's savannah sparrow (*Passerculus sandwichensis beldingi*)
- Monitoring Avian Productivity and Survivorship stations
- North American Breeding Bird Survey

Camp Pendleton will also evaluate landscape attributes as needed to ensure patch sizes and connectivity of habitat support sustainable populations of migratory birds.

4.3.1.3 Objective 3: Raptor Monitoring and Management

OBJECTIVE 3: Monitor and manage raptor populations on Camp Pendleton to support healthy populations, comply with federal laws (BGEPA and MBTA), and support the military mission.

Raptor monitoring and management are conducted to support species diversity, comply with the MBTA and BGEPA, and support the military mission and other species management programs on Camp Pendleton. To meet the objective, surveys are conducted every 5 years to track population changes. Other monitoring and management programs that will be implemented to satisfy the objective include the following:

- By 2024, Camp Pendleton will update the existing Avian Protection Plan. This includes coordination with the Facilities Maintenance Department to identify utilities that are hazardous to large birds (e.g., power lines, wind turbines, communication towers, etc.) and recommend modifications to reduce impacts.

- Currently, bald eagle and golden eagle are not nesting on Base. However, in recent years, bald eagle has transited and foraged on the Base. If eagles become prolific, Camp Pendleton will coordinate with USFWS to design measures in line with current policies to mitigate impacts.

4.3.1.4 Objective 4: MBTA Permits

OBJECTIVE 4: Manage and maintain permits for authorized removal of birds and bird nests.

Removal of bird nests on Base may be necessary to support the training mission or to minimize impacts during maintenance and construction activities. Salvage permits are required to allow natural resources staff to handle or remove protected wildlife presenting risks to human health and Camp Pendleton's training mission. Additionally, a Migratory Bird Depredation Permit is required to remove raptors and corvids from the installation beaches in order to protect California least tern and western snowy plover adults, chicks and eggs. Resource Management Branch personnel are responsible for ensuring wildlife salvage and depredation permits are obtained and maintained that allow lawful handling and removal of wildlife. Resource Management Branch evaluates need for natural resources permits on an annual basis. Once permits are in place, Camp Pendleton provides data related to wildlife conflicts (and the associated permits) to applicable state and federal agencies. Current permits maintained by Camp Pendleton, its purpose, and the responsible agency are identified in Table 4-1.

Table 4-1
Wildlife Permits

Agency	Specific Permit	Details	Expiration
USFWS	MBTA Depredation Permit	Raptor and corvid removal	Annually
USFWS	MBTA Special Purpose	Birds, nests, and eggs	3 yrs/report annual

4.3.1.5 Objective 5: Restore Grasslands

OBJECTIVE 5: Restore native perennial grass and forb lands in prescribed burn areas to promote nesting and foraging areas for grassland migratory bird populations.

After a prescription burn, Camp Pendleton conducts weed treatment and restoration on perennial grasslands invaded by nonnative grasses. The intent is to restore native perennial grasslands for the benefit of grassland birds at sites that do not conflict with fuel management objectives.

4.4 MARINE AND FISH MANAGEMENT PROGRAM

- PROGRAM GOAL: Manage sustainable populations of native marine and freshwater species to meet the conservation objectives of applicable regulations and provide maximum flexibility for the military training mission.

The Marine and Fish Management Program intends to develop and implement proactive marine and fish management plans that support populations of threatened, endangered, and native species so that all applicable conservation measures are met to provide maximum flexibility for military training requirements. The program also intends to continue utilization of the best technology and research methodology to characterize aquatic habitat and species interactions in support of enhanced flexibility for military training requirements. Lastly, the program intends to develop exceptional recreational sport-fishing conditions for service members and their families stationed aboard Camp Pendleton.

The Base is responsible to ensure that any of its actions or activities that may impact resources offshore are conducted in accordance with regulations and laws governing those resources. Camp Pendleton takes this responsibility seriously since a large portion of the military training mission requires use of sea space and the airspace over it. Management of aquatic fauna on Base balances the needs of the training mission with the support of recreational game programs, as well as with the protection of federally listed threatened and endangered species, and other natural resources as required by law. In addition to the Clean Water Act (CWA) and other laws that govern the minimization of pollution into U.S. waterways, aquatic resources on Base and offshore are subject to natural resources management laws, including the Magnuson-Stevens Act, Marine Mammal Protection Act (MMPA), and ESA (see Section 4.4.1 regarding the management of federally listed threatened or endangered marine or anadromous species). Camp Pendleton also has a recreational fishing program that is subject to additional applicable federal and state regulations (Section 4.6.1). The program is organized into two elements as discussed in Sections 4.4.1 and 4.2.2, respectively: (1) Magnuson-Stevens Act and MMPA Compliance Element and (2) Marine and Freshwater Monitoring Element. These elements and their associated goals and objectives are discussed further in the following subsections.

4.4.1 Magnuson-Stevens Act and MMPA Compliance Element

- ELEMENT GOAL: Support compliance with the Magnuson-Stevens Act and Marine Mammal Protection Act.

Magnuson-Stevens Act

The Magnuson-Stevens Fishery Conservation and Management Act is a national program for the conservation and management of the fishery resources of the United States. Its purpose is to prevent overfishing, rebuild overfished stocks, ensure conservation, facilitate long-term protection of Essential Fish Habitats (EFHs), and to realize the full potential of U.S. fishery resources. All of Camp Pendleton's nearshore resources, including the Santa Margarita estuary and Del Mar Boat Basin on Base, are designated as EFH under the Magnuson-Stevens Fishery Conservation and Management Act. EFH at Camp Pendleton may include streams, estuaries, and offshore subtidal habitats that may be important for marine and anadromous fish species. Eelgrass is also designated as an EFH pursuant to the Act.

Regulation of these resources falls under the Pacific Groundfish Management Area or the Pacific Coastal Pelagic Fishery Management Area. The Coastal Pelagic Species Fishery Management Plan includes 81 species potentially found offshore of Camp Pendleton, and the Pacific Coastal Pelagic Fishery Management Area is specifically designed to protect lower trophic species (e.g., anchovies, sardines, mackerel, and market squid), all of which are known to occur offshore of Camp Pendleton (NMFS 1991).

Eelgrass occurs in Camp Pendleton nearshore environment and in the Del Mar Boat Basin. The Southern California Eelgrass Mitigation Policy was developed, in collaboration by NOAA Fisheries, USFWS, and CDFW, to standardize and maintain a consistent policy regarding mitigating adverse impacts to eelgrass resources. Eelgrass vegetated areas are recognized as important ecological communities in shallow bays and estuaries because of their multiple biological and physical values. Eelgrass habitat functions as an important structural environment for resident bay and estuarine species, offering both predation refuge and a food source. Eelgrass functions as a nursery area for many commercially and recreational important finfish and shellfish species, including those that are resident within bays and estuaries, as well as oceanic species that enter estuaries to breed or spawn. Eelgrass also provides a unique habitat that supports a high diversity of noncommercially important species whose ecological roles are less understood (NMFS 1991). The Base proposes to evaluate opportunities to expand eelgrass in the Del Mar Boat Basin and near the mouth of the Santa Margarita River and will write an eelgrass management plan by 2026.

Marine Mammal Protection Act

The 1972, the MMPA established a federal responsibility to protect and manage marine mammals. The MMPA prohibits, with certain exceptions, the take of marine mammals in U.S. waters and by U.S. citizens in international waters; and the importation of marine mammals and marine mammal

products into the United States. Take of a marine mammal is defined to include harassment, hunting, capturing or killing, or the attempt of such actions.

As marine mammals do not breed, colonize, or haul out on Camp Pendleton beaches, management for marine mammals primarily consists of contacting USFWS and/or NOAA Fisheries, as appropriate, should marine mammals or their products (carcasses or body parts) be found stranded or washed ashore on Camp Pendleton's beaches, and coordinating with USFWS and NOAA Fisheries (as part of the NEPA process) to ensure that projects and activities that occur along the shore or offshore do not adversely affect marine mammals.

4.4.1.1 Objective 1: Review Policy and Develop Response Protocols

OBJECTIVE 1: Facilitate compliance with the Magnuson-Stevens Act and MMPA through review of policies and development of response protocols.

Camp Pendleton reviews existing and new policies on an as-needed basis to ensure that all activities on the Base are following the Magnuson-Stevens Act and MMPA. In 2024, Environmental Security will finalize protocols for responding to stranded marine mammals, and maintaining records. Ongoing coordination with NOAA Fisheries and USFWS will be conducted concurrently with the implementation of the established stranded marine mammal protocols and enforcement actions.

4.4.2 Marine and Freshwater Monitoring Element

- ELEMENT GOAL: Conduct monitoring of marine and freshwater habitats.

Marine and estuarine ecosystems include abundant biodiversity of species and microhabitats. Reduction of species' complexity in these ecosystems could indicate natural or nonnatural impacts and should be investigated by Base biologists. Periodic monitoring of the nearshore environment and routine monitoring of the estuaries are needed to determine whether species complexity or habitat alteration has occurred. The following objective ensures monitoring of marine and freshwater habitats on Camp Pendleton.

4.4.2.1 Objective 1: Monitor Marine and Freshwater Environments

OBJECTIVE 1: Monitor marine and freshwater environments and species to document diversity of native aquatic species through periodic inventory and habitat assessments.

Camp Pendleton will periodically (minimally every 10 years) inventory the condition of the nearshore environment and diversity of native marine species. The Base will annually monitor the lagoons and estuaries within Camp Pendleton to determine whether habitat is functional for persistence or existence (Santa Margarita River estuary) of tidewater goby as noted in Section 4.1.1 (see Objective 1). Monitoring efforts include invertebrate and vertebrate sampling, as well as physical and chemical water sampling. Species diversity and habitat constituents will be assessed on a relative scale to previous results, and future management actions addressed as needed based on most recent findings.

Freshwater fish species are sampled incidentally to conducting aquatic exotic species removal (Section 4.2.2) in the San Mateo, San Onofre, Las Flores, and Santa Margarita watersheds.

4.5 GAME MANAGEMENT PROGRAM

- PROGRAM GOAL: Manage sustainable game populations to support a sustainable food web and a recreational hunting program that is consistent with the military mission and other species management programs.

In support of the recreational hunting program on Camp Pendleton (see Section 4.6.2), the Base manages game species on Base in cooperation with CDFW and follows California law and the annual framework established by CDFW. Section 640, Title 14, California Code of Regulations (Management of Fish and Wildlife on Military Lands) and Sections 3450 through 3453 of California Fish and Game Code allow for sufficient flexibility in administering hunting and fishing programs, to avoid conflicts with military training and maintain sustainable game species populations. In recent years, Environmental Security has increased their involvement in the review of harvest data, review of authorized harvest limits, and identification of population enhancement measures.

Wildlife game species at Camp Pendleton include California quail (*Callipepla californica*), mountain quail (*Oreortyx pictus*), mourning dove (*Zenaida macroura*), band-tailed pigeon (*Columba fasciata*), desert cottontail (*Sylvilagus audubonii*), brush rabbit (*Sylvilagus bachmani*), southern mule deer (*Odocoileus hemionus fuliginatus*), and many waterfowl species. Sustainability in game management should favor using methods that do not require regular inputs of labor or materials to maintain continued benefits for wildlife; and those that promote a harvestable surplus of game animals (i.e., the Base shall not "overhunt"). Management practices benefiting game species on Camp Pendleton include providing additional water sources, prescribed burns, restoring plant communities, and population monitoring for game species.

The Game Management Program is organized into two elements: (1) Game Species Element and (2) Bison Management Element. These elements and their associated goals and objectives are discussed further in the following subsections.

4.5.1 Game Species Element

- ELEMENT GOAL: Monitor and manage game species to support recreational hunting.

The Base is responsible for managing wildlife game species (deer, small game, and waterfowl) in a scientifically sound manner to provide a sustainable food web and a high-quality hunting experience for those permitted to hunt on Camp Pendleton. The following objectives are intended to ensure that Environmental Security monitors and manages game species in support of the recreational hunting program.

4.5.1.1 Objective 1: Deer Management

OBJECTIVE 1: Implement management strategies to sustain mule deer populations as determined by current deer harvest and survey data.

Hunting and active management of the southern mule deer population at Camp Pendleton have been ongoing since at least 1955. Starting in 1987, in an effort to expand data input and reinforce game management plans, the Base began producing deer hunting reports that included deer age, weight, and sex. Environmental Security staff collect hunter harvest information including harvest date, number of animals, species, sex, body condition, and age of game animals harvested. The current objective intends to continue the management of the species through the analysis of data and management of hunter effort.

Future actions include the creation of a deer management plan that would incorporate current data collection methods and develop new methods for deer population analysis. The deer management plan will inform decisions on hunting, identify any required changes to existing hunting programs and any enhancements required to improve species populations or the quality of the program. Specific training/hunting area use is authorized each hunting day dependent upon training use, hunter numbers, effort, and safety with sufficient manpower to run programs; additional information from the deer management plan will enhance current practices.

4.5.1.2 Objective 2: Game Species Data Collection and Management

OBJECTIVE 2: Collect game species data that are useful in evaluating appropriate hunting bag limits, monitor for over-harvest, and identify health/disease conditions.

Since 1955, wildlife staff on the Base has collected and evaluated game species data to provide quality hunting and fishing programs. Data are collected for small game (since at least 1970) and waterfowl (since at least 1985), including data for doves, rabbits, pigeons, squirrels, and ducks harvested. Hunter effort is measured for small game and waterfowl hunters and sex data recorded for quail and waterfowl. Other monitoring methods have included performing quail cow-call counts and estimating juvenile and adult ratios for quail and doves. Data such as these have been used by Environmental Security in the past to examine trends and hunting pressure and determine if there is sufficient game to support future hunter effort and provide a quality hunting experience. After the completion of the deer management plan, Camp Pendleton will pursue management plans for other game species on Base.

4.5.2 Bison Management Element

- ELEMENT GOAL: Monitor and manage the bison population.

Currently, Camp Pendleton's bison herd is not intensively managed. Recommendations in Bison Management Plan (MCBCP 2015c) currently being implemented includes annual surveys, and proactive strategies to minimize conflicts between training activities and bison.

4.5.2.1 Objective 1: Bison Management

OBJECTIVE 1: Manage the bison population to minimize mission conflicts and impacts to habitat and safety.

On Camp Pendleton, management of bison includes: monitoring the herd's size, growth rate, sex composition, and age structure; hazing bison away from ranges that are actively firing and away from Basilone Road when traffic is heavy; euthanizing badly injured animals; and collecting samples for disease and genetic screening from dead animals. For the 5-year iteration of the INRMP, Camp Pendleton will continue to implement the Bison Management Plan (MCBCP 2015c) when appropriate.

4.6 OUTDOOR RECREATION PROGRAM

- PROGRAM GOAL: Provide natural resources-related recreational opportunities to installation personnel, their dependents, and the general public to the maximum extent practicable when compatible with the military mission, security, and natural resources sustainability.

The Base's Outdoor Recreation Program seeks to promote safe and legal outdoor recreation such as hunting, fishing, camping, and other recreational uses to ensure that service members and their families will have ready access to enjoy federally managed natural resources now, and well into the future. The Outdoor Recreation Program includes fishing and hunting programs, which are guided by the *Cooperative Plan for the Conservation and Management of Fish and Wildlife Resources Aboard Camp Pendleton*, signed by the DoI, DoD, and California Department of Fish and Game (now CDFW) in August 1963. Hunting and fishing programs are managed in cooperation with CDFW and are in compliance with California law and the annual framework established by CDFW. Section 640, Title 14, California Code of Regulations (Management of Fish and Wildlife on Military Lands) and Sections 3450 through 3453 of the California Fish and Game Code allow sufficient flexibility in administering hunting and fishing programs to avoid conflicts with military training.

The Outdoor Recreation Program is implemented by CLS and CRE across all ecosystems. The program is organized into two elements: (1) Fishing Element; and (2) Hunting Element. These elements and their associated goals and objectives are discussed further in the following subsections.

4.6.1 Fishing Element

- ELEMENT GOAL: Manage mission-compatible and ecologically sustainable fishing opportunities that enhance quality of life for active and retired military personnel, DoD civilian personnel, their dependents, and the sponsored public.

Although no native freshwater game fish species are permissible to catch on Camp Pendleton, a few ponds and lakes have been historically managed for exotic game fish as part of a recreational fisheries program. These lakes include Case Spring Ponds, Lake O'Neill, and Pulgas Lake. Inland freshwater fishing is not authorized in rivers or creeks, with the exception of the diversion ditches into and out of Lake O'Neill. Inland fishing may be authorized at Horseshoe Lake, Whitman Pond, Pilgrim Creek Pond, Broodmare Ponds, Wildcat Ponds, Windmill Lake, and Las Flores Slough (from I-5 bridge west to the ocean). Fishing is permitted at Pulgas Lake for catch and release only. The following objectives provide management of a mission-compatible and ecologically sustainable fishing program.

4.6.1.1 Objective 1: Manage Fisheries

OBJECTIVE 1: Manage fisheries to provide a high-quality recreational fishing program and experience consistent with the military mission and other species management programs.

To provide recreational fishing on Base, Lake O'Neill is annually stocked with exotic game fish, including largemouth bass (*Micropterus salmoides*), bluegill (*Lepomis macrochirus*), black crappie (*Pomoxis nigromaculatus*), channel catfish (*Ictalurus punctatus*), and red-eared sunfish (*Lepomis microlophus*) when salvaged as part of the exotic aquatic animal control program (Section 4.2.2). Occasionally (as environmental conditions, and funding allows), hatchery fish placed in Lake O'Neill. Stocking of Lake O'Neill is coordinated with Environmental Security's fishery biologist. In addition, the Base's exotic wildlife species control efforts (Section 4.2.2) that helps support protected species through the ongoing removal of exotic aquatic species in the native creeks and estuaries also promotes fishing, as select non-native fish are emplaced into Lake O'Oneill. Occasionally fish counts and data from anglers is collected to inform stocking efforts.

To limit the inadvertent escape of the stocked exotic game fish species into native streams, screens were installed on the outflow at Lake O'Neill. Anglers are required to comply with strict adherence to California State and Base fishing regulations that prohibit the transport of live fish from the lakes; this regulation further reduces the risk of direct or indirect adverse effects to protected species. Any proposed recreational fishing activities that may impact federally listed species will be evaluated through the NEPA process prior to implementation.

Floating Solar Bee™ pond circulators are also installed in Lake O'Neill to redistribute water from the bottom to the top of the lake. The mixing action accelerates the biological and photosynthetic processes and aids in stabilizing oxygen and temperature levels of the lake thereby creating an environment to sustain fish for sport fishing. Before the introduction of the Solar Bee™ units, the lake was susceptible to blue-green algae. Oxygen and temperature measurements are collected and evaluated to ensure the equipment is operating correctly and algae blooms and summer fish kills are minimized. In most years, the Solar Bee™ units must be emplaced into Lake O'Neill in conjunction to fish stocking to ensure survival of the fish.

Additionally, fishing is authorized at Case Springs Lake and Lake Pulgas; however, this fish populations are not actively managed by Environmental Security.

4.6.1.2 Objective 2: Sustainable Fishing Program

OBJECTIVE 2: Provide an accessible, sustainable outdoor fishing experience for military and civilian patrons within the constraints of the military mission and capability of the resources.

Base Conservation Law Enforcement staff is responsible for the sale and tracking of recreational fishing permits. Permit prices are monitored relative to other installations to ensure prices are reasonable. Conservation Law Enforcement tracks fishing area usage and regularly patrols fishing areas to ensure compliance with the rules and regulations of Camp Pendleton's fishing program.

Anglers are required to follow published federal, state, and Base fishing regulations and must acknowledge receipt and understanding of the regulations by initialing a release statement when purchasing a Base permit.

4.6.2 Hunting Element

- ELEMENT GOAL: Manage quality, mission-compatible and ecologically sustainable hunting opportunities that enhance quality of life for Base patrons.

Recreational hunting is permitted year-round and includes seasons for small/upland game, deer, and waterfowl hunting (Table 4-2). Hunting is allowed within training areas when not in use for military training. Hunting is not permitted in dud-producing impact areas, most cantonment areas, areas closed for conservation (e.g., recently burned), and areas with sensitive vegetation and habitat. However, it is allowed within some non-dud-producing impact areas if no training is occurring.

Table 4-2
Listed Game and Hunting Seasons on Camp Pendleton

Species[1]	Hunting Season[2]	Limit[3]
Mourning Dove	1 September to mid-September, and early-November to mid-December	10 per day; 10 in possession
California Quail and Mountain Quail	Mid-October to late-January	10 per day; 10 in possession
Band-tailed Pigeon	Mid-December to late-December	2 per day; 2 in possession
Crow	December to late March	24 per day, 24 in possession
Waterfowl	Mid-October to late-January	Varies by species
Deer (archery)[4]	September to early-December	1 per season per hunter
Deer (rifle)[4]	Mid-October to early-December	1 per season per hunter
Ground Squirrel	Year-round	None
Brush Rabbit and Cottontail Rabbit	1 July to late-January	5 per day; 5 in possession
Coyote	Year-round	None

[1] Species may be added to or removed from this list, depending upon resource needs and as long as state and federal hunting regulations are met.
[2] Actual dates of hunting periods vary. CLS publishes specific dates annually.
[3] Limits may be reduced dependent upon resource management decisions.
[4] Not more than one deer can be taken per hunter per year.

4.6.2.1 Objective 1: Sustainable Hunting Program

OBJECTIVE 1: Provide a quality, sustainable outdoor hunting experience for those permitted to hunt on Base within the constraints of the military mission, and capability of the resources.

Hunting is available to active-duty military, active reservists, retired service members, DoD employees, dependents, and some immediate family members. In addition to holding a valid California hunting license, and state required stamps and tags, hunters must also hold a valid Base hunting permit that may be purchased from the Conservation Law Enforcement Officers on Camp Pendleton. Hunters may use firearms, crossbows, or bow-and-arrows, in accordance with all applicable state and Base regulations. While not a common activity, Camp Pendleton allows hunters to field-train hunting dogs with game birds during daylight hours between 1 July and 31 March. All hunters planning to train hunting dogs on Camp Pendleton must have a CDFW hunting license and Base hunting permit. Hunters must ensure that birds are not harmed or killed while field-training dogs.

Base Conservation Law Enforcement staff is responsible for the sale and tracking of recreational hunting permits. Permit prices are monitored relative to other installations to ensure prices are reasonable. Conservation Law Enforcement tracks hunting area usage and regularly patrols hunting areas to ensure compliance with the rules and regulations of Camp Pendleton's hunting program. Hunters are required to follow published federal, state, and Base fishing regulations and must acknowledge receipt and understanding of the regulations by initialing a release statement when purchasing a Base permit.

4.7 HUMAN-WILDLIFE SAFETY MANAGEMENT PROGRAM

- PROGRAM GOAL: Manage Camp Pendleton wildlife safety response and resolution.

Camp Pendleton's boundaries interface with both urban and natural environments. Safety issues routinely arise with animals that occasionally pose a health or safety hazard to Camp Pendleton residents. Further, federally listed threatened and endangered species and other native wildlife can become prey for domestic animals (e.g., cats), including pets and feral animals. Wildlife problems previously identified at Camp Pendleton include snakes, coyotes, and nesting birds in housing and cantonment areas, bats roosting in buildings, gulls and crows at the landfill, and birds nesting in military equipment. Wildlife management services have included the removal of coyotes and turkey vultures from housing areas that were classified as a threat to human health or safety by CDFW; and the removal of opossums, raccoons, and skunks that have become problem animals. The following objective ensures that wildlife conflicts are resolved to minimize risks to human health and safety.

The Human-Wildlife Safety Management Element and its associated goals and objectives are discussed further in the following subsections.

4.7.1 Human-Wildlife Safety Management Element

- ELEMENT GOAL: Assist and resolve human-wildlife conflict for Camp Pendleton Base personnel.

4.7.1.1 Objective 1: Manage Wildlife Safety Responses

OBJECTIVE 1: Manage wildlife safety responses as related to human health and safety, military operations, quality of life, cantonment areas, and other species management programs.

Routine, ongoing wildlife safety management efforts are focused on domestic, exotic, and native species that can be a nuisance, pose a threat to human health and safety, or are causing property damage. Wildlife safety management efforts in housing and cantonment areas are focused on providing information to residents, units, and commands on how to avoid creating conditions that will attract wildlife and potentially create a conflict. All wildlife damage management and control measures on Camp Pendleton are conducted in a humane and judicious manner. Wildlife control activities are compliant with existing federal regulations regarding these species. The salvage permit required to allow natural resources staff to handle or remove protected wildlife presenting risks to human health and Camp Pendleton's training mission are discussed in Section 4.3.1.4.

4.8 INCIDENT MANAGEMENT PROGRAM

- PROGRAM GOAL: Support conservation compliance and oversight for the installation mission and activities.

The Incident Management Program provides for compliance with applicable laws while allowing flexibility for Camp Pendleton's mission and training activities. Under this program, natural resources staff respond to incidents involving regulated natural resources (e.g., federally listed species) and provide for the rehabilitation of habitat impacts resulting from training activities. The program is implemented by all Environmental Security staff, and across all ecosystems. Environmental Security staff identify federally threatened and endangered species incidents and report them through the Base's internal Environmental Incident Reporting System (EIRS), along with the appropriate federally agency reporting requirements. The Incident Management Program is organized into two elements: (1) Incident Management Element, and (2) Wildlife Permits Element. These elements and their associated goals and objectives are discussed further in the following subsections.

4.8.1 Incident Management Element

- ELEMENT GOAL: Manage the timely redress of unauthorized impacts to regulated resources.

This element provides for repair and restoration of impacts associated with unplanned and/or unauthorized events (i.e., environmental incidents). Examples of environmental incidents include accidental sewage spills, activities not conducted in compliance with Base Training Regulations (MCBCP 2022), and documented occurrences of unauthorized take. When an environmental incident occurs, the incident is documented and tracked in the EIRS database. As needed, the Conservation Law Enforcement Section will investigate the incident, determine the proximate cause, and take appropriate law enforcement action.

4.8.1.1 Objective 1: Conduct Investigations for Environmental Incidences

OBJECTIVE 1: In a timely manner investigate, report, and address solutions for environmental incidents pertaining to regulated resources as needed using the EIRS.

Whenever environmental incidents have been determined to have the potential to affect listed or other sensitive species, the Base will conduct the appropriate agency reporting requirements for that incident within the allocated timeframe. Environmental Security Department staff works together with other Base entities (military training units, Public Works) to address solutions for the impacts, such as further education or restoration. Often, CLS staff is involved to conduct a 30-day Conservation Law Enforcement Investigation.

4.8.1.2 Objective 2: Mitigate Unauthorized Impacts

OBJECTIVE 2: Mitigate unauthorized impacts to regulated resources on an as-needed basis.

Restoration projects that are currently planned or are being implemented by Camp Pendleton to address unauthorized impacts to listed species are listed in Table 4-3. In addition to the restoration projects summarized in Table 4-3, Camp Pendleton will also conduct new restoration projects if additional incidents occur.

Table 4-3
Current and Planned Restoration Projects (through 2023)

Project Name	Habitat(s)
Vernal Pool Group 68	Vernal pool mesa
51 Area Unauthorized Firebreaks	Coastal sage scrub

4.9 NATURAL RESOURCES AWARENESS AND EDUCATION PROGRAM

- PROGRAM GOAL: Raise awareness of Camp Pendleton's natural resources management program successes and contribution to conservation of the resources entrusted to USMC stewardship.

While the management and protection of natural resources within Camp Pendleton's boundaries are important (and contribute to regional conservation efforts), long-term sustainability of ecosystems processes requires a regional perspective and coordination of efforts to achieve common goals. Through the Natural Resources Awareness and Education Program, natural resources staff are responsible for coordination and outreach efforts that serve to enhance awareness of management programs, federally listed and other regulated species, and steps being taking to balance training with resource protection on Camp Pendleton. Educating other units, residents, visitors, and the general public about Camp Pendleton's unique natural resources, stewardship initiatives, and contributions to regional conservation goals helps to demonstrate the Marine Corps' commitment to environmental protection and preservation of its natural resources. The Natural Resources Awareness and Education Program is implemented by all Environmental Security natural resources staff and is applicable to all ecosystems. The Base's Comprehensive Environmental Training and Education Program (CETEP) is also applicable to all ecosystems. These programs are generally organized into three elements: (1) Data Sharing Element; (2) Internal Education Element; and (3) External Education Element. These elements and their associated goals and objectives are discussed in the following subsections.

4.9.1 Data Sharing Element

- ELEMENT GOAL: Share ecological data with stakeholders and interested parties to promote regional conservation of sensitive natural resources.

To promote regional conservation and support natural resources awareness, Camp Pendleton generates and shares useful ecological data. Much of the knowledge gained from data derived on

Camp Pendleton can be directly applicable to issues of regional concern and has a clear benefit to local and regional management and planning efforts.

4.9.1.1 Objective 1: Public Availability of Public Data

OBJECTIVE 1: Facilitate the public availability of ecological data collected on Camp Pendleton to support regional conservation and research efforts.

Camp Pendleton routinely makes available data and copies of completed reports and surveys conducted on the installations to interested parties. Data is shared by Camp Pendleton at regional and species-specific meetings, and Camp Pendleton provides monitoring reports to USFWS annually, which are kept in their library and available to the public in that manner. USGS monitoring on Base is available to the public through the USGS website. Natural resources staff partner with USGS, State Parks, Western Ecological Research Center, San Diego Natural History Museum, and nongovernment organizations to collectively serve as participants in regional working groups for Pacific pocket mouse, riparian birds, coastal California gnatcatcher, and burrowing owl, where Camp Pendleton data is readily provided.

4.9.2 Internal Education Element

- ELEMENT GOAL: Inform military staff about natural resources and the programs to manage these resources, maintain natural resources staff technical expertise related to ecosystem management, and provide Conservation Law Enforcement Officers (CLEOs) with training opportunities to meet their mandated training requirements.

The primary mission of the Base is to train Marines. Camp Pendleton is home to the largest stretch of undeveloped coastline in southern California, and the coastal and foothill terrain provides opportunities for a wide variety of military training. The Marine Corps manages land so that its military land uses can continue while complying with the suite of laws governing protection of natural resources. To ensure that training is accomplished in compliance with federal laws protecting sensitive natural resources, natural resources staff coordinate with other branches and units to educate them on natural resources, applicable laws and regulations, and programs implemented on Base. Training is also critical for natural resources technical staff to maintain proficiency in their areas of expertise and provide technical currency and updated knowledge in natural resources subject matter and management issues.

4.9.2.1 Objective 1: Training of Base Personnel

OBJECTIVE 1: Provide training opportunities and information to other units and staff on a periodic basis to enhance their understanding of wildlife and land management programs being conducted on Camp Pendleton and ensure compliance with CLS, UPL, and CRE programs.

Resource Management Branch natural resources staff coordinates with other branches and units on Base through as-needed informal meetings, staff support, and project coordination. RMB Section Heads and staff serve as Subject Matter Experts in their respective fields and are responsible for interpretation and dissemination of natural resources laws and policy.

All Environmental Security staff participates in the monthly Environmental Compliance Coordinator (ECC) meetings which is an integral part of the unit mission; representatives from each Marine Corps unit attends these meetings. ECCs help to ensure unit compliance with federal, state, and local regulations that govern, but not limited to, hazardous waste handling and disposal, air quality, water quality, and protected species and their habitats. Almost monthly, natural resources staff attends these meetings to discuss a myriad of topics including federally listed species habitat and Base Training Regulations (MCBCP 2022).

Environmental Security participates in the annual Reserve Support Unit (RSU) conference. RSU consists of military reservists that engage in annual training exercises on Base to maintain readiness. Environmental Security provides a brief at this conference to ensure reservists are informed of natural resources conservation issues.

In addition, CRE conducts annual briefs to military units that frequently train on installation beaches to ensure compliance with the Estuarine and Beach Ecosystem Conservation Plan and Base Training Regulations (MCBCP 2022). Seasonal restrictions in the Santa Margarita Endangered Species Management Zone, estuarine management zones, and all posting of nesting sites apply to all military units training on beaches to protect the federally listed California least tern, western snowy plover, light-footed Ridgway's rail, and tidewater goby. Restrictions limit activity type and number of military personnel permitted within 16 feet and 984 feet of management zones and posted nesting areas, depending on activity. Beach briefs are provided at the beginning of the breeding season and emphasize the need to comply with restrictions in order to maintain flexibility of training for future units.

On an as-need basis, all natural resources staff engage with military units and conduct trainings on wildlife conflict response, and other non-beach wildlife species (e.g., pacific pocket mouse). Typically, a unit will reach out to Environmental Security when they determine a need, such as

receiving an abundance of rattlesnake calls or desiring to train in an area with marked restrictions in the Environmental Operations Map.

4.9.2.2 Objective 2: CLEO Mandated Training

OBJECTIVE 2: Provide mandated and focused training for all CLEOs.

The Conservation Law Enforcement Officers (CLEOs) on Camp Pendleton must adhere to Marine Corps Policy, which implements an in-depth training regime. Conservation officers shall attend the Federal Law Enforcement Center Land Management Police Training in order to be issued Department of Interior, U.S. Fish and Wildlife Service Law Enforcement Officer credentials from the Commandant of the Marine Corps, Land Use and Military Construction Branch. Additionally, CLEOs must complete an annual 40-hour, law enforcement in-service training conducted by Qualified Conservation Law Enforcement Instructors, which includes annual firearms qualifications.

4.9.2.3 Objective 3: Natural Resources Staff Training

OBJECTIVE 3: Support current trainings for natural resources staff on technical issues related to wildlife and plant species, ecosystem habitat management, and biodiversity.

To meet this objective, natural resources staff should attend regional and range-wide workshops, symposiums, meetings, etc. to maintain and share knowledge of wildlife and land management techniques and issues (e.g., annual Western Snowy Plover Regional Unit 6 Working Group Meeting). Trainings are selected from a variety of sources and can include formal classes from universities and colleges, formal training from other federal agencies (e.g., USFWS National Conservation Training Center), attendance at conferences held by DoD and other professional organizations (e.g., National Military Fish and Wildlife Association), and participation in annual/periodic regional species meetings and conferences. As time allows, natural resources staff will obtain field training with contractors sufficient to apply for and hold their own ESA Section 10(a)(1)(A) recovery permits.

4.9.3 External Education Element

- ELEMENT GOAL: Promote public awareness of Camp Pendleton's natural resources management program and USMC stewardship.

As stewards of significant open space in coastal southern California, it is important for Camp Pendleton to ensure the general public is well informed of the Marine Corps' commitment to

environmental protection and preservation of its natural resources. Communicating the contributions to the sustainability of local natural resources benefits both the sensitive resources in the region and public perception of the Marine Corps' efforts to conserve these resources. The External Education Element targets education of nonmilitary groups, such as neighboring communities, conservation organizations, and academic institutions. The following objectives are provided to raise awareness of Camp Pendleton's natural resources management programs to nonmilitary groups.

4.9.3.1 Objective 1: Public Outreach

OBJECTIVE 1: Maintain public awareness of Camp Pendleton's effort to manage natural resources and INRMP programs through public outreach.

To maintain public awareness of natural resources management programs, staff are responsible for developing briefs, papers, posters, and articles for presentation at appropriate venues. In addition, staff are available for interviews with local newspapers via Camp Pendleton Public Affair Office with management approval. Natural resources objectives (such as endangered species or hunting regulations) are often published on Camp Pendleton's social media (Facebook) by the Camp Pendleton Public Affair Office, with Environmental Security oversight. Staff also participate in, support, and/or host events for many educational days throughout the year. Current and potential activities that provide education may include:

- Earth Day
- National Public Lands Day
- Annual Camp Pendleton Beach Clean-up
- National Audubon Bird Festival Tour
- Cal-Poly Pomona Herpetological Class Tour
- Endangered Species Day

Staff also participate with local high schools in a School-to-Career program, orienting students monthly during winter months to the environmental compliance and natural resources management professions, education requirements, and expertise being exercised on Camp Pendleton. Staff also present educational briefs to the local elementary schools.

In 2022, CRE established a new partnership with Marine Corps Community Services (MCCS) to develop series of lectures for Marine families at installation resorts. The pilot year involved CRE staff providing conservation based *Nature Talks* to patrons on a weekly basis from Memorial day to Labor Day. Topics included steelhead migration, bird and plant identification, and pacific

pocket mouse survey methods. In 2023, the program was adjusted to provide weekly talks between Jul1 and August 30, with a dual goal of entertaining MCCS guests and informing Base residents about Camp Pendleton's conservation program.

4.9.3.2 Objective 2: Public Awareness Through Educational Material

OBJECTIVE 2: Elevate public awareness and elicit understanding of and support for listed species conservation objectives.

On the Base, RMB is responsible for installing signs and kiosks that inform users of sensitive habitats and listed species. These signs or kiosks provide an opportunity to communicate natural resources information and Marine Corps policies to users and visitors of Camp Pendleton. The signs are intended to show users how successful the Marine Corps has been at accomplishing their training mission while significantly protecting natural resources. The Marine Corps is proud of the work done to protect threatened and endangered species on this topnotch training facility, and feels it is important for users to learn about how interesting Camp Pendleton is and how unique. Interpretive signs have been installed in a few locations on Camp Pendleton, and the goal is to continue to develop signs where needed for the enjoyment of all users for now and in the future. Education signs at the entrance of the maintained nature trail at Environmental Security's building were installed in 2017 and will be updated in 2023.

RMB is focusing public outreach in the Endangered Species Management Zone. Specifically, brochures are prepared for MCCS to facilitate education of beach users on endangered species issues in the Endangered Species Management Zone. Furthermore, Environmental Security will be installing a blue whale bone display at the Del Mar Recreation Beach in 2023 and installing more outreach signs at the Del Mar Beach main lifeguard tower.

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CHAPTER 5.0
INRMP IMPLEMENTATION

5.1 IMPLEMENTATION

The Sikes Act requires that Integrated Natural Resources Management Plans (INRMPs) be implemented and the status of implementation reported to Congress; therefore, the INRMP must reflect an annual strategy that addresses DoDM 4715.03 (DoD 2018b), MCO P5090.2A (USMC 2018), and United States Marine Corps (USMC) INRMP (USMC 2004) guidance. This INRMP will be considered implemented when Camp Pendleton:

- Actively requests, receives, and uses funds for Common Output Levels of Service (COLS) compliance projects and activities;
- Ensures that sufficient numbers of professionally trained natural resources management personnel are available to perform the tasks required by the INRMP;
- Coordinates annually with all cooperating offices;
- Documents specific INRMP action accomplishments undertaken each year; and
- Evaluates the effectiveness of management actions and makes changes on those activities for future actions (i.e., conducts adaptive management).

5.2 FUNDING

5.2.1 Funding Mechanisms

This INRMP identifies a number of actions to meet the natural resource objectives of Camp Pendleton (Appendix M). These actions include compliance requirements that must be performed to maintain compliance with laws and regulations, Executive Orders, Memoranda of Agreements (MOAs), and Memoranda of Understandings (MOUs), as well as conservation actions that are necessary to ensure effective stewardship of public land entrusted to the Department of Defense (DoD). Although funding priority is generally given to compliance-driven actions (e.g., those mandated by federal law), actions without a regulatory driver will be carried out as funding and personnel become available. Proactive management not necessarily evoked by a current regulatory driver that focuses on efforts to prevent the listing of species at risk, which, if listed under the ESA, could adversely impact military readiness, is considered a priority funding by Camp Pendleton. Actions that rely on volunteer labor and enjoy the support of the military community or have available alternate funding sources are also likely to be implemented.

Operations and Maintenance, Marine Corps (O&M, MC) environmental funds are the primary source of resources to support recurring and non-recurring natural resources projects. Other environmental funding may be provided from the Naval Working Capital Fund (NWCF); Military Construction; Procurement, Marine Corps; Hunting and Fishing Access Fees ("17X" funding); Qualified Recycling Program revenues; and the Defense Logistics Agency Energy funds. Responsibilities, requesting, and reporting requirements for each of these funds are identified in MCO P5090.2A CH 4 (USMC 2018). Camp Pendleton no longer holds any agricultural outleases and does not have a commercial forestry program. However, limited reimbursable funds from Hunting and Fishing Access Fees (17X) may be available for stewardship activities. Revenue collected from access fees may be used for the protection, conservation, and management of installation wildlife habitats and the hunting, fishing, and trapping programs.

Other special Department of Defense (DoD) initiatives to fund natural resources projects also may become available on a limited basis (e.g., Carbon Sequestration funding). In addition, alternate funding sources for special projects and initiatives may be sought from cooperative grants and partnership programs such as the DoD Legacy Program and National Public Lands Day grants. These grants require a written proposal, are competitive, and often are cost-sharing opportunities.

5.2.2 Funding Priorities

The Office of Management and Budget requires federal agencies to classify natural resources projects based in part on compliance requirements. DoDI 4715.03 (DoD 2018a) provides detailed guidance on programming and budgeting natural resources projects. Programming and budgeting priority classifications are either (1) recurring natural resources conservation management requirements or (2) nonrecurring natural resources conservation management requirements.

Recurring conservation requirements (coined Operational Budget, OPBUD) include recurring natural resources programs (e.g., annual species monitoring), day-to-day costs of sustaining an effective natural resources management program such as personnel and administrative costs, training, supplies, permits, fees, testing and monitoring, sampling and analysis, reporting and recordkeeping, maintenance of natural resources conservation equipment, and compliance self-assessments. These requirements are high priorities for budgeting resources. The installation Commanding Officer manages the funds and priorities.

Nonrecurring conservation requirements - one time or emergent requirements - are funded by the Centrally Managed Program (CMP). Examples include those actions needed to correct an enforcement action from an authorized regulator (e.g., Clean Air Act violation) or surveying of a species that may receive federally-listing status (e.g., monarch butterfly). Marine Corps

Installations Command (MCICOM) manages the funds and priorities, with each installation applying to receive funds and competing against each other.

Headquarters Marine Corps and U.S. Marine Corps Installations Command have established COLS to characterize program health and degree of risk associated with varying funding levels. COLS level assignments (Table 5-1) must be used to prioritize funding of environmental requirements (both recurring and nonrecurring).

Table 5-1
Common Output Levels of Service (COLS) Level Descriptions

COLS Level	Description
COLS 1	1. Provides 100% compliance with applicable, explicit federal, state, or local laws, regulations, Executive Orders, or Final Governing Standards, DoD, DoN, and Marine Corps policy, such that primary installation mission and readiness are supported. 2. Meets official Marine Corps commitments made to Congress, regulatory agencies, and the public. 3. Provides recurring administrative, personnel, and other support associated with managing environmental programs that are specifically necessary to meet mandated requirements as described in this COLS level. 4. Provides ability to address 100% of anticipated emerging mandated requirements based on historical execution, such as new laws, regulations, and incident response. 5. Provides 100% future planning capability. Includes management or planning activities that are prerequisites for future year mandated requirements or improve or enhance capabilities. 6. Provides ability to proactively address mandated requirements with no established deadlines. 7. Provides 100% compliance with DoD, DoN, and Marine Corps policy. 8. Provides investments in land or infrastructure that demonstrates Marine Corps environmental leadership and proactive environmental stewardship.
COLS 2	1. Provides 100% compliance with all known, applicable, and explicit federal, state, or local laws, regulations, Executive Orders, and Final Governing Standards ("mandated requirements") by established deadlines, such that primary installation mission and readiness are supported. 2. Meets official Marine Corps commitments made to Congress, regulatory agencies, and the public. 3. Provides recurring administrative, personnel, and other support associated with managing environmental programs that are specifically necessary to meet mandated requirements as described in this COLS level. 4. Provides ability to address 100% of anticipated emerging mandated requirements based on historical execution, such as new laws, regulations, and incident response. 5. Provides management and planning activities that are explicit prerequisites to meet future year mandated requirements. 6. Provides limited ability to address mandated requirements with no established deadlines that are directly related to protection of Marine Corps operational readiness and human health.

COLS Level	Description
	7. Provides 100% compliance with DoD, DoN, and Marine Corps policies that are directly related to protection of Marine Corps operational readiness and human health.
COLS 3	1. Provides 100% compliance with all known, applicable, and explicit federal, state, or local laws, regulations, Executive Orders, and Final Governing Standards ("mandated requirements") by established deadlines, such that primary installation mission and readiness are supported. 2. Meets official Marine Corps commitments made to Congress, regulatory agencies, and the public. 3. Provides recurring administrative, personnel, and other support associated with managing environmental programs that are specifically necessary to meet mandated requirements by established deadlines. 4. Provides ability to address 50% of anticipated emerging mandated requirements (based on historical execution), such as new laws, regulations, and incident response. 5. Provides management and planning activities that are explicit prerequisites just in time to meet future year mandated requirements.

5.2.3 Marine Corps Environmental Program Database

Congress and the Secretary of Defense further specify that all environmental requirements and costs must be tracked. Currently, the USMC uses the program Environmental Compliance and Operational Reporting (ENCORE) to fulfill this requirement. The primary functions of ENCORE are estimating, prioritizing, tracking, and reporting for compliance and natural resources conservation projects, planning annual budgets, and reporting to Congress through the Office of the Secretary of the Navy and Office of the Secretary of Defense. All Marine Corps environmental requirements must be entered into the environmental program database utility as soon as they are identified and reported. Each year, Camp Pendleton goes through a budget review cycle within ENCORE which captures environmental requirements over the next five years, including the production of an executable spending plan for the upcoming fiscal year.

5.3 STAFFING NEEDS

The Sikes Act and DoDI 4715.03 require that all DoD components ensure that sufficient numbers of professionally trained natural resources management personnel and natural resources law enforcement personnel are available and assigned responsibility to manage their installations' natural resources. Camp Pendleton has 17 billets within Resource Management Branch (Conservation Law Enforcement Section (CLS), Coastal and Riparian Ecosystem Management

(CRE), and Upland Management (UPL) Sections) that are responsible for natural resources management and the implementation of actions identified in this INRMP. However, one or more permanent positions may be vacant at any given time, which impacts program implementation. Staff from other federal agencies and contract personnel are also available and used when needed on a case-by-case basis.

5.3.1 Professional Development and Natural Resources Training

DoDI 4715.03 requires that necessary supplemental training to ensure the proper and efficient management of those resources be provided in a timely manner (e.g., Naval Civil Engineer Corps Officers School's Natural Resources Compliance Course, DoD Sikes Act Training Course). Personnel with natural resources responsibilities must, as a condition of employment, possess the appropriate knowledge, skills, and professional training/education to perform their duties. Camp Pendleton provides natural resources personnel timely and necessary supplemental training to ensure proper and efficient natural resources management. Camp Pendleton also maintains adequate natural resources staffing levels to provide and sustain installation natural resources. Natural resources personnel participate in required and recommended training opportunities when they are available to ensure that personnel are adequately trained in natural resources management. Staff also participate in annual professional conferences and workshops.

Recommended annual conferences for one or more Camp Pendleton staff includes:

- National Military Fish and Wildlife Association annual workshop;
- Cal-Invasive Plant Council (IPC) Symposium;
- Western Association of Fish and Wildlife Agencies;
- The Wildlife Society Conference (national, section, and chapter levels);
- American Society of Mammologists;
- California/Nevada Amphibian Populations Task Force;
- Climate Science Alliance;
- American Ornithological Society;
- International Association of Wildland Fire and Climate; and
- Environmental Systems Research Institute (ESRI) Users GIS Conference.

In addition, staff frequently attend training courses and accompany experts in the field for survey/sampling hours of federally-listed species to obtain their "10 (a) (1) (A) permits". Under section 10 (a) (1) (A) of the Endangered Species Act, the U.S. Fish and Wildlife Service (USFWS) or National Oceanic and Atmospheric Administration (NOAA) Fisheries may permit any act otherwise prohibited by section 9 for scientific purposes or to enhance the propagation or survival

of the affected species. Examples include permits for surveying for coastal California gnatcatcher or western snowy plover, or sampling for federally-listed fairy shrimp.

Note that all training and conference attendance is based on the availability of funding; therefore, the completion or attendance of some training may not be feasible.

5.4 COOPERATIVE AGREEMENTS AND PARTNERSHIPS

Per DoDI 4715.03, DoD installations may enter into cooperative agreements with states, land-grant universities, local governments, nongovernmental organizations, and individuals to provide for the maintenance and improvement of natural resources or conservation research on or off DoD installations. A cooperative agreement is used to acquire goods or services to accomplish a public purpose of support or stimulation authorized by federal statute. Use of a cooperative agreement requires substantial involvement between the federal agency and recipient during performance of the activity. Funds approved for a particular fiscal year may be obligated to cover the costs of goods and services provided under a Cooperative Agreement during any 18-month period beginning in that fiscal year in accordance with the Sikes Act. Cooperative agreements may be executed over a 60-month period. Using cooperative agreements to accomplish projects is an efficient means to implement INRMPs.

5.4.1 Cooperative Ecosystem Studies Units

The Cooperative Ecosystem Studies Unit (CESU) National Network provides coordinated research, technical, and educational assistance to federal agencies and their partners for natural and cultural resources through a network of 17 regional partnerships. The DoD is a member of all 17 CESUs. Each CESU is competitively developed under a single cooperative agreement based on the need of INRMP approved projects. DoD and host /partner universities collaborate on specific projects with the host/partner universities providing space, faculty expertise, students, and educational services while DoD provides scientists and funding. CESU objectives include:

- Provide resource managers with high-quality scientific research, technical assistance, and education;
- Deliver research and technical assistance that is timely, relevant to resource managers, and needed to develop and implement sound adaptive management approaches;
- Ensure the independence and objectivity of research;
- Create and maintain effective partnerships among federal agencies and universities to share resources and expertise;
- Take full advantage of university resources while benefiting faculty and students;

- Encourage professional development of federal scientists; and
- Manage federal science resources efficiently.

Using CESU Cooperative Agreements to accomplish projects is another means to implement INRMPs and can be administered through the Naval Facilities Engineering Systems Command (NAVFAC) Southwest Regional Natural Resources Office.

5.5 INRMP REVIEW

It is a statutory requirement of the Sikes Act that a formal review as to operation and effect be completed every 5 years, and it is DoD policy to review INRMPs annually with the cooperating fish and wildlife agencies. During the formal 5-year review process, the Base and the cooperating agencies should determine whether the existing INRMP needs updating or revision. INRMP updates are minor changes to an INRMP that do not result in new biophysical effects, do not change the management prescriptions set forth in the INRMP, and do not require analysis under NEPA nor associated public review. An INRMP revision is required if significant changes are proposed to be made that may result in environmental effects not previously analyzed (e.g., changes to the natural resource management practices that will be implemented).

The formal Headquarters Marine Corps (HQMC) Environmental Compliance Evaluation (ECE) Program assesses and evaluates the implementation of the INRMP. The ECE requires an on-site evaluation every 3 years by an independent team established by HQMC, an annual review and validation of a Plan of Action and Milestones that follows up formally on any deficiencies identified during the HQMC ECE, and an annual Self-Audit Program administered by Camp Pendleton. In addition, the DoD (Office of Secretary of Defense Natural Resources) collects annual metrics on the effectiveness of the Base's INRMP.

5.5.1 Annual Reviews

Camp Pendleton's Resources Management Branch (RMB) will communicate annually with United USFWS, NOAA Fisheries, California State Parks, and California Department of Fish and Wildlife (CDFW) personnel ("external stakeholders") regarding INRMP implementation progress, potential areas of improvement, and expected projects for the coming year. Reviews may be accomplished via correspondence or in a meeting between appropriate parties. Such annual reviews enable project tracking and assessment, help facilitate adaptive management, help determine whether the existing INRMP is contributing to the conservation and rehabilitation of natural resources and are used to inform changes to future INRMP updates and revisions.

The annual review must also assess and verify:

- The INRMP is effective in preventing a net loss capability of military installation lands to support the military mission;
- Current information on all conservation metrics (Section 5.5.2) is available;
- All "must fund" projects and activities have been budgeted for and implementation is on schedule;
- All required trained natural resources positions are filled or are in the process of being filled;
- Projects and activities for the upcoming year have been identified and included in the INRMP (an updated project list does not necessitate revising the INRMP);
- All required coordination with Federal, State, and installation stakeholders has occurred; and
- All significant changes to the installation's mission requirements or its natural resources have been identified.

In accordance with MCO 5090.2 CH 4, Resource Management Branch (RMB) will engage with other installation stakeholders (e.g., operations and training, public works) in the review process, to measure and track progress. This annual review will support the INRMP in its assessment of preventing a loss to training capability.

5.5.2 Annual Metrics

The Sikes Act requires each installation with significant natural resources to report annually on the status of its INRMP implementation. Natural Resources Conservation metrics are used to assess the overall health and trends of the Camp Pendleton natural resources program and to identify and correct potential funding and other resource shortfalls. Metrics have been developed to assess INRMP implementation, measure conservation efforts, ensure no net loss of military training lands, understand the conservation program's installation mission support, and indicate the success of partnerships with the external stakeholders. Input from the appropriate stakeholders is obtained during the annual INRMP review process. This evaluation is facilitated by a web-based metrics reporting tool - the USMC Conservation Metrics Portal (CMP). The CMP provides the means to evaluate performance in three focus areas:

1. **Species and Habitat.** Evaluates the extent to which federally listed species have been identified and the conservation benefits provided to these species and their habitats, including fiscal information. Also, this metric identifies species at risk of needing listing protection.

2. **INRMP Implementation.** Evaluates the execution of actions taken to ensure they meet the goals/objectives outlined in the INRMP including:

   - The availability and adequacy of public recreational use opportunities;
   - The adequacy of the natural resources team (natural resources management professional and installation support staff) in accomplishing INRMP goals and objectives for the installation;
   - The degree that external stakeholder partnerships are cooperative and ensuring that they result in effective INRMP development and review for operation and effect; and
   - The level to which the existing natural resources program supports the installation's ability to sustain the current operational mission ensuring no net loss of mission capability.

3. **Supplemental Information.** Provides feedback to HQMC and Office of Secretary of Defense, Natural Resources on INRMP effectiveness and policy. Provide metrics on the emerging concerns of Wildland Fire and Invasive Species.

5.5.3 INRMP 5-Year Update or Revision

Camp Pendleton will conduct annual reviews, adaptively manage the ecosystems and continuously evaluate the INRMP over the next five years. After 5 years (or sooner if necessary), either an INRMP update or revision will be conducted. An INRMP may be simply updated if the INRMP does not require substantial changes in the way natural resources on the Base are to be managed. INRMP revisions are required when the existing INRMP is determined to be inadequate, because the installation mission or physical features have changed significantly, following Base Realignment and Closure (BRAC) actions, if new species are listed or listed species are identified on the installation, or if the mission intensity or training is dramatically changed or increased.

If an update is warranted in 2028, then the Base will conduct a streamlined INRMP Update process as outlined in the tripartite MOU between the DoD, USFWS, and the Association of Fish and Wildlife Agencies titled Cooperative Integrated Natural Resource Management Program on Military Installations (2013); this MOU includes a provision to streamline the review process, which will allow for expedited review and approval (new signatures) of updated sections of each INRMP.

Most likely, in 2028 an INRMP Revision will be warranted due to the complex nature of Camp Pendleton. Camp Pendleton natural resources managers will once again engage external and installation stakeholders (e.g., operations and training) in reviewing and updating the INRMP to

ensure goals, objectives, and actions are in line with mission requirements, and to identify potential project conflicts or opportunities for cooperative program implementation.

5.6 DATA MANAGEMENT

5.6.1 Marine Corps Environmental Management Portal

As discussed in Section 5.5.2, the Marine Corps Conservation Metrics Portal is the Marine Corps' official repository of natural resources information to track INRMP status and implementation measures ("metrics"). In addition, for internal audits, the Marine Corps uses the Environmental Compliance Management System (ECMS) to centralize and track environmental compliance.

5.6.2 Geographic Information Systems Management

USMC policy and goals for GIS data are established by MCO 11000.25, Installation Geospatial Information and Services. This order provides policy, guidance, and standards for acquiring, protecting, utilizing, and implementing the Marine Corps Installation Geospatial Information and Services (IGI&S), also known as GEOFidelis, in support of Marine Corps installation management. The GEOFidelis Data Management Guide documents the required procedures to create and maintain geospatial data for Marine Corps use and dissemination.

The Installation IGI&S Manager oversees MCIWEST-MCB Camp Pendleton's IGI&S effort including maintaining oversight geospatial data assets and creating, maintaining, and implementing the installation geospatial data management plan as well as coordinating with the installation's Subject Matter Experts (SMEs) for access and release policy implementation. Camp Pendleton's SMEs are responsible for a particular function or resources on the installation (e.g., listed species data). The SME is the person knowledgeable about the domain or field being represented and is responsible for ensuring that data are properly attributed and collected to meet their needs and the requirement of the business process. The SME reviews sources for data collection and conservation to ensure that the most current data are captured. Environmental Security's Coastal and Riparian Management Section and Upland Management Section are the Base SMEs for GIS natural resource domains.

The GEOFidelis Data Model 4.0 is the standard for all USMC Installation IGI&S geospatial data. The data model is based on Spatial Data Standards for Facilities, Infrastructure, and Environment. It maintains a common USMC IGI&S data standard and provides all USMC installations with a common structure for data layers and attributes. MCIWEST-MCB Camp Pendleton's geospatial data are available to United States Government authorized users via GEOFidelis Online through a Citrix-based portal. Requests for Environmental Security Department geospatial data are

completed via the Base Sponsor and require a GIS Request form completed by the Base Sponsor, a GIS Data Request letter from the contractor/agency requesting the data, a list of data layers being requested, identified area or project boundary file, and signed nondisclosure agreement.

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CHAPTER 6.0
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Appendix A

Public Comment and Endorsement Letters for the INRMP

Appendix B

Climate Change Trends and Management Strategy for MCB Camp Pendleton

Appendix B

CLIMATE CHANGE TRENDS AND MANAGEMENT STRATEGY FOR MARINE CORPS BASE CAMP PENDLETON

B.1 STEP 1: CLIMATE ADAPTATION PLANNING

The iterative process of climate adaptation planning, with opportunities for periodic review, evaluation, and adjustment, is consistent with the Department of Defense's (DoD's) longstanding commitment to adaptive management (INRMP Implementation Manual, DoDM 4715.03; DoD 2018b). Further, climate adaptation planning is also a form of ecosystem management because it involves understanding dynamic system processes and managing in the face of shifting or non-stationary conditions.

The DoD recognizes that installations will experience significant risks from climate-driven changes in the environment, which could compromise the capacity of the installations to support military training (DoD 2019a; DoD 2021). Sustaining MCB Camp Pendleton's capacity to meet its mission now and in the future will be greatly improved by understanding the installation's risks and vulnerabilities to climate change effects, and by getting a start on adapting to the predicted future changes. DoDI 4715.03 (DoD 2018a) specifically calls for installations to address climate considerations when updating or revising their INRMPs and the Climate Adaptation for DoD Natural Resources Managers, A Guide to Incorporating Climate Considerations into Integrated Natural Resources Plans (DoD 2019b) provides a framework to assist in climate planning.

The INRMP adaptation planning process consists of the following steps (Figure B-1):

- Set context for adaptation planning: document current and future climate projections, including uncertainties;
- Identify potential climate impacts and vulnerabilities, risks to natural resources and mission;
- Evaluate the implications of climate-related changes to INRMP goals, objectives, and actions;
- Identify opportunities, develop strategies and actions to reduce climate-related risks and vulnerabilities;
- Implement climate adaptation actions and projects. Link natural resource adaptation concerns/responses with other installation projects/planning; and
- Monitor and adjust climate adaptation actions.

B.1.1 INTRODUCING CLIMATE VULNERABILITY ASSESSMENTS

Camp Pendleton Environmental Security personnel currently maintain cost-effective programs to identify and address habitat changes (e.g., restoration when invasive species are present), while also maintaining legal requirements to manage natural resources. Climate change vulnerability assessments can further provide a means of preparing for and coping with the effects of climate change. A vulnerability assessment is a key element in identifying which species or systems are likely

to be most strongly affected by projected changes in climate and provides a framework for understanding why particular species or systems are likely to be vulnerable, often depending on factors such as exposure, sensitivity, and adaptive capacity (Glick et al. 2011). Vulnerability assessments inform conservation planning by identifying climate-related threats and resulting stresses, which then become part of the decision-making process undertaken to identify and prioritize conservation strategies.

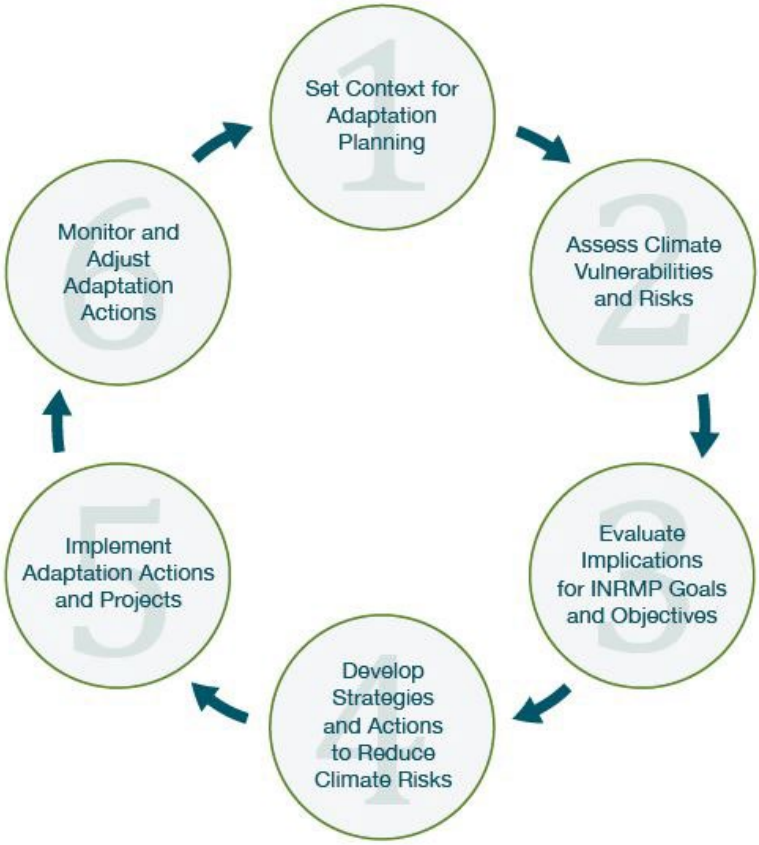


Figure B-1. Six-step INRMP adaptation planning process (DoD 2019b).

The following information can assist Camp Pendleton in assessing climate vulnerabilities and risk as part of the DoD INRMP adaptation planning process (DoD 2019b). Due to San Diego County's unique characteristics (such as biodiversity and narrow beaches), climate impacts for the region can be categorized into four main assessments: temperature, precipitation and drought, sea level rise, and Santa Ana winds and wildfire (Bedsworth et al. 2018, Kalansky et al. 2018). Other climatic phenomenon is considered, such as changes to coastal clouds and fog, but not addressed independently as these conditions intersect with the four main assessments discussed. The climatic changes are discussed on a global/continental scale for temperature and sea level rise since the global community is deeply affected by both; and in a regional and local context for perspective for all four categories.

B.1.2 TOOLS AND RESOURCES FOR ASSESSMENTS

The climate change vulnerability assessments for temperature, precipitation and drought, sea level rise, and Santa Ana winds and wildfire used the following tools and references:

B.1.2.a United States Climate Change Assessment

The Global Change Research Act of 1990 mandates that the U.S. Global Change Research Program (USGCRP) deliver a report to Congress and the President no less than every four years that analyzes the effects of global change. The Fourth National Climate Assessment was completed in 2018 (USGCRP 2018) and used in this INRMP as information on global, national, and regional climate change (Southwest Region is applicable).

B.1.2.b California's Climate Change Assessment

California is a "global leader in using, investing in, and advancing research to set proactive climate change policy". In California, in accordance with the Governor's EO S-03-05, biannual climate change assessments have been conducted and reported by the California Energy Commission's California Climate Change Center using probabilistic forecasting models since 2006. Analyses conducted during four California Climate Change Assessments used several widely accepted global climate models (GCMs) to forecast climate change through 2100 for two greenhouse gas emissions scenarios. One scenario was based on relatively low emission rates and the other used medium-high emissions rates (Bedsworth et al. 2018). In California's Fourth Climate Change Assessment, the research provided a statewide summary (Bedsworth et al. 2018), and robust and detailed results for San Diego County in particular via a regional assessment (Kalansky et al. 2018).

In addition, technical reports were prepared by leading scientists in the community. Jennings et al. (2018) published an in-depth report titled "San Diego County Ecosystems: Ecological Impacts of Climate Change on a Biodiversity Hotspot" in California's Climate Change Assessment. This report was prepared by leading scientists at San Diego State University, Scripps Institute of Oceanography, Climate Science Alliance South Coast, Space and Naval Warfare Systems Center Pacific (now Naval Information Warfare Center Pacific), Conservation Biology Institute, the Nature Conservancy, and Southern California Coastal Water Research Project. Technical reports were provided for sea level rise and drought (Pierce et al. 2018) and wildfire (Westerling 2018).

B.1.2.c National Aeronautics and Space Administration (NASA) Global Temperature Tool

As part of their Global Climate Change Vital Signs of the Planet initiative, NASA provides the public data on a global scale for carbon dioxide levels, global temperature, methane levels, ocean temperature data, ice sheet data, sea level data and arctic sea ice data (NASA 2023). This analysis used the global temperature information. This can be accessed at:
https://climate.nasa.gov/vital-signs/global-temperature/

B.1.2.d National Oceanic and Atmospheric Administration (NOAA) Tools

NOAA's Climate at a Glance, U.S. Climate Resilience Toolkit and Climate Explorer

As a leader in scientific research and to meet the challenges of a changing climate, NOAA provides over 500 digital tools to generate graphs and maps of climate data that is region specific. In addition, NOAA provides framework to develop workable solutions to reduce climate-related risks. NOAA's "Climate at a Glance" was developed for the public for near real-time analysis of monthly temperature and precipitation data across the contiguous U.S. and intended for the study of climate variability (NOAA 2023a). This can be accessed at:
https://www.ncei.noaa.gov/access/monitoring/climate-at-a-glance/

The U.S. Climate Resilience Toolkit (NOAA 2023b) is a website developed by NOAA and other Federal agencies to help decision-makers take action to boost their climate resilience using data-driven tools, information, and subject-matter expertise to make smarter decisions. Built to accompany the U.S. Climate Resilience Toolkit, Climate Explorer graphs projections for two possible futures: one in which humans drastically reduce and stabilize global emissions of heat-trapping gases (labeled Lower emissions, also known as RCP4.5), and one in which we continue increasing emissions through the end of the 21st century (labeled Higher emissions, also known as RCP8.5). This can be accessed at:
https://toolkit.climate.gov/tool/climate-explorer-0
https://crt-climate-explorer.nemac.org/climate_graphs/

NOAA Sea Level Rise Viewer

To examine the impacts of sea level rise to the installation Camp Pendleton, a digital mapping tool can be used: "Sea Level Rise Viewer". This tool was created by NOAA's Office for Coastal Management to visualize community-level impacts from coastal flooding or sea level rise (up to 10 feet above average high tides). The tool uses data to generate maps that illustrate the scale of potential flooding. Water levels are shown as they would appear during the highest high tides (excludes wind-driven tides). Using data related to water depth, connectivity, flood frequency, socio-economic vulnerability, wetland loss and migration, and mapping confidence, it allows a visualization of potential impacts from sea level rise through maps and photos (NOAA 2023c).
This can be accessed at:
https://coast.noaa.gov/slr/

B.1.2.e Department of Defense (DoD) Climate Resiliency Tools

To plan for climate change, the Department of Defense (DoD) has developed tools to assess current and future climate change impacts, manage climate-related risks, and to inform decision-making across installations.

DoD Climate Assessment Tool

The DoD Climate Assessment Tool (DoD 2023a) enables DoD staff to gain better awareness of current and projected exposure to climate effects in 30-year periods of analysis centered on 2050 and 2085 that may result in changes to coastal flooding, riverine flooding, extreme temperature, drought, energy demand, wildfire, and land degradation. This tool also provides information on current exposure to extreme weather events (hurricanes, wildfire, drought, ice storms, ice jams, and tornadoes).

Within the DoD Climate Assessment Tool, a Standard Assessment can be conducted for each installation. This Standard Assessment presents the results of exposure assessments based on eight (8) climate hazard types for DoD sites. Hazard areas were identified by Congress (NDAA 2018 Section 335 and NDAA 2019 Section 2805) and the Department of Defense (DoD 2012) as the hazards of greatest concern for military readiness, mission execution, and infrastructure sustainability.

Exposure to each hazard area is measured using a combination of indicators selected to capture different aspects of exposure. These indicators were selected based on the peer-reviewed literature, and indicator data are from authoritative national datasets, or derived from such datasets. Assessments are conducted for the base time period from 1950 to 2005 and for future periods based on the 30-year average from 2035 to 2064 centered on 2050, and 2070 to 2099 centered on 2085. Each time period is assessed using two scenarios, a lower (slower warming) scenario and a higher (faster warming) scenario. This tool can be accessed by DoD employees at:
https://dodclimate.sec.usace.army.mil/ords/f?p=118/

Defense Installations Spatial Data Infrastructure (DISDI) Portal

The DISDI portal provides military installations with climate exposure data (DoD 2023b). For Camp Pendleton, the extent of flooding from coastal inundation for future scenarios in 2050 and 2085 has been determined from mapping the 1% annual exceedance probability (AEP) using tide gage data developed by the Coastal Assessment Regional Scenario Working Group (CARSWG). The 1% AEP water levels are developed from tide gauge data near the installation. The coastal flood inundation shapefiles represent the expected coastal flooding extent resulting from the 1% annual exceedance probability (AEP) or 100-yr flood with a base year of 1992; modeling has been conducted for both low and high emission scenarios (as discussed further in this appendix) for both 2050 and 2085.

Furthermore, this portal provides riverine flooding inundation maps to include the expected flooding based on the 1% annual exceedance probability (AEP) flood event, 1% AEP plus 2 feet, and 1% AEP plus 3 feet. Projected changes in flood extent were modeled by adding 2 ft (for 2050) and 3ft (for 2085) freeboard to the current elevation of the 1% AEP event and mapping the area of inundation that would result. This indicator is a measure of the potential inundation extent during a flood event. These inundation maps are based on FEMA's National Flood Hazard Layer (NFHL), where available, and a two-dimensional (2D) hydraulic analysis. This tool can be accessed by DoD employees at:
https://rsgisias.crrel.usace.army.mil/disdiportal/f?p=166:5:

DoD Regional Sea Level Tool

The Strategic Environmental Research and Development Program (SERDP) and the Environmental Security Technology Certification Program (ESTCP) recently launched a DoD Regional Sea Level tool (2023c) that enables DOD planners and managers to understand and assess a range of site-specific scenarios of sea level rise and extreme water level conditions for future years 2035, 2065, and 2100 (Hall et al. 2016; DoD 2023c). The Sea Level tool provides users access to graphical scenario information for DOD coastal and tidally influenced military installations worldwide. Using the tool, each sea level scenario scan be adjusted for local conditions of future sea level change and storm surge. This can be accessed at:
https://toolkit.climate.gov/tool/department-defense-regional-sea-level-drsl-database

B.1.2.f Assessing Impact of Climate Change Surface Water and Ground Water Resources on Camp Pendleton – The Conjunctive Use Project (CUP)

In support of a Biological Assessment for the rehabilitation of existing facilities and the construction of new facilities for the conjunctive use of surface water and groundwater resources within the Lower Santa Margarita Basin, Camp Pendleton modelled current operations and future operations under climate change (MCBCP 2015). As part of the proposed action, an Adaptive Management Plan (AMP), followed by a separate Facility Operation Plan (FOP) has been developed by MCB Camp Pendleton to manage project diversion, recharge, production, and delivery facilities. An important feature of adaptive management is the ability to adjust water management operations based on measured and observed data that describe the relationship between hydrology and environmental and physical constraints. The temperature and precipitation changes predicted by Pierce et al. (2011) who investigated sixteen global GCMs to develop probabilistic projections of temperature and precipitation changes over California were used to develop inflow and water demand requirements for simulation of the CUP Climate Model. The purpose of the CUP Climate Model was to assess the future impact of climate change on the environment under CUP operations.

B.1.2.g DoD's Climate Change Adaptation Working Group for Camp Pendleton

DoD's Climate Change Adaptation Working Group (CCAWG) tasked the inter-agency "Coastal Assessment Regional Scenario Working Group," led by the Office of Secretary of Defense, to develop a model based on global sea-level rise (SLR) and extreme water level (EWL) conditions to project future SLR and EWL scenarios relevant to specific locations. This was to support the next phase of vulnerability and impact assessment for DoD coastal and tidally influenced sites worldwide (Hall et al. 2016).

Camp Pendleton was among the specific site locations included in this study. The study presented future scenarios in 2035, 2065 and 2100, and took into account physical processes, local setting, and data availability. These timeframes are relevant to management and planning horizons, and the resulting scenarios enable decision-makers to assess future climate-change related risk or vulnerabilities relative to baseline assessments in the coastal environment (Hall et al. 2016).

B.1.2.h Assessing Impact of Sea Level Rise on Camp Pendleton

The Department of Defense commissioned a report on seal level vulnerabilities in Southwest which focused on the Naval Base Coronado and Marine Corps Base Camp Pendleton (Chadwick et al., 2014). The report provides a detailed examination of the vulnerabilities to the installation and estimates the replacement costs which ranged from several hundreds of million of to over $1 billion for 6.6 f (2.0 meters) of sea level rise. The report examined the impact of seawater intrusion on groundwater as a result of sea level rise at Camp Pendleton. Chadwick et al. 2014 developed an analysis framework and methodologies for evaluations of vulnerabilities on Camp Pendleton and tested them under prescribed scenarios of increased local mean sea level at 0.5 meters, 1.0 meters, 1.5 meters, and 2.0 meters) for the 22nd century. The assessment targeted vulnerabilities of buildings, civil infrastructure, training areas, and waterfront and coastal structures. In addition, GIS layers were provided to the installation for planning purposes.

B.2 STEP 2: IDENTIFY CLIMATE IMPACTS AND VULNERABILITIES

B.2.1 TEMPERATURE

B.2.1.a Historic Temperature

Global and National Temperatures

Climate data shows that nineteen of the hottest years have occurred since 2000, since record keeping began in 1880 (NASA 2023; Figure B-2). Figure B-2 shows the change in global surface temperature (a long-term warming trend) compared to the long-term average from 1951 to 1980. The recent Intergovernmental Panel on Climate Change (IPCC 2019) report found that human influence is, unequivocally, causing climate change, and confirms the impacts are widespread and rapidly intensifying.

There has been a rapid warming throughout the contiguous United States from 1979 to present, as shown by consistent data from surface and satellite monitors (USGCRP 2018). From 1986 to 2016, the annual average temperatures have increased by 1.8 Fahrenheit (°F), based on data from 1895–2016 (USGCRP 2018). When looking at pre-historic climate evidence covering a tremendous time period - the past 1,500 years – the warmest temperatures have occurred in just the most recent decades (USGCRP 2018).

2020 = 1.02 (°C)

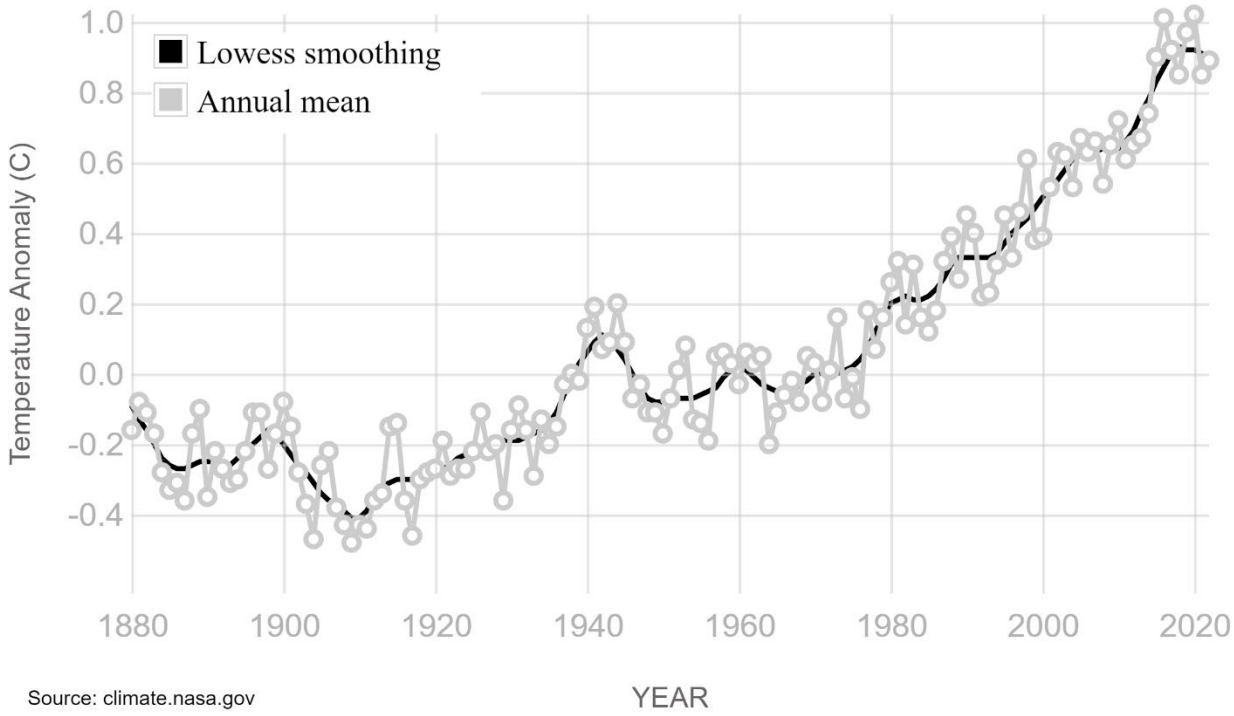


Figure B-2. Global temperatures, shown as the yearly average anomaly from 1880 to 2022 (points) and 5-year averages of those anomalies (black line, "lowess smoothing"). The anomaly reflects the change in global surface temperature compared to the long-term average from 1951 to 1980 (*data from* NASA 2023). Note that in 2020, the average for global temperature was 1.02 Celsius (°C) (1.84 °F) higher than the 1951-1980 average.

Temperatures in the Region

Within the continental United States, the largest temperature changes have occurred in the West (USGCRP 2017). In 2018, NOAA completed a U.S. National Climate Assessment, which included a study on "Regional Climate Trends and Scenarios." The study found that between 1901 and 2016, temperatures have increased across almost all of the Southwest region (USGCRP 2018). The annual average temperatures (difference between the present average (1986–2016) and the past average (1901–1960) in the southwest increased by 1.6° °F (USGCRP 2017). Areas that experienced the greatest warming were southern California and western Colorado (USGCRP 2018).

NOAA's Climate Explorer- San Diego County

Specifically, for San Diego County, maximum temperatures have been measured daily since 1895. Maximum temperatures on average in San Diego County have increased by +0.3°F per decade (Figure B-3, NOAA 2023a).

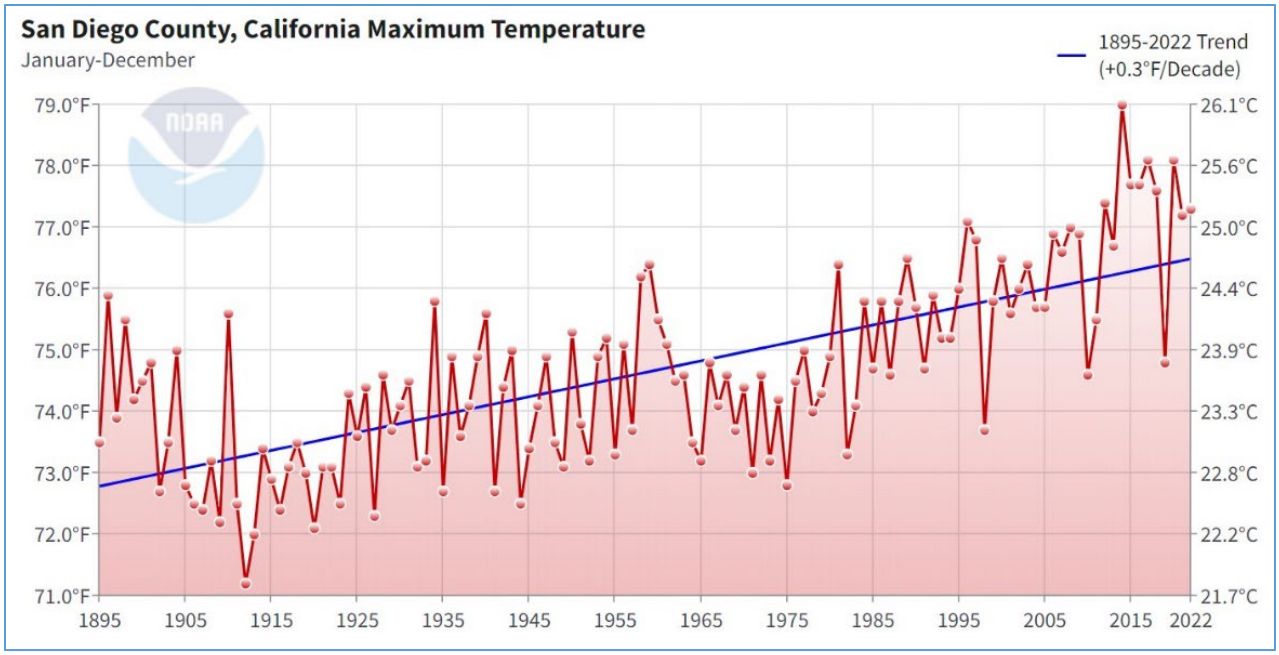


Figure B-3. Annual maximum temperatures in San Diego County from 1895 to 2022 (*data from* NOAA 2023a).

Comparing the historic trends in San Diego County by individual months, the month that showed the greatest increase in maximum temperatures measured from 1895 to 2023, was January. Maximum temperatures in January have risen in the county by a rate of +0.5°F per decade (Figure B-4).

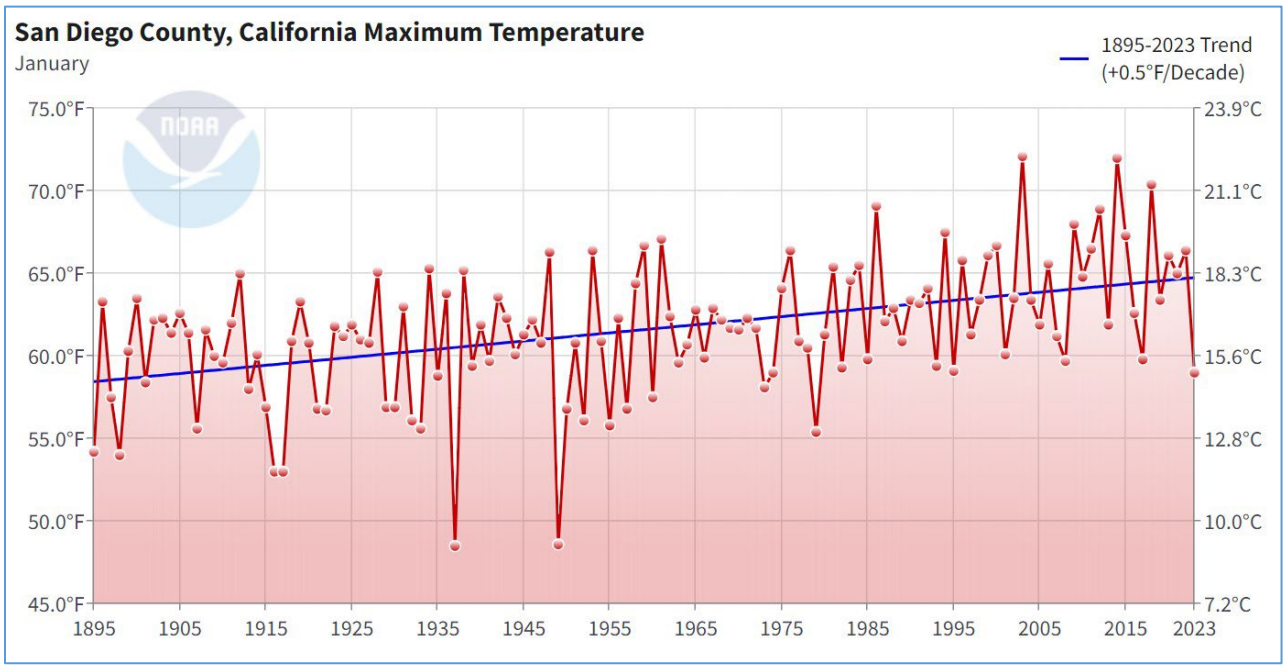


Figure B-4. Annual maximum temperatures for January in San Diego County from 1895 to 2023 (*data from* NOAA 2023a).

B.2.1.b Climate Change Projections: Temperature

Temperatures in the United States

Annual average temperature over the contiguous United States is projected to rise (USGCRP 2018). Climate scientists have defined four scenarios based on a plausible future pathways regarding global emissions of greenhouse gases. The scenarios, known as Representative Concentration Pathways, or RCPs, specify the amount of radiative forcing in 2100 relative to 1750. At the high end of the range, the RCP8.5 scenario corresponds to a future where carbon dioxide and methane emissions continue to rise as they are currently as a result of current fossil fuel use. The RCP4.5 scenario, is curtailing fossil fuel use as soon as possible.

For the period 2021–2050, all climate model scenarios predict increases of about 2.5°F relative to 1976–2005, implying recent record-setting years may be "common" in the next few decades (USGCRP 2017). By late in this century (2071–2100), much larger temperature rises are projected. For a low emissions scenario (RCP4.5), this increase is projected to be +2.8° to 7.3°F. However, for higher emissions scenario (RCP8.5), it could get hotter by as much as +5.8° to 11.9°F (USGCRP 2017).
Extreme temperatures in the contiguous United States are projected to increase even more than average temperatures. The temperatures of extremely cold days and extremely warm days are both expected to increase. Cold waves are projected to become less intense while heat waves will become more intense. The number of days below freezing is projected to decline while the number above 90°F will rise *(*USGCRP 2017).

Temperatures in the Region

According to the 2018 U.S. National Climate Assessment for the Southwest region (USGCRP 2018), and the USDA-FS (2016), all climate models project temperatures to increase over the 21st century, and almost uniformly, across the entire Southwest region. In brief, it is predicted that:

1) By 2100, annual average temperatures in the Southwest will increase by 3.7 to 8.6°F, under low and high emissions scenarios;
2) Southern parts of the region could get up to 45 more days each year with maximum temperatures of 90°F (32°C) or higher; and
3) Warming will be relatively less in winter, and along the Pacific coast.

According to California's Fourth Climate Change Assessment (Bedsworth et. al; Kalansky et al. 2018; Jennings et al. 2018), all climate models project temperatures to increase over the 21st century. In brief, it is predicted that:

1) Overall in the State of California, warming projections range from about 2.5°F to 2.7°F in the early century (2006-2039), 4.4°F to 5.8°F in the mid-century (2040-2069), and 5.6°F to 8.8°F by the end of the twenty-first century in the low and high emissions scenarios;

2) In San Diego County, warming projections range from 4-6 °F under the low emissions scenario and 7-9 °F under the high emissions scenario by the end of the century;
3) The frequency, duration and intensity of heat waves will increase. In San Diego County, historically the average hottest day per year was in the range of 90-100 °F at the coast, and at the end of the century under the high emissions modelling, the average hottest day per year is projected to increase to 100-100 °F at the coast. Heatwaves in the region will also become more humid, with higher nighttime temperatures; and
4) The greatest temperature increase is projected for the fall season where some parts of San Diego show a >10 °F increase by the end of the century.

NOAA's Climate Explorer- San Diego County

Using NOAA's online "Climate Explorer" tools, both historical and projected temperature trends for San Diego County can be depicted graphically, from 1950 to 2100 (Figures B-5 and B-6; *data from* NOAA 2023b).

Figure B-5. San Diego County Average Daily Maximum Temperatures (Annual Average) Historically through Projections into 2100 (*data from* NOAA 2023b). The gray band shows the range of values modeled for 1950–2005, and dark gray bars are observed averages historically. The red and blue bands shows projections for 2006–2100 based on low (blue) and high (red) emissions. The top edge of each band shows the maximum value modeled at each time step; the bottom edge of the band represents the minimum. The blue and red lines show the weighted mean of all projections. The red band is a future in which global emissions of heat-trapping gases continue increasing through 2100 (high emissions) or the blue band is a future in which humans stop increasing global emissions of heat-trapping gases by 2040 and then dramatically reduce them through 2100 (low emissions).

Details of Figure B-5 are below:

	Range of Average Daily Maximum Temperature (°F)	
Decade	Higher Emissions	Lower Emissions
2020s	74.7-80.3	74.3-80.1
2030s	75.3-81.1	74.9-80.5
2040s	76-82	75.5-81.5
2050s	76.8-83.2	76-82.4
2060s	77.5-84.7	75.7-82.6
2070s	78.1-86	76.3-82.9
2080s	79.1-87	76.5-83.3
2090s	80.1-88.4	76.4-83.4

Table B-1. Predicted range of average daily maximum temperature (°F) over time (decades) in San Diego County for higher emissions and lower emissions as depicted and explained in Figure B-5. Note that the observed average from 1961-1990 in San Diego County was 74.8 °F.

Figure B-6. Historic and projected number of days per year in San Diego County with temperatures above 90°F, from 1950 to 2100 (*data from* NOAA 2023b). Red = high emissions, Blue = low emissions as described in Figure B-5.

Details of Figure B-6 are below:

	Range of days per year with maximum above 90°F	
Decade	Higher Emissions	Lower Emissions
2020s	47-97.4	45.5-97.2
2030s	51.4-104.6	47.3-102.5
2040s	55.8-114.1	54.7-109.8
2050s	59.6-121.2	55-114.6
2060s	67.6-133.3	54.7-117.6
2070s	72.8-146.2	59.7-120.8
2080s	77.7-156.9	60.4-124
2090s	84.6-165	61.9-124.8

Table B-2. Predicted range of days per year with maximum temperature above 90°F in San Diego County for higher emissions and lower emissions as depicted and explained in Figure B-6. Note that the observed average from 1961-1990 in San Diego County was 53.4 days/year.

B.2.1.c. Vulnerabilities Due to Temperature Change Impacts

Jennings et al. (2018) conducted a detailed assessment of the vulnerabilities of systems in San Diego County to temperature changes; a synopsis is as follows:

1) Species are predicted to shift their ranges most often at the edge of their range toward cooler environments (up to higher elevations or towards the coast) or contract their ranges, to resemble the current climate of the present-day.
2) "San Diego region may have more opportunities for species to shift and adapt to changing conditions" because of the more mild coastal region of lower winter low temperatures.
3) Shrub (coastal sage scrub and chaparral) communities in Southern California will be impacted by these community shifts, with declines in species richness predicted (Riordan and Rundel 2009). Current federally-listed species such as the California gnatcatcher (*Polioptila californica*), which resides in coastal sage scrub, may have more limitations on suitable habitat.
4) Preston et. al. (2008) developed distribution models for the federally-threatened California gnatcatcher and the federally-endangered quino checkerspot butterfly (*Euphydryas editha quino*) under future warming temperatures and altered precipitation; suitable habitat for each species was reduced 98-100%.
5) Increased air temperatures result in higher water temperatures for streams and estuaries, also limiting the biological communities in San Diego, especially in shallow systems that are prone to heating. Jaeger et al. (2014) predicted that stream intermittency will increase by 20% due to climate change in the southwestern United States.
6) Two species both found on Camp Pendleton – southern steelhead (federally endangered; *Oncorhynchus mykiss*), and the California newt (California species of special concern; *taricha torosa*) – are already at the limit of their habitat ranges and cold water dependent; the

reduction of cold water habitat or loss of thermal stratification in ponds, lakes, and estuaries may reduce breeding and rearing habitat or refugia during warm weather for these species and others.

7) Another aquatic species found at Camp Pendleton – the federally-endangered arroyo toad – may be susceptible to early heat waves as their breeding occurs in shallow streams with the potential of water to dry up or heat up to lethal levels for eggs and larvae (Perry et al. 2012).
8) Current and future rare and endemic species that only occur in the region may become extripated/extinct due to the alteration of habitat suitability from temperature increases.
9) Non-native species or pathogens ranges may shift as well having implications on the natural and human environment (e.g., Zika virus may shift into San Diego county or West Nile Virus expand due to an increase in vectors (mosquitos).
10) Pathogens affecting plants (fungus) and beetles (e.g., shot-hole borer) may spread and become endemic within the region.
11) Flowering, emergence of insects, and breeding could shift earlier. For example, over the last several decades, migration and nesting has shifted earlier in California for migratory songbirds (Macmynowski et al. 2007, Socolar et al. 2017).
12) Phenological shifts may result in a mismatch of key biotic relationships – e.g., flowering won't time with the presence of pollinators.
13) The overall productivity of instream communities may be impacted with earlier emergence of insect larvae or extensive algal blooms (e.g., with a negative impact on Steelhead and the arroyo toad).

In addition, other possible vulnerabilities exist not discussed by Jennings et al. (2018):

14) The projected present and future rising temperatures are likely to impact reptiles on Camp Pendleton, such as turtles and snakes as temperature is known to directly affect important life history traits (Bindoff et al. 2019). Analyses in recent studies show that in turtles and snakes, temperature influences their hatchlings' gender, size, sex, viability and performance (Bindoff et al. 2019).
15) More precipitation in mountainous regions (e.g., Palomar Mountain) will fall as rain instead of snow. Diminished snow packs result in declines in water supply for both humans and the ecosystem. Runoff of precipitation will be faster than the slow moisture release from snow packs, and thus less available overall.
16) Reduced cooling at night with increased humidity and/or increased heat waves causes more stress for animals and humans alike (Kalansky et al. 2018).
17) Increased air temperatures increase soil warming and drying.

B.2.1.d. Impacts to Military Training and the Mission

An increase in temperature in the future will greatly impact natural resources stewardship and the Military Training mission; possible impacts include the following:

1) Increased pathogens, such as Zika or West Nile Virus, that could impact the human environment and pose a greater risk to the community. These pathogens could also impact federally-listed plant and animal species.
2) More frequent heat waves exacerbates human health, including heat stoke and heat exhaustion (DoD 2019a; DoD 2023a).
3) More frequent heat waves include increased occurrence of test/training limitations due to high heat days and wildfires (DoD 2012; DoD 2019a).
4) Degrading infrastructure and increased maintenance costs for roads, utilities, and runways (DoD 2019a).
5) Reduced airlift capacity and reduced live-fire training (DoD 2012).
6) Increased energy costs for building and industrial operations (e.g., cooling, DoD 2012; DoD 2019a).
7) Increased operational health surveillance and risks (DoD 2012).
8) San Diego as a biodiversity hotspot already has a greater than average number of threatened and endangered species; the number of federally-listed species on Camp Pendleton will increase, as will management costs.
9) Regions like Camp Pendleton, which provide unobstructed open space abutting Cleveland National Forest to the east may become important refugia for many species as they move to coastal regions to keep cool. This would increase management costs as these species become rarer in the surrounding region.
10) Increased management costs for current listed species; some examples are as follows:
    a. Moving arroyo toad larvae when pools are drying up;
    b. Moving stranded southern California steelhead when pools are drying up;
    c. Restoration of shrub habitat for California gnatcatcher;
    d. Increased management of non-native species as their numbers increase, such as shot-hole borer and invasive plants.

DoD Climate Assessment Tool Heat Exposure Hazard

The DoDs Standard Assessment (DoD 2023a) provides further climate change modelling and information on the vulnerabilities due to temperature increase on Camp Pendleton in the "Heat Exposure Hazard" analysis (Table B-3):

1) The average number of days where the maximum temperature (daytime high) exceeds 95°F is significant because it marks the point at which air temperature is approximately equal to body temperature, which makes it difficult for people to shed heat; for Camp Pendleton, current conditions ("Baseline") are at 10 days/year, with future predictions in 2050 and 2085 more than double the Baseline.
2) The 5-day maximum temperature in a year is significant because a 5-day window marks a significant impact on training and testing schedules.
3) The highest weighted risk for Camp Pendleton according to the analysis is the increase in the number of days in the High Heat Index (where Heat Index Values are ≥90°F for a portion of the day (extreme caution or higher)), which is the National Weather Service Heat Index for the way that temperature and humidity interact to impair thermoregulation and increases

health risk to humans. For Camp Pendleton, this the number of high heat index days in the future scenarios more than doubles from the Baseline as well.

Indicator Name	Baseline ("current")	2050 Lower Emissions Model	2050 Higher Emissions Model	2085 Lower Emissions Model	2085 Higher Emissions Model
Days Above 95°F (days/year)	10	22	25	26	40
5-Day Maximum Temperature (°F)	92	96	97	97	101
High Heat Index Days (days/year)	9	26	30	31	54

Table B-3. Heat Exposure Hazard information from the DoD Climate Assessment Tool, which models heat exposure issues for low and high emissions scenarios in 2050 and 2085.

B.2.2 PRECIPITATION AND DROUGHT

B.2.2.a. Historic Precipitation

Precipitation in the Region

Patterns of precipitation in the southwest are undergoing a change just in recent decades. Water for people and nature in the southwest has declined during droughts, with an increase of large floods. In the Colorado River Basin drought, higher temperatures attributed to climate change have contributed to lower runoff with 17-50% streamflow reductions between 2000 and 2014 (USGCRP 2018). In California, through increased temperature and less precipitation, climate change may have contributed to $1/10^{th}$ to $1/5^{th}$ of the reduced soil moisture from 2012 to 2014 (USGCRP 2018).

Southern California has high year-to-year variability where annual precipitation ranges between a low of 5 inches to a high of over 35 inches. Most of the heaviest rain events occur during the winter, although the region occasionally has high rainfall events from tropical storms during the late summer and early fall (Bedsworth et al. 2018). In particular, San Diego County has experienced large multi-year fluctuations in precipitation; in the last 101 years, the driest 4 year period (1999-2002) dipped to 53% of the historical long-term average and the driest 20-year period (1953-1972) of precipitation fell to 80% of historical average (Livneh et al. 2015).

NOAA's Climate Explorer- San Diego County

Historic data show that overall, the amount of precipitation falling on San Diego County has steadily declined over the last 12 decades (Figure B-7). The trend line in precipitation declines approximately 0.62 inches of precipitation a decade, from approximately 45 inches in 1898 to 38 inches in modern times.

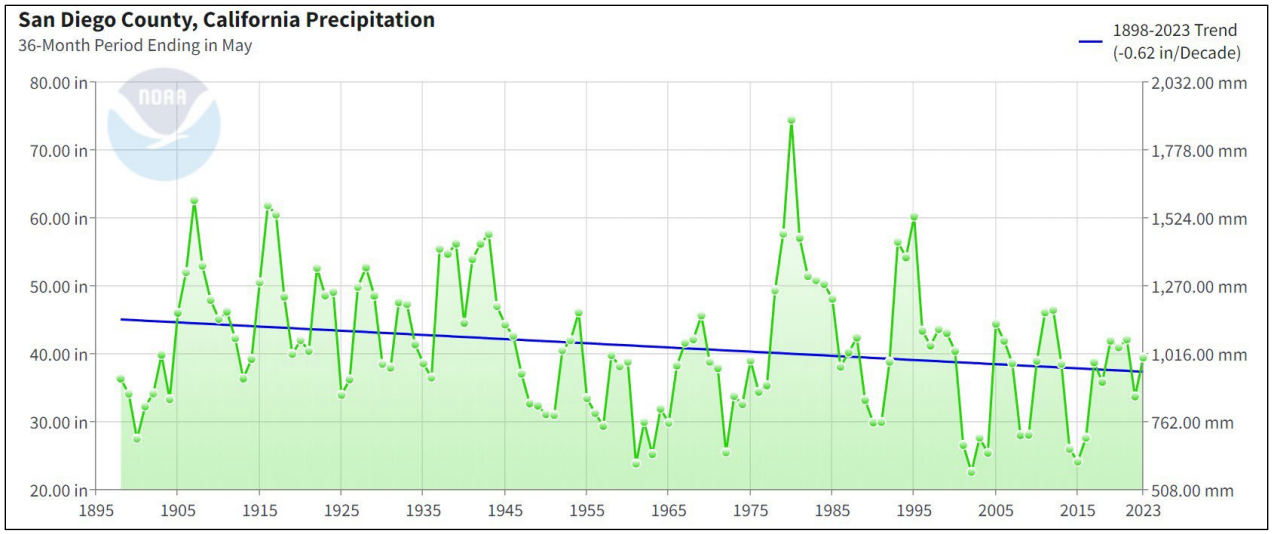


Figure B-7. Precipitation in San Diego County during 3-year periods, from 1895 to 2023 (*data from* NOAA 2023a).

B.2.2.b. Climate Change Projections: Precipitation and Drought

Precipitation and Drought in the Region

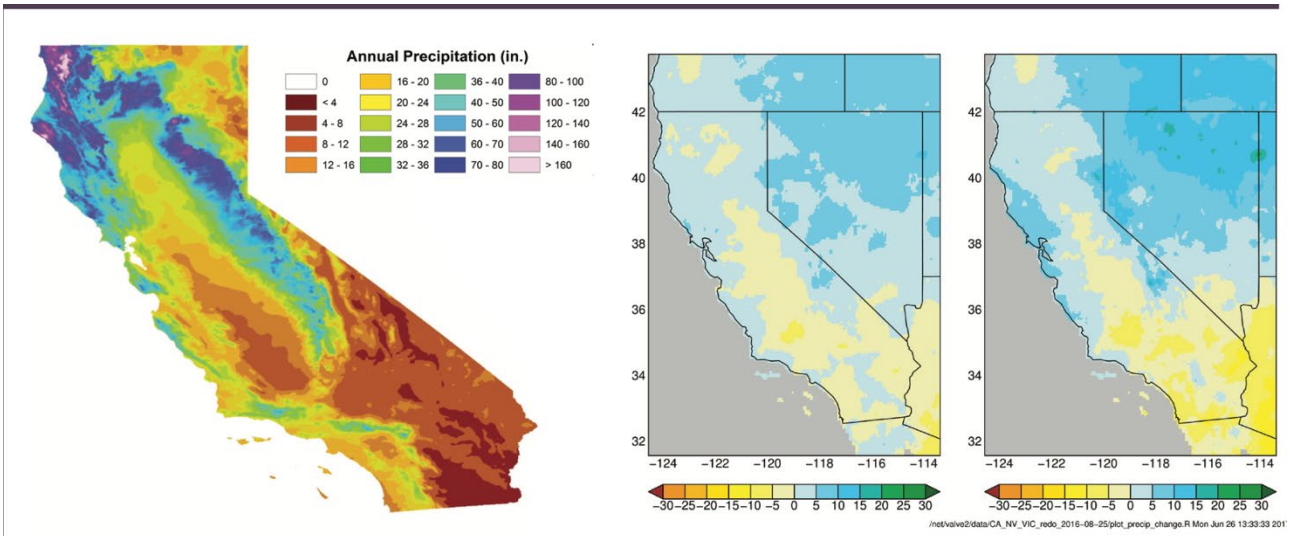
According to the 2018 U.S. National Climate Assessment for the Southwest region (USGCRP 2018), all climate models project average annual precipitation to decrease substantially with prolonged droughts by the end of the century across the entire Southwest region. In brief, it is predicted that:

1) While there is uncertainty between different climate scenarios for future precipitation projections in the Southwest, the greatest decreases in precipitation (3-12%) is projected to occur in southern California, Arizona, and New Mexico;
2) In some areas, more precipitation would fall as rain instead of snow. The formation of winter snowpack development is dependent on annual snowfall. Snowpack is a valuable resource since, by melting slowly, they release water in spring and summer, when ecosystems are most reliant on water;
3) Although overall precipitation is expected to decline, rain is projected to fall less frequently, but with greater intensity. In other words, a greater proportion of the region's rainfall is projected to be delivered in large storms, as opposed to more moderate rainfall events. Large rain events that historically had an expected return of 5 years are expected to occur twice as often by the end of the century, under a high emission scenario (RCP 8.5);
4) Under a high emission scenario (RCP 8.5), higher temperatures would cause more frequent and severe droughts, and substantial reductions in snowpack - which supplies a major portion of water in the Southwest. The risk of mega-droughts—dry periods lasting 10 years or more—will be sharply increased by the occurrence of higher temperatures; and
5) Under high emissions scenarios (RCP 8.5), climate models project annual declines of river flow in southern basins (the Rio Grande and the lower Colorado River). Although there is

great uncertainty in the magnitude and timing of future drying in the Southwest, fewer days with precipitation may lead to increased year-to-year variability.

According to California's Fourth Climate Change Assessment (Bedsworth et. al; Kalansky et al. 2018; Jennings et al. 2018), all climate models project precipitation to decrease and drought to increase over the 21st century. In brief, it is predicted that:

6) The northern part of the state will become wetter, and the very southern portion of California, extending and intensifying in Mexico, to become drier (Figure B-8);
7) Precipitation volatility will intensify, with days of measurable precipitation becoming less frequent as extreme precipitation events intensify. Atmospheric rivers (transports of moisture form the tropics over the Pacific), will increase and cause more moisture;
8) In San Diego County, the average wettest day every five years is projected to increase by 10-25% under RCP4.5 and 15-30% under RCP 8.5 by the end of the century;
9) Spring precipitation decreases by 20% by 2050, and 25% by 2100; fall precipitation 15% by 2050, and 20% by 2100 under the high emissions modeling;
10) Droughts are projected to become more frequent and intense. More dry years also lead to an increase in the duration, frequency, and severity of droughts in the future. Higher temperatures will exacerbate future droughts leading to larger water deficits; and
11) Soil moisture will decrease substantially during prolonged drought; under RCP8.5, spring soil moisture will decrease 10-15% by 2100.



Left panel: Average annual precipitation in California. Right two panels: Projected percent changes (2070-2100 relative to 1950-2005) of annual precipitation, averaged over 10 LOCA downscaled GCMs selected for the Fourth Assessment for RCP 4.5 (left) and RCP 8.5 (right) scenarios. Sources: Left: modified from PRISM, 2018; Right: Pierce et al., 2018.

Figure B-8. Historic and Projected Precipitation in California (Kalansky et al. 2018). Both the low emissions model (RCP 4.5) and the high emissions model (RCP 8.5) demonstrate a decrease in annual precipitation in the years 2070-2100 in San Diego County (highlighted in yellow, from -5 to -15%) relative to precipitation in 1950-2005.

NOAA's Climate Explorer- San Diego County

These climate change projections for extreme rain events are depicted for San Diego County using NOAA's Climate Explorer tool (NOAA 2023a). Figure B-9 shows the number of days per year when more than 3 inches of rain fell from 1950 to present, and the projected number of days with more than 3 inches of rain from 2005 to 2100. In the 2020s, San Diego County is projected to have 0-0.8 days per year with more than 3 inches of precipitation, but climate models indicate that the county will experience up to 1.5 days per year by the 2090s (with the high emissions model). That is a possible 10+-fold increase above the 1961-1990 observed average of 0.1 day per year.

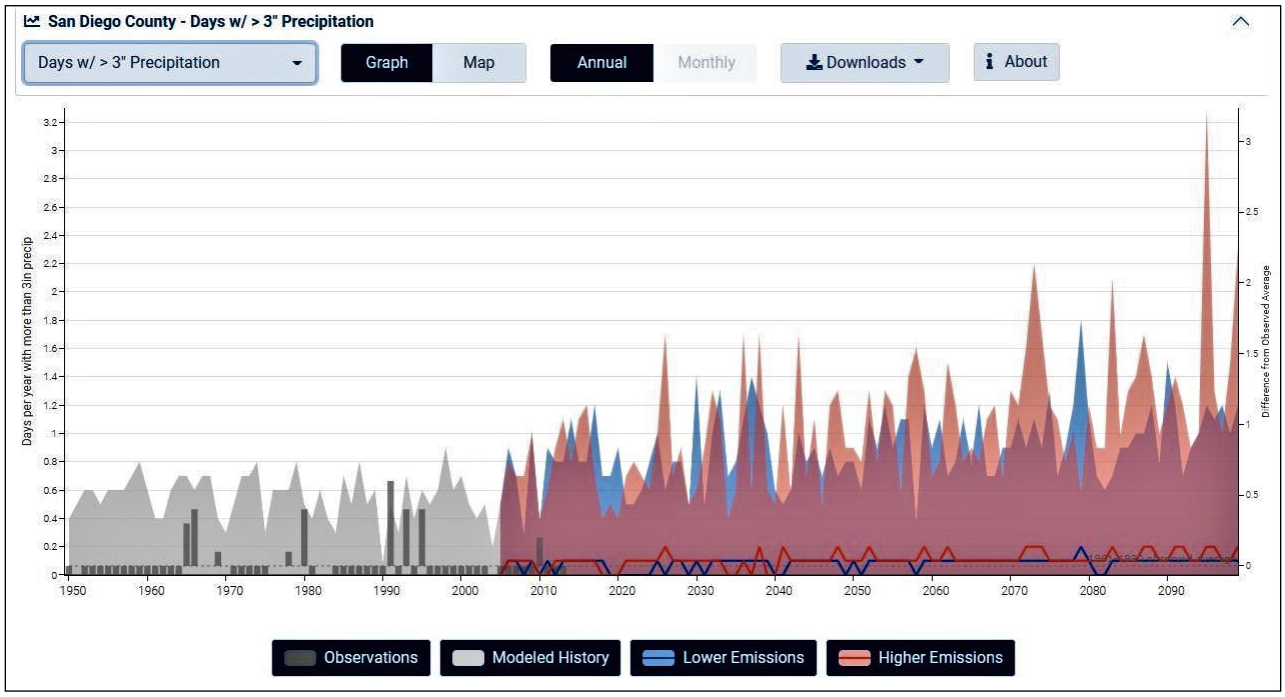


Figure B-9. The number of days per year with more than 3 inches of rain from 1950 to present (gray bars on graph's left side), and in the future, based on NOAA climate model outcomes. The model predictions under a high emissions scenario (red line) and low emissions scenario (blue line) are shown. The solid, shaded graph sections show the maximum ranges of climate model-predicted values for historic conditions (gray), and high emissions (red) and low emissions (blue) scenarios (*data from* NOAA 2023a).

B.2.2.c. Vulnerabilities Due to Precipitation Change Impacts

Jennings et al. (2018) conducted a detailed assessment of the vulnerabilities of systems in San Diego County to precipitation changes and drought; a synopsis is as follows:

1) In the shrublands, drought tolerant species will be better adapted to survive then drought avoiding species; species composition in these systems will change to favor deep rooted systems.
2) Vernal pools will be sensitive to those species with dormant life stages (seed and cyst of listed fairy shrimp). With an increase in precipitation intensity, the pools will fill and dormant life

stages will emerge to reproduce; however, maintaining water throughout the lifecycle will not be sustainable as the amount of winter rain events decreases. This increases the probability that fairy shrimp will go extinct in some pools, especially those that only fill in high precipitation years.

3) Changes in annual timing in precipitation may increase Lindahl's fairy shrimp, a competitor to federally endangered San Diego fairy shrimp.
4) Rare plants may experience recruitment failure during drought.
5) Amphibian species such as the arroyo toad aestivate after breeding, typically in June and July to avoid dessication. Aestivation may occur earlier, thus impacting breeding and survival.
6) The impacts of the change of the hydroperiod in streams will disrupt breeding and dispersal patterns of invertebrates, fish, and amphibians whose life histories are tuned to cues associated with seasonal flow (Brooks 2009), such as the arroyo toad. Further, earlier stream drying may promote formation of macroalgal mats and eutrophication, impacting the overall habitat.
7) Some species will be more susceptible to attach by pests or pathogens. For example, stress can make trees susceptible to insect attack like the rapid oak mortality event in southern California from the 2012-2016 drought.
8) Bird species will demonstrate a significant decline in reproductive success, due to lack of food availability (arthropod abundance). The California gnatcatcher could be particularly vulnerable since it occupies shrub habitat.
9) Current and future rare and endemic species that only occur in the region may become extripated/extinct due to the alteration of habitat suitability from drought.
10) High precipitation events will cause flooding, less stable streamside vegetation, and increased erosion.

In addition, other possible vulnerabilities exist not discussed by Jennings et al. (2018):

11) Local water supply will be reduced, with a reduction in surface and aquifer supply. With an increase in demand, due to reductions from supplemental water from the Colorado Basin.
12) More extreme precipitation events will discharge oil, pesticides, metals, pathogens, and bacteria into the ocean negatively affecting coastal water quality (Kalansky et al. 2018).
13) Increased maintenance on flood control and wastewater facilities/infrastructure, with poor drainage and debris build-up in basins (Kalansky et al. 2018).
14) Increase in high flow events can increase the delivery of sediment, nutrients, and microbial pathogens into streams, lakes, and estuaries; and thus impact aquatic life (USGCRP 2018).
15) Stream bank erosion and gullying.

B.2.2.d. Impacts to Military Training and the Mission

An increase in high precipitation events and prolonged drought in the future will greatly impact natural resources stewardship and the Military Training mission; possible impacts include the following:

1) Extended drought impacts air quality.
2) Reduced land carrying capacity for vehicle maneuvers (DoD 2012).
3) Increased maintenance costs for roads, utilities, and runways (DoD 2012; DoD 2019a).

4) Reduced live-fire training (DoD 2012; DoD 2019a).
5) Reduced water availability and greater competition for limited water resources (DoD 2012; DoD 2019a).
6) Operational health surveillance and risks; and increased flood control/erosion prevention measures (DoD 2012).
7) Temporary or prolonged disruption of military operations or test and training activities due to intense storms and resulting storm damage, in addition to military training safety (DoD 2012; DoD 2019a).
8) Inundation of and damage to coastal infrastructure with increased riverine flooding. Reduced access to military water crossings and river operations; reduced off-road maneuver capacity (DoD 2012; DoD 2023a).
9) Increased flood control/erosion prevention measures; and transportation infrastructure damage (DoD 2012).
10) San Diego as a biodiversity hotspot already has a greater than average number of threatened and endangered species; the number of federally-listed species on Camp Pendleton will increase, as will management costs.
11) Direct and cascading effects on water quality; changes to runoff affect pollutant transport into and within water bodies.
12) Increased management costs for current listed species; some examples are as follows:
    a. Moving arroyo toad larvae when pools are drying up;
    b. Moving stranded southern California steelhead when pools are drying up;
    c. Increased management of vernal pools, including removal of competitor species of the endangered species;
    d. Increased management of non-native species as their numbers increase, such as shot-hole borer and invasive plants.

Assessing Impact of Climate Change Surface Water and Ground Water Resources on Camp Pendleton – The Conjunctive Use Project (CUP)

The CUP Climate Model (MCBCP 2014) assessed the future impact of climate change on the environment under CUP operations, with modelling of the year 2060. Water pumping and delivery out of the Santa Margarita River system relies current climatic conditions as managed through an Adaptive Management Plan. In short:

1) Santa Margarita River (SMR) Inflow decreases from 38,300 AFY (average feet year) to 34,900 AFY, evapotranspiration by riparian vegetation increases from 2,400 AFY to 2,600 AFY, and Groundwater Pumping decreases from 10,800 AFY to 10,500 AFY. Essentially both inflow of water into the system (river and aquafer) and outflow (pumping and water delivery) decrease.
2) The reduced inflow and outflow is consistent with the reduction in rainfall and increase in evaporation rates. The reduced groundwater pumping reflects the decrease in above normal conditions and reduced delivery requirement to Fallbrook. The total diversions decrease from 10,000 AFY to 9,600 AFY.

3) The CUP Climate Model shows that reduced streamflow, increased evaporation and evapotranspiration, and changes in groundwater pumping will impact arroyo toad habitat by an additional 6.4% over recent water management conditions.

DoD Climate Assessment Tool Riverine Flood Inundation Hazard

The DoDs Standard Assessment (DoD 2023a) provides further climate change modelling and information on the vulnerabilities due to precipitation increase on Camp Pendleton in the "Riverine Flood Inundation Hazard" analysis (Table B-4). Projected changes in flood extent were modeled by adding 2 ft (for 2050) and 3ft (for 2085) freeboard to the current elevation of the 1% AEP event ("100 year flood event") and mapping the area of inundation that would result. This indicator is a measure of the potential inundation extent during a 1% AEP flood event on Camp Pendleton. (Table B-4).

Indicator Name	Baseline ("current")	2050 (1% AEP+2ft)	2085 (1% AEP+3ft)
Percent of Camp Pendleton inundated due to a "100 year flood event"	20.8%	27.5%	28.6%

Table B-4. Riverine Flood Inundation Hazard information from the DoD Climate Assessment Tool, that shows the percent of Camp Pendleton that floods during an 1% AEP "100-year flood" event currently, and modelled in the future (2050 and 2085).

Furthermore, the DoDs Standard Assessment (DoD 2023a) provides the percent of Camp Pendleton buildings that are likely to be inundated due to the projected increase in flood extent; information is provided in Table B-5.

Indicator Name	Baseline ("current")	2050 (1% AEP+2ft)	2085 (1% AEP+3ft)
Percent of the 8023 buildings on Camp Pendleton	22% (1760 buildings)	38% (3014 buildings)	40% (3215 buildings)

Table B-5. Riverine Flood Inundation Hazard information from the DoD Climate Assessment Tool, that shows the percent of Camp Pendleton buildings that become inundated during an 1% AEP "100-year flood" event currently, and modelled in the future (2050 and 2085). Building information was obtained from a FY19 geodatabase analysis for the DoD.

B.2.3 SEA LEVEL RISE

B.2.3.a. Historic Sea Levels

Global and National Sea Level Rise

The recent rise in global temperatures and extreme weather events has raised concerns about sea level rises in coastal areas. According to the National Oceanic and Atmospheric Administration (NOAA)'s National Centers for Environmental Information, the global sea level has already risen by about 8 inches since 1900 (Frankson et al. 2017), with almost half this rise occurring since 1993 as oceans have warmed and land-based ice has melted (USGCRP 2018).

Regional changes in sea level rise and coastal flooding are not evenly distributed across the United States; ocean circulation changes, sinking land, and Antarctic ice melt will result in predicted greater-than-average sea level rise for the Northeast and western Gulf of Mexico (USGCRP 2018). Sea level rise has already increased the frequency of high tide flooding by a factor of 5 to 10 for several national coastal cities since the 1960s (USGCRP 2018). With sea level rise comes an increase in the frequency, depth, and extent of tidal flooding with coastal storms, such as hurricanes and nor'easters.

Sea Level Rise in the Region

Sea-level along the central and southern California coast has risen more than 5.9 inches since 1900 (Bedsworth et al. 2018). At the Golden Gate Bridge in San Francisco, sea level rose 9 inches between 1854 and 2016 and in San Diego, sea level rose 9.5 inches from 1906 to 2016 (USGCRP 2018).

Locally, since data was collected in 1924, the tide gauge at La Jolla has measured an increase in sea level at a rate of 0.08 +/- 0.01 in/year (2.1+/- 0.27 mm/year). Between 1980 and 2000, sea level along San Diego was relatively stable, even decreasing slightly as stronger wind stress gradients over the eastern Pacific suppressed the global rise along North America; however, sea level has been increasing rapidly as the wind systems relaxed once again from 2000- current (Kalansky et al. 2018).

Coastal cliff erosion is broadly attributed to marine and terrestrial erosion mechanisms, with wide beaches buffering erosion due to waves/sea level. Between 1998 and 2009, the mean cliff face retreat averaged over the entire cliff height was 0.1 ft/yr in San Diego (Young 2018).

B.2.3.b. Climate Change Projections: Sea Level Rise

Global Sea Level Rise

Due to both past and future emissions and with rapid ice loss from Greenland and Antarctica, the sea level on a global scale is projected to rise another 1 to 4 feet by the year 2100, with a possibility of up to 8 feet under an high emission (RCP8.5) scenario (Figure B-10; Frankson et al. 2017, USGCRP 2018).

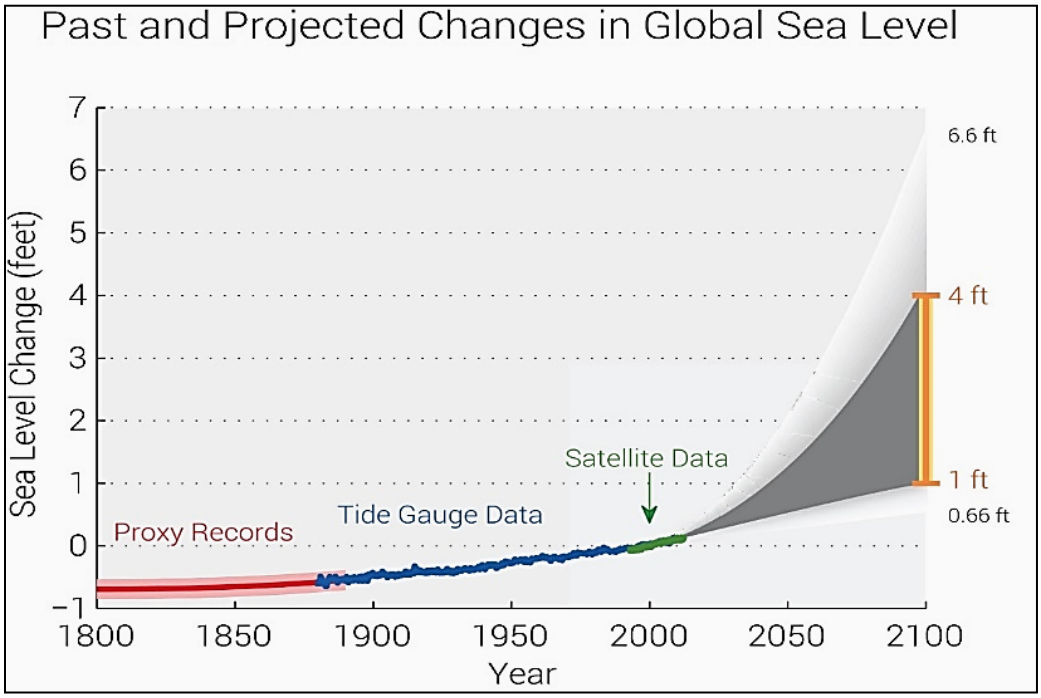


Figure B-10. Estimated, observed, and possible future amounts of global sea level rise since 1800 relative to the year 2000. The most likely sea level rise of 1 - 4 feet by 2100 (orange line) is based on an assessment of scientific studies. (Melillo et al. 2014 in Frankson et al. 2017).

Over the first half of this century, the future scenario the world follows has little effect on projected sea level rise due to the inertia in the climate system. However, towards the second half of the century, relative to the year 2000, global average sea level is very likely to rise by 0.3–0.6 feet by 2030, 0.5–1.2 feet by 2050, and 1–4 feet by 2100 under a low-moderate emissions scenario (USGCRP 2018).

Sea Level Rise in the Region

According to the 2018 U.S. National Climate Assessment for the Southwest region (USGCRP 2018), all climate models project sea levels to increase over the 21st century on the California coastline. In brief, it is predicted that:

1) By 2100, 200,000 people currently in California live in areas 3 feet or less above sea level, with projections of sea level rise showing inundation of this population; and
2) Storm surges and high tides on top of sea level rise would exacerbate tidal flooding. Example, data collected at the gage at La Jolla California since the 1920s and a prediction model can be graphed below. Based on the tidal flood day defined in Sweet et al. (2014), the threshold level for coastal flooding in La Jolla will increase dramatically after 2040 (Fig. B-11). The current number of flood annual days in La Jolla is projected to increase from 10-15 to over 50 in 2040, between 75 and 175 in 2060, to between 175 and as much as 350 flood days by 2080-2100. Upper ranges (red) are for high emission levels and 100-year flood events.

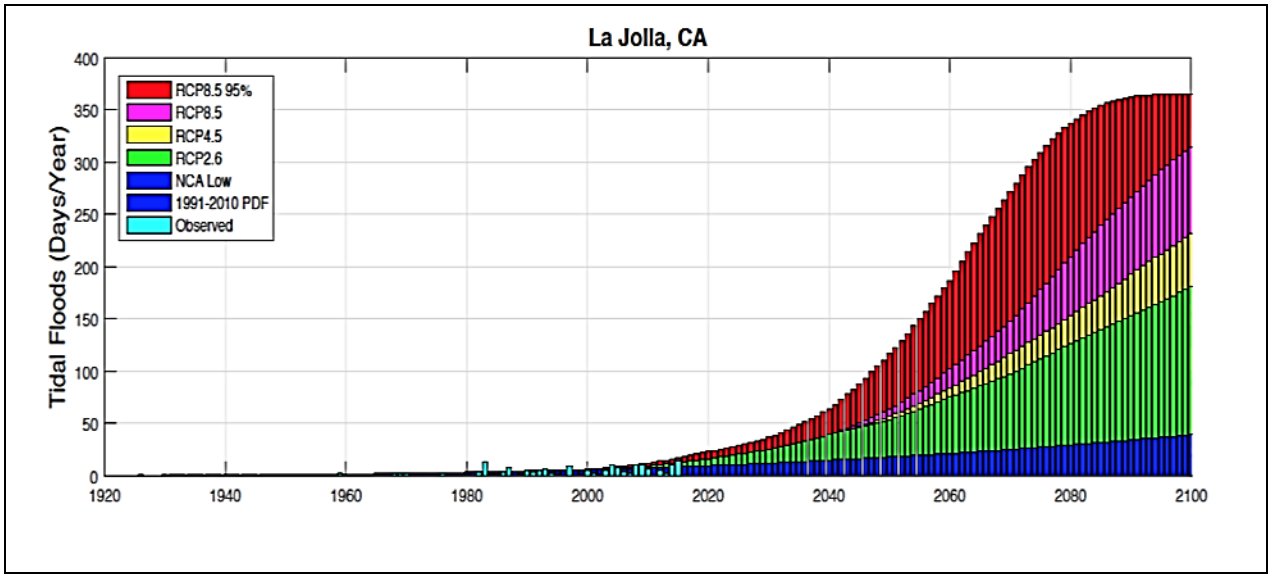


Figure B-11. Number of tidal flood days per year for the observed record (light blue bars) and projections for four possible futures: simple extrapolation ("NCA Low") of the recent global sea level rise of 3.2 mm per year (blue), much lower emissions (RCP2.6; green), lower emissions (RCP4.5; yellow), and higher emissions (RCP8.5; red) per calendar year for La Jolla, CA. The 95th percentile of model simulations under the RCP 8.5 scenario is shown in red. Under a higher emissions pathway, tidal flooding is projected to occur in La Jolla nearly every day of the year by the end of this century. Projected increases are larger even when considering a lower emissions pathway. Source: NOAA 2019.

According to California's Fourth Climate Change Assessment for the State of California (Bedsworth et. al; Kalansky et al. 2018; Pierce et al. 2018), all climate models project sea level rise to increase over the 21st century. In brief, it is predicted that:

1) Uncertainty persists in the rate of sea level rise; sea-level rise (SLR) estimates are similar under both a moderate and high emission scenario through 2050; however, under the RCP 8.5 scenario, a slim possibility that sea-level rise will exceed 9 feet by 2100 along the California coast;
2) Sea level along the San Diego County coast is expected to rise approximately 1 f by mid-21st century, and 3 f or potentially much higher by end of the century; and
3) San Diego cliffs are usually between 65 -115 feet tall; the long-term cliff retreat rate is estimated at an average of 0.2 to 0.7 f/yr (Young et al., 2010).

DoD's Climate Change Adaptation Working Group for Camp Pendleton

DoD's Climate Change Adaptation Working Group (CCAWG) reviewed regionalized sea level change and extreme water level scenarios. At Camp Pendleton, under the lowest emissions scenario (e.g., assuming an immediate and rapid reduction in our carbon emissions), the resulting sea level rise will be 0.3 ft above reference level until toward the end of this century, when it will double to about 0.7 ft above reference level. However, under the highest emissions scenario (e.g., assuming a

continuation similar to the current path of global emissions increases), sea level rise is projected to triple in value every 30 years, from about 1 ft (2035) to 3 ft (2065) to over 7 ft by the end of the century (Table B-5, Hall et al. 2016).

Furthermore, these scenarios are severely worsened when including Extreme Water Level Statistics. Under high emissions scenarios, the resulting in sea level rises are projected to be about 7 ft (2035) to 9 ft (2065) to 13 ft by the end of the century, during 5-Year Flood Events. These are events with a 20% chance in any given year that there will be an extreme water level event of at least this magnitude. The worst projected flooding levels occur in a high emissions scenario during 100-year flooding events. For the years 2035, 2065, 2100, the sea level rises are projected at 8 ft, 10 ft, and over 14 ft above the current reference level (Hall et al. 2016).

	Sea Level Rise (ft) above reference level for future years					
	2035		**2065**		**2100**	
Regionalized Sea Level Change Scenarios	Global Scenario	**Camp Pendleton**	Global Scenario	**Camp Pendleton**	Global Scenario	**Camp Pendleton**
Lowest Emissions Model	0.3	0.3	0.3	0.3	0.7	0.7
Highest Emissions Model	1.0	1.0	2.6	2.9	6.6	7.3

Table B-5. Regionalized Sea Level Change Scenarios for Camp Pendleton relative to the global scenario. Magnitudes of site-specific adjustments depend on the global scenario, time horizon, and site-specific factors. All values are relative to global mean sea level (referenced to 1992, the 1983-2001 tidal epoch; Hall et al. 2016). *Note*: Water levels do not include effects of waves.

Combined Scenario Value: Sea Level Change Scenario & Extreme Water Level Statistics

Extreme Water Levels include effects of astronomical tides and storm surges. These both vary over time, so their combined effect is expressed in terms of annual exceedance probability. Hall et al. (2016) predicted the probabilities of different return periods for combined storm and tide elevations of different magnitudes on Camp Pendleton. For detailed explanations of Regional Sea Level Change and Extreme Water Level Scenarios, see NAVFAC (2017) Appendix C (pg. C-13): Climate Science, Data, and Projections, Section 3 – Sample Output.

Below (Table B-6, Figure B-12) are Hall et al. (2016) predictions for a 5-Year Flood Event (meaning there is a 20% chance in any given year that there will be an extreme water level event of at least this

magnitude). This modelling demonstrates that by 2025, there is a 20% chance that the sea level will rise above 6 ft. in a given year (Table B-6). Hall et al. (2016) continued to model for a 20-year, 50-year, and 100-year flood event, but that data is not presented below.

Emission Model Scenarios	Sea Level Rise (ft) above reference level for future years		
	2035	2065	2100
Lowest	6.4	6.4	6.8
Low	6.4	6.8	7.7
Medium	6.8	7.4	9.4
High	6.8	8.1	11.0
Highest	7.1	9.0	13.4

Table B-6. A 5-Year Flood Event with a 20% chance in any given year that there will be an extreme water level event of at least this magnitude, measured as Sea Level Rise (ft. above the reference level) (Hall et al. 2016). Values represent elevations above the reference datum for the combination of sea level change scenario and the selected annual chance event. 5 emission models provided input- from lowest emissions to highest emissions. Note: these water levels do not include the effects of waves.

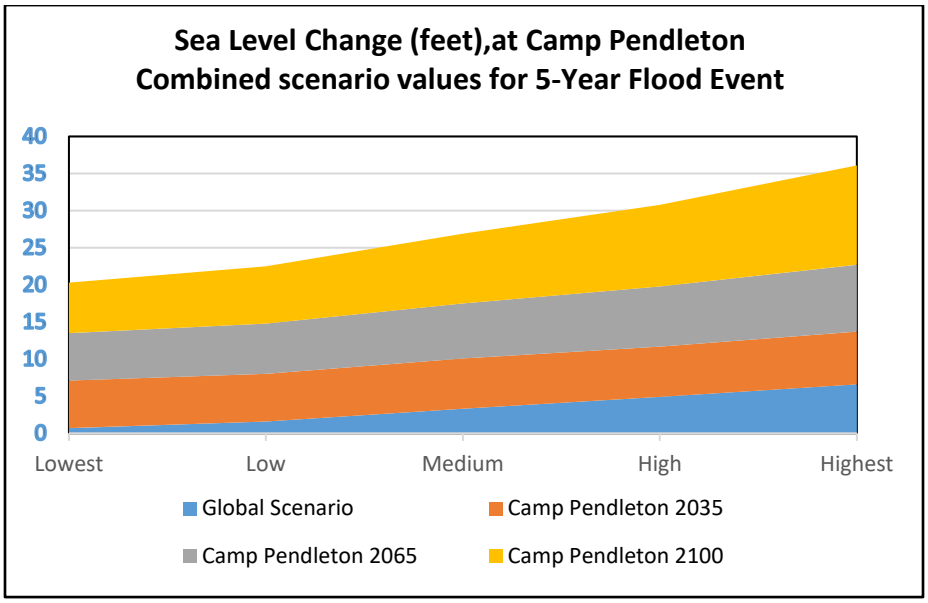


Figure B-12. Projected impacts of climate change on sea level change (in feet, y-axis) at CPEN in 2035, 2065, and 2100, under extreme water level conditions, various emission scenarios (x-axis), and combined with values for a 5-Year Flood Event. Based on data in Table B-6 (Hall et al. 2016).

NOAA's Sea Level Rise Viewer

Sea level increase at Camp Pendleton by 2100 will vary between 0.7 ft (low emissions scenario) to 7.3 (high emissions scenario), according to the Regionalized Sea Level Change Scenario presented by Hall et al. (2016; Table B-6). However, sea levels at Camp Pendleton will reach from 6.8 ft to over 13 ft (low to high emissions scenarios) by 2100 in a Sea Level Change Scenario combined with Extreme Water Level Statistics, and a 5-Year Flood Event (with a 20% chance in any given year that there will be an extreme water level event of at least this magnitude; Hall et al. 2016). Even under a medium emissions scenario, a 5-year flood event would cause sea level surge on Camp Pendleton of 6.8 feet as early as 2035 (Table B-6).

Using NOAA's Sea Level Rise Viewer (NOAA 2023c), with sea level set at 7 feet, the resulting scenario shows that the ocean will eliminate much of Camp Pendleton's beach areas, especially on the southern portion of Camp Pendleton's beaches. Sea water will intrude over most of the riparian areas at the mouth of the Santa Margarita and northeastward for approximately 2.5 miles, well past Stuart Mesa road (Figure B-13). On the northern portion of the Base, the beach currently held under lease by the State Parks will become inundated, as will San Onofre Beach (Figure B-14).

B.2.3.c. Vulnerabilities Due to Sea Level Rise

In general, likely impacts from rising sea levels at Camp Pendleton will thus include the following:

1) Extensive loss of beach areas due to sea level rise. The loss of beach area and beach habitat as a result of the sea level rise, will severely impact:
   - Current listed species, such as California least tern and snowy plover, due to major loss of nesting habitat.
   - All resident and wintering shorebirds, due to major loss of foraging habitat.
   - Brand's phacelia, a rare dune plant species currently under a Candidate Conservation Agreement.
2) Sand loss due to storm surges, wave actions, wind events.
3) Beach erosion due to storm surges and wave actions.
4) Loss of coastal cliffs, including rare species that may inhabit the tops of the cliffs (e.g., vernal pool species).
5) Potential changes in river inlet closure patterns. Greater inlet closures may increase low oxygen in the estuaries (Kalansky et al. 2018).
6) Flooding of inshore, wetlands, riparian and upland areas due to storm surges and sea level rise. As a result of the sea level rise, surge of sea water into marshlands, wetlands and upstream riparian areas will impact plants and animals such as:
   - Freshwater-adapted (wetland) plants and trees.
   - Freshwater-adapted aquatic invertebrates and fish.
   - Riparian plants and trees in areas of salt water intrusion, and riparian dependent birds such as least Bell's vireo may suffer habitat loss.
   - Other sensitive species, such as Belding's savannah sparrow.

- Decreases in plant diversity in the salt marsh plain through competition (Noto and Shurin 2017).

B.2.3.d. Impacts to Military Training and the Mission

Strategic Environmental Research and Development Program (SERDP) Assessment of Impacts of Sea Level Rise on Camp Pendleton

Chadwick et al. 2014 developed an analysis framework and methodologies for evaluations of vulnerabilities on Camp Pendleton and tested them under prescribed scenarios of increased local mean sea level at 0.5 meters, 1.0 meters, 1.5 meters, and 2.0 meters for the 22nd century. The assessment targeted vulnerabilities of buildings, civil infrastructure, training areas, and waterfront and coastal structures.

An increase in sea level in the future will greatly impact the Military Training mission; possible impacts include the following:

1) Camp Pendleton beach training areas are reduced to about 41% of baseline for 1.0 m Sea Level Rise (SLR) and further reductions to a remaining area of 27% of baseline for 2.0 m SLR.
2) For buildings, the erosion pathway resulted in vulnerability to about 66 structures for 1.0 m SLR.
3) Roadways were found to be vulnerable to the erosion pathway along the exposed shoreline of MCBCP.
4) The analysis indicated an increasing level of vulnerability to inundation and flooding as a function of increasing sea level and increasingly extreme short-term events flooding, it also reflected the relative resilience of MCBCP to inundation and flooding as a function of the generally steep nature of the installation topography, and the buffering effect of the coastal cliffs.
5) Beach training areas are one of the most sensitive receptors to inundation and flooding, with inundation impacts reflected in reductions in average beach widths to a remaining area of about 17% for only 0.5 m SLR, and further reductions to a remaining area of 10% for 2.0 m SLR.
6) Flooding impacts (100 year return period condition) are more significant with nearly the entirety of the beach training areas (5% remaining) being subject to flooding for SLR scenarios of about 0.5 m and above. A potential of 158 flooded structures for 1.0 m SLR, increasing to about 200 structures for 2.0 m SLR.
7) Roadways, storm drain systems and recreational areas all had projected vulnerability to inundation and flooding as well.

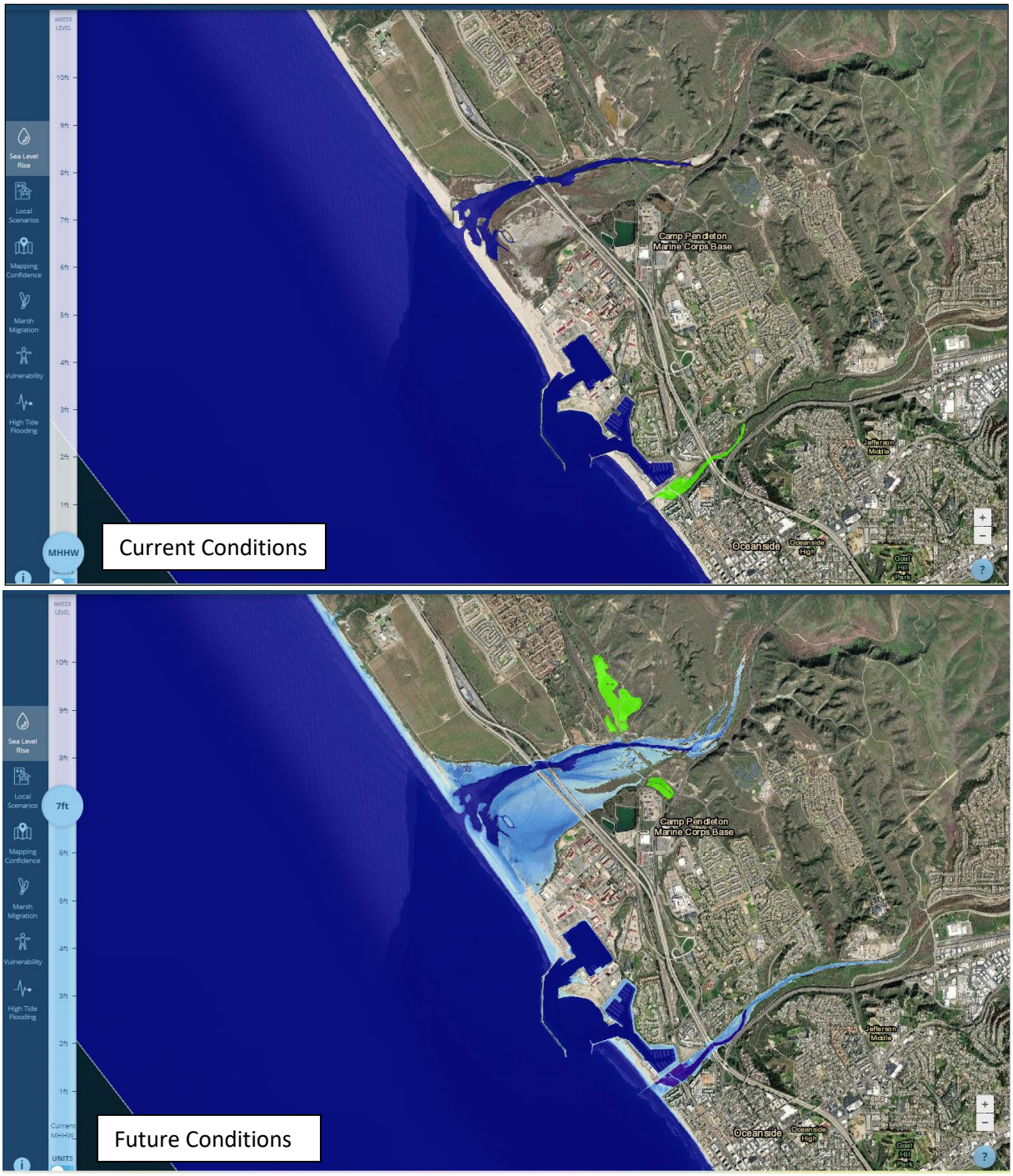


Figure B-13. Simulated sea level rise using NOAA (2023c) comparing current conditions and future conditions at the Santa Margarita River mouth and Del Mar Boat Basin on Camp Pendleton. The viewer's vertical slider is set at 7 feet to simulate water level rise, the resulting inundation footprint, and relative depth. Water levels are relative to the current Mean Higher High Water Datum ("current conditions"). Areas hydrologically connected to the ocean are shown in shades of blue (darker blue = greater depth). In green are low-lying areas, hydrologically "unconnected," that may also flood.

Figure B-14. Simulated sea level rise using NOAA (2023c) comparing current conditions and future conditions at the current State Parks lease and San Onofre beach on Camp Pendleton. The viewer's vertical slider is set at 7 feet to simulate water level rise, the resulting inundation footprint, and relative depth. Water levels are relative to the current Mean Higher High Water Datum ("current conditions"). Areas hydrologically connected to the ocean are shown in shades of blue (darker blue = greater depth). In green are low-lying areas, hydrologically "unconnected," that may also flood.

Other vulnerabilities not addressed in Chadwick et al. (2014) with an increase in sea level in the future that will greatly impact natural resources stewardship and the Military Training mission include the following:

8) The number of federally-listed species on Camp Pendleton will increase, as will management costs. Some examples of increased management costs for current listed species include:
    a. Habitat restoration of "inland" dunes/beach habitat away from the coast to support California least tern and western snowy plover habitat, as well as other rare plants and animals;
    b. Restoration of riparian habitat near the coast to support listed species; and
    c. Beach replenishment, coastal erosion fixes and other high-cost management strategies to save coastal environments.
9) Flooding from sea-level rise and coastal wave events leads to bluff, cliff, and beach erosion.
10) In addition, the intrusion of salt water upstream into the Santa Margarita River basin may impact well water pumped up for human consumption, depending on well pump location, and the extent of sea water intrusion.

DoD Climate Assessment Tool Coastal Flood Inundation Hazard

The DoDs Standard Assessment (DoD 2023a) provides further climate change modelling and information on the vulnerabilities due to sea level rise increase on Camp Pendleton in the "Coastal Flood Inundation Hazard" analysis (Table B-7). Projected changes in the 1% AEP event (one that happens "every 100 years") were modeled for low and high emissions in 2050 and 2085 by mapping the area of inundation. This indicator is a measure of the potential inundation extent during a 1% AEP flood event on Camp Pendleton. (Table B-7).

Indicator Name	Baseline ("current")	2050 Lower Emissions Model	2050 Higher Emissions Model	2085 Lower Emissions Model	2085 Higher Emissions Model
Percent of Camp Pendleton inundated due to a "100 year flood event"	.3%	.3%	.5%	.3%	.9%

Table B-7. Coastal Flood Inundation Hazard information from the DoD Climate Assessment Tool, that shows the percent of Camp Pendleton that floods during an 1% AEP "100-year flood" event currently, and modelled in the future (2050 and 2085) for two emissions models.

Furthermore, the DoDs Standard Assessment (DoD 2023a) provides the percent of Camp Pendleton buildings that are likely to be inundated due to the projected increase in flood extent; information is provided in Table B-8.

Indicator Name	Baseline ("current")	2050 Lower Emissions Model	2050 Higher Emissions Model	2085 Lower Emissions Model	2085 Higher Emissions Model
Percent of the 8023 buildings on Camp Pendleton	<1% (6 buildings)	<1% (6 buildings)	<1% (8 buildings)	<1% (6 buildings)	<1% (28 buildings)

Table B-8. Coastal Flood Inundation Hazard information from the DoD Climate Assessment Tool, that shows the percent of Camp Pendleton buildings that become inundated during an 1% AEP "100-year flood" event currently, and modelled in the future (2050 and 2085). Building information was obtained from a FY19 geodatabase analysis for the DoD.

B.2.4 SANTA ANA WINDS AND WILDFIRE

B.2.4.a. Historic Wildfire

Wildfires in the Region

Many ecosystems require fire. However frequent and/or extreme, intensive wildfires can permanently alter ecosystem integrity (USGCRP 2018). The western US is currently undergoing a severe drought accompanied by a fire season that has become longer than it was several decades ago, with many more large-scale fires (USCCSP 2008). According to the National Climate Assessment, climate change in the western US has led to an increase in the area burned by wildfires (USGCRP 2018). There is consensus that climate induced changes are intensifying fire regimes, as evidenced by the recent megafires in California and other parts of the world (Martin et al. 2021 and references therein). In recent years, wildfires in much of San Diego have occurred more frequently, while urban development has increased as well than historical fire return intervals (Jennings et al. 2018; Figure B-15).

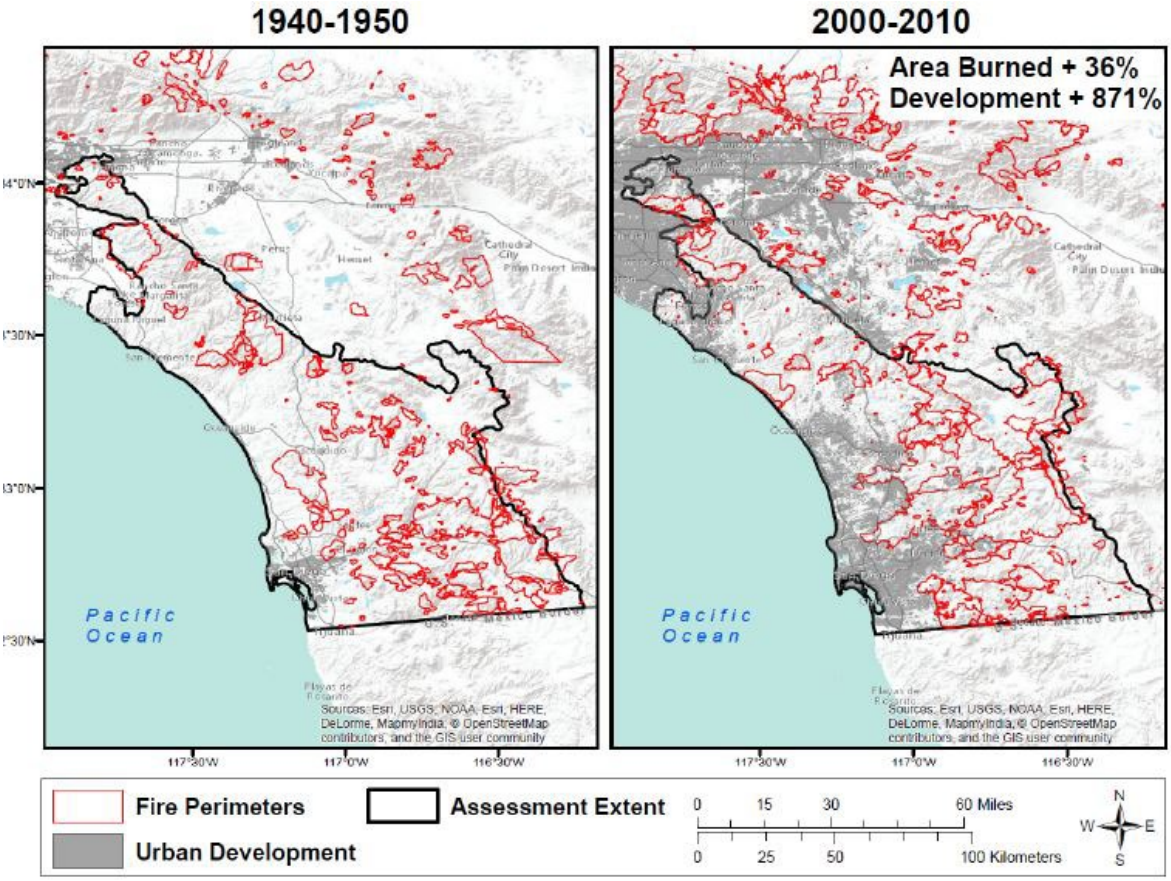


Figure B-15. Size and Distribution of fires (CALFIRE FRAP 2017) and urban development in the San Diego region during two periods: 1940-1950 (left panel), and 2000-2010 (right panel) (Jennings et al. 2018).

In addition, wildfires in much of San Diego have occurred significantly more frequently than historical fire return intervals (Safford and Van de Water 2014; Figure B-16). With this comes the risk of vegetation type conversion.

Santa Ana Winds are dry, hot, gusty winds (greater than to equal to 8 m/s with relative humidity less than or equal to 20%) that peak in winter, as they originate in the elevated Great Basin as cold air masses and pushes southwestward (Hughes et al. 2011). These winds often fuel California's largest wildfires (Kalansky et al. 2018). Santa Ana conditions also account for the some of the hottest maximum temperatures along the San Diego County coast; for example, in October, Santa Ana events account for over 70% of hot days (Kalansky et al. 2018).

Camp Pendleton's recent fire history is provided in Section 3.1.5 in Chapter 3.

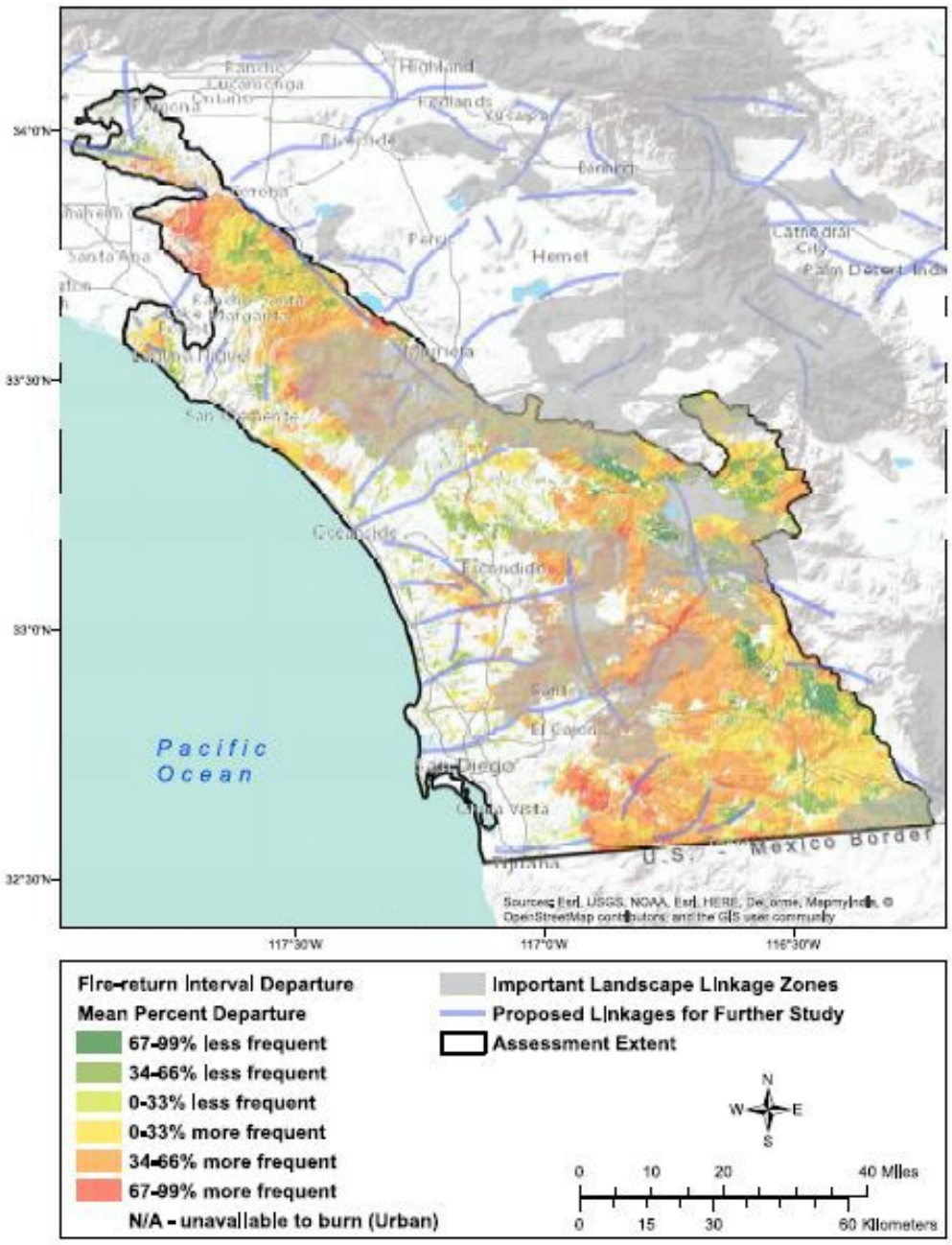


Figure B-16. Map of fire-return interval departure (Safford and Van de Water 2014) in the region with an overlay of linkage corridors; yellow, orange and red denotes areas at risk for vegetation type conversion because of their frequent fire intervals (Jennings et. al 2018).

B.2.4.b. Climate Change Projections: Wildfire

Wildfires in the Region

According to the 2018 U.S. National Climate Assessment for the Southwest region (USGCRP 2018), all climate models predict an increased wildfire risk across the entire Southwest region. In brief, it is predicted that:

1) Model projections suggest the number of low humidity days (and high fire danger days) is increasing across much of the western US (USCCSP 2008);
2) Under a higher emissions scenario, climate models predict that fire frequency could increase in parts of the southwest by 25% by the end of the century, and the frequency of very large fires (> 5,000 hectares) could triple; and
3) The National Research Council projects that for every 1°C warming across the western US, the amount of area burned by wildfire will increase by two- to six-fold (USCCSP 2008).

According to California's Fourth Climate Change Assessment (Bedsworth et. al 2018; Kalansky et al. 2018; Westerling 2018; Jennings et al. 2018), all climate models project precipitation to decrease and drought to increase over the 21st century. In brief, it is predicted that:

4) In California, the frequency of extreme wildfires burning over approximately 25,000 acres would increase by nearly 50 percent, and that average area burned statewide would increase by 77 percent by the end of the century;
5) The risk for large catastrophic wildfires driven by Santa Ana wind events likely increases as a result of a drier autumns before the height of the Santa Ana wind season (December and January);
6) For San Diego County, under RCP 8.5, models suggest there will be an increase in area burned by up to 61 acres per fire by the end of the century; and
7) Extension of the seasonal drought that pushes the fire season later into the fall and winter means that low live fuel moisture could more frequently coincide with Santa Ana winds creating conditions that support megafires.

B.2.4.c. Vulnerabilities Due to Wildfire Impacts

Jennings et al. (2018) conducted a detailed assessment of the vulnerabilities of systems in San Diego County to an increase in catastrophic fire events and wildland fire interval; a synopsis is as follows:

1) Type conversion of vegetation communities, in particular from shrublands to grasslands. These conversions associate with a loss of species that occupy those shrublands (bird, mammal, insect, etc.), such as the federally listed California gnatcatcher associated with coastal sage scrub. Vegetation community conversion is assisted by drought, where the climate can no longer support juvenile recruitment of succession plants after a fire.
2) Shifts in functional type of shrublands; for example, obligate resprouters may increase at the expense of shrubs with fire-stimulated seed (obligate or facultative seeders).

3) With conversion to grasslands, comes the increases in non-native species including non-native grasses and fennel.
4) Some species are well adapted to fire (e.g., Stephens' kangaroo rat); however, other species in the region have already been greatly impacted locally due to large wildfires such as Hermes copper butterfly (*Lycaena hermes*), the dusky footed woodrat (*Neotoma macrotis*), and coastal cactus wren (*Campylorhynchus brunneircapillus*).
5) Habitat degradation from fire may limit gene flow and result in inbreeding of species; e.g., mountain lions are at risk from vegetation-type conversion and the inability to move long distances between habitats if degraded (Ernest et al. 2014).
6) Wildfire negatively impacts water quality and aquatic fish and benthic macroinvertebrate species when there are impacts to the watersheds.

In addition, other possible vulnerabilities exist not discussed by Jennings et al. (2018):

7) With type conversion of vegetation from shrublands to grasses, there is a loss in carbon sequestration.
8) Potential impacts of increased wildland fires include the large-scale release of carbon and aerosols into the atmosphere (particularly from megafires).
9) Increase of soil erosion and possible landslides.
10) With conversion to grasslands, comes the increases in non-native species including non-native grasses and fennel.

B.2.4.d. Impacts to Military Training and the Mission

An increase in Santa Ana driven wildfire events in the future will greatly impact natural resources stewardship and the Military Training mission; possible impacts include the following:

13) Loss of homes and infrastructure (e.g., utilities) to the Base (DoD 2019a).
14) Severe economic consequences due to operations and business disruptions (DoD 2019a).
15) Increases in the costs of wildfire fighting and insurance (USCCSP 2008).
16) Direct and cascading effects on water quality.
17) Impacts to health from impaired air quality (Martin et al. 2021).
18) Reduced live-fire training with an increase in High Fire Danger Rating days.
19) Temporary or prolonged disruption of military operations or test and training activities due to intense wildfire events, in addition to military training safety.
20) Erosion issues after a wildfire, causing mudslides during high precipitation events.
21) Increased management costs for current listed species; some examples are as follows:
    a. Restoration of California gnatcatcher habitat; and
    b. Increased non-native vegetation removal in habitat.

B.3 STEP 3 EVALUATE IMPLICATIONS FOR INRMP GOAL AND OBJECTIVES STEP 4 DEVELOP STRATEGIES AND ACTIONS TO REDUCE CLIMATE RISKS

Adaptation strategies and actions should be capable of mitigating key climate risks to the natural resources under management, and ultimately to the military mission of the installation. Natural resource managers typically look to past conditions as a benchmark for their work, and resource conservation is often focused on either maintaining current conditions or restoring a system to some desired historical state. For this 5-year cycle of the INRMP, Camp Pendleton will focus on restoring and maintaining the current systems and ensuring that monitoring protocols are climate informed. Camp Pendleton environmental staff is in the infancy of developing on the ground climate change studies and habitat improvements; as these projects are developed, they will be provided to all interested parties during the INRMP annual reviews and updates.

Natural resources management efforts (goals and objectives) vulnerable to climate, with associated actions to reduce climate risks (i.e., strategies that could reduce climate vulnerabilities), are identified in the Table B-9 (Table B-9 was derived from DoD 2019b). Camp Pendleton did not identify all elements, goals and objectives in the INRMP in Table B-9; a subset of the either the most vulnerable resource or where Base actions can assist in reducing risk were discussed. For each vulnerability, the risk reduction strategy, supporting actions or projects (and whether these are currently named in Chapter 4 or Appendix M of the INRMP) were included. In addition, the Vulnerability Assessments of federal-listed species from the DoD Climate Assessment Tool (DoD 2023a) are included as well. Highlights from Table B-9 are also discussed in Chapter 4, Natural Resources Management.

INRMP Goals/Objective to Evaluate *What are the existing goals of the INRMP that may be affected?*	**Vulnerability Assessment from the DoD Climate Assessment Tool (DoD 2023a)**	**Climate Implications for Existing Goals/Objective** *Based on climate concerns, how might Camp Pendleton's ability to achieve existing goals be compromised?*	**Risk Reduction Strategies** *What actions or projects could be carried out to reduce these vulnerabilities and risks? (Name current actions in Chapter 4 and Appendix P if applicable)*
Develop and implement management plans for key listed wildlife beach, estuary species (Section 4.1.1)	**California least tern**, **Western snowy plover**, and **Ridgway's rail** ranked "Vulnerable" from: Drought Flooding Also susceptible to increased predation and habitat degradation.	It may be difficult to "maintain" status quo of SNPL and LETE populations with continuation of existing management. Existing management may not be enough in the face of increased flooding due to sea level rise. Ecosystem services for RIRA still seems feasible.	Current - Restoration and removal of non-native vegetation is already addressed in the Dune Management Element (Section 4.1.1, 4.2.8). - Predator control is conducted annually (Section 4.1.1). - Monitoring is conducted annually to assist in climate informed management (Section 4.1.1). Future - Develop ideas to enhance habitat farther inland from the coast. - Develop sand retention projects (e.g., sea wall), that would also preserve military training beaches. - Conduct vulnerability assessment for listed shorebird habitat by 2024, to include food fish availability and sand erosion (Section 4.2.11). - Conduct vulnerability assessment for riverine species, focusing on flood regimes and aquatic exotic species by 2026 (Section 4.2.11).
Develop and implement management plans for key listed wildlife riparian species (Section 4.1.1)	**Least Bell's vireo** and **southwestern willow flycatcher** ranked "Vulnerable" from: Drought Wildfire	Restoration to support habitat resiliency and ecosystem services for listed species still seems feasible considering climate implications (although will likely require more than status quo management to	Current - Adaptative management plan for conjunctive use of surface water and groundwater resources within the Lower Santa Margarita Basin (MCBCP 2015). - Non-native species removal (plants, cowbirds, and aquatic animal species) is conducted annually (Section 4.2.2, 4.2.8). - Monitoring is conducted annually to assist in climate informed management (Section 4.1.1, MCBCP 2015).

INRMP Goals/Objective to Evaluate *What are the existing goals of the INRMP that may be affected?*	**Vulnerability Assessment from the DoD Climate Assessment Tool (DoD 2023a)**	**Climate Implications for Existing Goals/Objective** *Based on climate concerns, how might Camp Pendleton's ability to achieve existing goals be compromised?*	**Risk Reduction Strategies** *What actions or projects could be carried out to reduce these vulnerabilities and risks? (Name current actions in Chapter 4 and Appendix P if applicable)*
	Arroyo toad ranked "Vulnerable" from: Drought Wildfire Flooding Extreme Temperature Also susceptible to increased predation and habitat degradation.	achieve; e.g., increase in non-native species removal, larval rescue, artificial watering sources).	- SWFL artificial seeps have been established in support of MCBCP 2015. <u>Future</u> - Develop further ideas to increase surface water for SWFL. - Develop arroyo toad larvae rescue plans as ponded water evaporates. - Increase native habitat resiliency by improving groundwater recharge. - Develop strategies to reverse streambank erosion. - Conduct vulnerability assessment for riverine species, focusing on flood regimes and aquatic exotic species by 2026 (Section 4.2.11).
Develop and implement management plans for key listed wildlife upland species (Section 4.1.1)	**Pacific pocket mouse** and **coastal California gnatcatcher** ranked "Vulnerable" from: Drought Wildfire **Stephens' kangaroo rat** ranked "Not Vulnerable"	Restoration to support habitat resiliency and ecosystem services for listed species still seems feasible considering climate implications (although will likely require more than status quo management to achieve).	<u>Current</u> - Implement PPM, SKR, CAGN habitat restoration (Section 4.1.1). - Non-native plant species removal is conducted annually (Section 4.2.8). - Monitoring is conducted annually to assist in climate informed management (Section 4.1.1). - Prescription burns are conducted to enhance PPM and SKR habitat (Section 4.1.1). <u>Future</u> - Develop further ideas to protect shrub type conversion to grasslands due to increased wildfire frequency. - Prepare a Vulnerability Assessment for coastal sage scrub by 2027 (Section 4.2.11).

INRMP Goals/Objective to Evaluate *What are the existing goals of the INRMP that may be affected?*	**Vulnerability Assessment from the DoD Climate Assessment Tool (DoD 2023a)**	**Climate Implications for Existing Goals/Objective** *Based on climate concerns, how might Camp Pendleton's ability to achieve existing goals be compromised?*	**Risk Reduction Strategies** *What actions or projects could be carried out to reduce these vulnerabilities and risks? (Name current actions in Chapter 4 and Appendix P if applicable)*
Manage for the continued sustainability of federally listed and select rare plants while reducing encumbrances to training lands. (Section 4.1.3)	**Encinitas Baccharis** ranked "Vulnerable" from: Drought Wildfire Assume similar status for **thread leaved Brodiaea** although not addressed in assessment.	Restoration to support habitat resiliency and ecosystem services for listed species still seems feasible considering climate implications (although will likely require more than status quo management to achieve).	Current - Manage TLB in accordance with the TLB Management Plan, including habitat enhancement (Section 4.1.3). Future - Monitor effects of wildfire on both listed species. - Develop further ideas to protect shrub type conversion to grasslands due to increased wildfire frequency.
Vernal Pool Management Element (Section 4.2.7)	Listed fairy shrimp ranked "Vulnerable" from: Drought Flooding Temperature Increase Wildfire	Restoration to support habitat resiliency and ecosystem services still seems feasible considering climate implications (although will likely require more than status quo management to achieve; e.g., increase in non-native species removal)	Current - Restoration and removal of non-native vegetation is already addressed in the Vernal Pool Management Element (Section 4.2.7). - Camp Pendleton has a project proposed to explore Lindahl's fairy shrimp abatement, a competitor of listed shrimp. Future - Develop ideas to increase retention of ponded water. Evaluate existing fuelbreaks and clear zones for areas of strategic improvement (Section 4.2.11).
Wildfire Management Element (Section 4.2.10)	Wildfire has been named as major threat to Natural Resources	To meet the natural resources objective of minimizing type conversion	Current - Data is collected currently to help inform the Adjusted FDR (Section 4.2.10).

INRMP Goals/Objective to Evaluate *What are the existing goals of the INRMP that may be affected?*	**Vulnerability Assessment from the DoD Climate Assessment Tool (DoD 2023a)**	**Climate Implications for Existing Goals/Objective** *Based on climate concerns, how might Camp Pendleton's ability to achieve existing goals be compromised?*	**Risk Reduction Strategies** *What actions or projects could be carried out to reduce these vulnerabilities and risks? (Name current actions in Chapter 4 and Appendix P if applicable)*
	Management and Military Training	of shrub to grasslands, more than status quo management will be needed.	- Prescription burns are currently maximized on Camp Pendleton to reduce risk of a catastrophic wildfire (Section 4.2.10). - Post fire rehabilitation including restoration and erosion control is currently conducted to minimize destruction from wildfires (Section 4.2.10). <u>Future</u> - Support a risk assessment for the Base. - Monitor effects of prescribed fires to grasslands and restore grasslands if needed. - Evaluate existing fuelbreaks and clear zones for areas of strategic improvement.

Table B-9. Climate implications (vulnerabilities and risks) to INRMP goals on Camp Pendleton and identification of possible adaptation strategies and actions that can reduce the risk.

B.4 STEP 5 AND STEP 6: ADAPTIVE MANAGEMENT: IMPLEMENT, MONITOR, AND ADJUST CLIMATE ACTIONS

When determining how to fund climate adaptation projects, the easiest avenue is to determine how the action or project fits into existing natural resources projects (DoD 2019b). Modifying already existing projects can shorten the time for implementation and have the backing of an already existing driver for funding (e.g., ESA).

DoD guidance (DoD 2019b) recognizes that climate adaptation planning for large scale efforts often entails a time horizon of more than 10 years and therefore recommends that managers break up complex projects into phases that can be implemented over the course of several years, and several funding cycles. In addition, collaborative partnerships provide an important mechanism for information and cost-sharing and are encouraged. Cam Pen addresses funding and implementation in Chapter 5.

Monitoring will become increasingly significant of effective climate adaptation planning to understand how conditions are changing, and to respond to that change (DoD 2019b). Camp Pendleton already supports a robust monitoring program, including monitoring to support climate-informed decisions in the riparian system for water management; these monitoring efforts are highlighted in Chapter 4.

Monitoring currently provides data to see if management is meeting the INRMP goals, and already is analyzed to demonstrate short and long-term impacts of climate to species (e.g., many species' population numbers, fecundity, etc. are already tied to drought). The INRMP accommodates a degree of flexibility to respond to these changes. This adaptive management is highlighted in Chapter 4 and is a key component of responding to and combating climate impacts.

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Appendix C

CAMP PENDLETON SOILS: CODES, ACREAGES, AND ERODIBILITY

APPENDIX C
CAMP PENDLETON SOILS:
CODES, ACREAGES, AND ERODIBILITY

Soil Code, Description, Acreage, and Erodibility of Camp Pendleton Soils

Soil Code	Description	Acreage	Erodibility [1]
	Undefined	2	
ACG	Acid igneous rock land	90	Severe 1
ATC	Altamont clay, 5-9% slopes	1095.2	Slight
ATD	Altamont clay, 9-15% slopes	1314.2	Slight
ATE	Altamont clay, 15-30% slopes	1151.3	Moderate 1
ATF	Altamont clay, 30-50% slopes	3404.0	Severe 1
B1C	Bonsall sandy loam, 2-9% slopes	524	Severe 9
B1C2	Bonsall sandy loam, 2-9% slopes, eroded	105	Severe 9
B1D2	Bonsall sandy loam, 9-15% slopes, eroded	118	Severe 9
BEE	Blasingame loam, 9-30% slopes	780	Severe 16
BGF	Blasingame loam, 30-50% slopes	103.8	Severe 1
BSC	Bosanko clay, 2-9% slopes	8	Moderate 16
C1D2	Cieneba coarse sandy loam, 5-15% slopes, eroded	104.0	Severe 16
C1E2	Cieneba coarse sandy loam, 15-30% slopes, eroded	82.2	Severe 16
C1G2	Cieneba coarse sandy loam, 30-65% slopes, eroded	4137.9	Severe 1
CBB	Carlsbad gravelly loamy sand, 2-5% slopes	272.5	Severe 2
CBC	Carlsbad gravelly loamy sand, 5-9% slopes	1173.0	Severe 2
CBD	Carlsbad gravelly loamy sand, 9-15% slopes	45.1	Severe 2
CBE	Carlsbad gravelly loamy sand, 15-30% slopes	116.4	Severe 2
CCC	Carlsbad-Urban land complex, 2-9% slopes	80.3	
CFB	Chesterton fine sandy loam, 2-5% slopes	343.3	Severe 9
CFC	Chesterton fine sandy loam, 5-9% slopes	212.2	Severe 9
CME2	Cieneba rocky coarse sandy loam, 9-30% slopes, eroded	335.3	Severe 16
CMRG	Cieneba very rocky coarse sandy loam, 30-75% slopes	17360	Severe 1
CNE2	Cieneba-Fallbrook rocky sandy loams, 9-30% slopes, eroded	470	Severe 16
CNG2	Cieneba-Fallbrook rocky sandy loams, 35-65% slopes, eroded	86	Severe 1

Camp Pendleton Soils (*Continued)*

Soil Code	Description	Acreage	Erodibility [1]
CR	Coastal beaches	181.4	Severe 2
DAC	Diablo clay, 2-9% slopes	340.2	Slight
DAD	Diablo clay, 9-15%slopes	479.4	Slight
DAE	Diablo clay, 15-30% slopes	886.0	Moderate
DAE2	Diablo clay, 15-30% slopes, eroded	302.3	Moderate 1
DAF	Diablo clay, 30-50% slopes	976.7	Severe 1
DOE	Diablo-Olivenhain complex, 9-30% slopes	254.9	Moderate 1
EDC	Elder shaly fine sandy loam, 2-9%slopes	2543.3	Moderate 2
ESC	Escondido very fine sandy loam, 5-9% slopes	67.6	Severe 16
ESD2	Escondido very fine sandy loam, 9-15% slopes, eroded	77.2	Severe 16
ESE2	Escondido very fine sandy loam, 15-30% slopes, eroded	64.1	Severe 16
EXG	Exchequer rocky silt loam, 30-70% slopes	718.8	Severe 1
FAB	Fallbrook sandy loam, 2-5% slopes	88.3	Severe 16
FAC	Fallbrook sandy loam, 5-9% slopes	1011.9	Severe 16
FAC2	Fallbrook sandy loam, 5-9% slopes, eroded	904.5	Severe 16
FAD2	Fallbrook sandy loam, 9-15% slopes, eroded	1570.6	Severe 16
FAE2	Fallbrook sandy loam, 15-30% slopes, eroded	1064.2	Severe 16
FEC	Fallbrook rocky sandy loam, 5-9% slopes	19.8	Severe 16
FEE	Fallbrook rocky sandy loam, 9-30% slopes	337.9	Severe 16
FEE2	Fallbrook rocky sandy loam, 9-30% slopes, eroded	859.4	Severe 16
FVD	Fallbrook-Vista sandy loam, 9-15% slopes	13.1	Severe 16
FXE	Friant rocky fine sandy loam, 9-30% slopes	34.0	Severe 9
FXG	Friant rocky fine sandy loam, 30-70% slopes	27.8	Severe 1
GAE	Gaviota fine sandy loam, 9-30% slopes	427.2	Severe 9
GAF	Gaviota fine sandy loam, 30-50% slopes	5917.5	Severe 1
GOA	Grangeville fine sandy loam, 0-2% slopes	297.4	Severe 16
GRA	Greenfield sandy loam, 0-2% slopes	411.0	Severe 16
GRB	Greenfield sandy loam, 2-5% slopes	625.4	Severe 16
GRC	Greenfield sandy loam, 5-9% slopes	130.3	Severe 16
HAG	Hambright gravelly clay loam, 30-75% slopes	5553.4	Severe 1
HRC	Huerhuero loam, 2-9% slopes	3165.2	Severe 9
HRD	Huerhuero loam, 9-15% slopes	1405.4	Severe 9
HRD2	Huerhuero loam, 9-15% slopes, eroded	46.0	Severe 9

Camp Pendleton Soils *(Continued)*

Soil Code	Description	Acreage	Erodibility [1]
HRE2	Huerhuero loam, 15-30% slopes, eroded	2024.6	Severe 9
HUC	Huerhuero-Urban land complex, 2-9% slopes	70.9	
HUE	Huerhuero-Urban land complex, 9-30% slopes	34.9	
LEC	Las Flores loamy fine sand, 2-9% slopes	2666.5	Severe 2
LEC2	Las Flores loamy fine sand, 5-9% slopes, eroded	39.1	Severe 2
LED	Las Flores loamy fine sand, 9-15% slopes	3388.6	Severe 2
LED2	Las Flores loamy fine sand, 9-15% slopes, eroded	1952.8	Severe 2
LEE	Las Flores loamy fine sand, 15-30% slopes	4288.6	Severe 2
LEE2	Las Flores loamy fine sand, 15-30% slopes, eroded	1355.0	Severe 2
LEE3	Las Flores loamy fine sand, 9-30% slopes, severely eroded	482.2	Severe 2
LFC	Las Flores-Urban land complex, 2-9% slopes	83.2	
LPC	Las Posas fine sandy loam, 5-9% slopes	127.1	Moderate 2
LPD2	Las Posas fine sandy loam, 9-15% slopes, eroded	6.2	Moderate 2
LPE2	Las Posas fine sandy loam, 15-30% slopes, eroded	77.8	Moderate 1
LRE	Las Posas fine sandy loam, 9-30% slopes	315.5	Moderate 1
LRG	Las Posas stony fine sandy loam, 30-65% slopes	490.4	Severe 1
LSE	Linne clay loam, 9-30% slopes	145.5	Moderate 2
LSF	Linne clay loam, 30-50% slopes	1679.6	Severe 1
LVF3	Loamy alluvial land-Huerhuero complex, 9-50% slopes, severely eroded	66.3	Severe 1
M1C	Marina loamy coarse sand, 2-9% slopes	550.3	Severe 2
M1E	Marina loamy coarse sand, 9-30% slopes	804.4	Severe 2
MD	Made land	5.3	
OHC	Olivenhain cobbly loam, 2-9% slopes	6761.6	Severe 16
OHE	Olivenhain cobbly loam, 9-30% slopes	2978.1	Severe 16
OHF	Olivenhain cobbly loam, 30-50% slopes	7373.6	Severe 1
OKC	Olivenhain-Urban complex, 2-9% slopes	308.9	
PEC	Placentia sandy loam, 2-9% slopes	22.5	Severe 9
PEC2	Placentia sandy loam, 5-9% slopes, eroded	20.5	Severe 9
PFC	Placentia sandy loam, thick surface, 2-9% slopes	186.1	Severe 16
RAB	Ramona sandy loam, 2-5% slopes	20.9	Severe 16
RAC	Ramona sandy loam, 5-9% slopes	2.7	Severe 16
RAC2	Ramona sandy loam, 5-9% slopes, eroded	92.5	Severe 16

Camp Pendleton Soils (*Continued*)

Soil Code	Description	Acreage	Erodibility [1]
RAD2	Ramona sandy loam, 9-15% slopes, eroded	8.0	Severe 16
RCD	Ramona gravelly sandy loam, 9-15% slopes	122.1	Severe 16
RCE	Ramona gravelly sandy loam, 15-30% slopes	112.5	Severe 16
RKB	Reiff fine sandy loam, 2-5% slopes	2922.9	Severe 16
RKC	Reiff fine sandy loam, 5-9% slopes	11666.7	Severe 16
RM	Riverwash	1998.8	Severe 2
RUG	Rough broken land	13662.5	Severe 1
SBA	Salinas clay loam, 0-2% slopes	116.6	Moderate 2
SBC	Salinas clay loam, 2-9% slopes	2831.7	Moderate 2
SCA	Salinas clay, 0-2% slopes	269.0	Slight
SCB	Salinas clay, 2-5% slopes	1336.7	Slight
STG	Steep gullied land	1467.6	Severe 1
SVE	Stony land	4300.9	Severe 1
TEF	Terrace escarpments	6120.6	Severe 1
TF	Tidal flats	363.2	Severe 2
TUB	Tujunga sand, 0-5% slopes	810.0	Severe 2
VAA	Visalia sandy loam, 0-2% slopes	1726.0	Severe 16
VAB	Visalia sandy loam, 2-5% slopes	857.8	Severe 16
VAC	Visalia sandy loam, 5-9% slopes	1289.7	Severe 16
VAD	Visalia sandy loam, 9-15% slopes	77.9	Severe 16
VBB	Visalia gravelly sandy loam, 2-5% slopes	127.9	Severe 16
VBC	Visalia gravelly sandy loam, 5-9% slopes	852.3	Severe 16
VSC	Vista coarse sandy loam, 5-9% slopes	403.2	Moderate 2
VSD	Vista coarse sandy loam, 9-15% slopes	23.1	Moderate 2
VSD2	Vista coarse sandy loam, 9-15% slopes, eroded	49.8	Moderate 2
VSE	Vista coarse sandy loam, 15-30% slopes	458.4	Moderate 2
VSE2	Vista coarse sandy loam, 15-30% slopes, eroded	463.7	Moderate 2
VVD	Vista rocky coarse sandy loam, 5-15% slopes	33.6	Moderate 2
VVE	Vista rocky coarse sandy loam, 15-30% slopes	414.4	Moderate 2
WTR	Water	237.3	

[1] Erodibility rating system- *Slight* indicates that water erosion is a minor problem and the soil is suitable for intensive use if other factors are favorable. *Moderate* and *Severe* indicate that protective and corrective measures are needed before and during the time the soil is used. Numerals indicate soil properties or qualities that affect erodibility. (1) Refers to slope; (2) indicates surface layer texture; (9) refers to depth to hard rock, or a hardpan, or any layer that restricts permeability; (16) refers to grade of structure in the surface layer. Absence of rating means no valid interpretations can be made.

Appendix D

Plant Communities and Unvegetated Habitats of MCB Camp Pendleton

APPENDIX D

PLANT COMMUNITIES AND UNVEGETATED HABITATS OF MCB CAMP PENDLETON

Aerial Information Systems completed the Basewide vegetation mapping in 2018 (Aerial Information Systems 2019). This vegetation mapping project used the United States National Vegetation Classification (USNVC), which is a Federal Geographic Data Committee (FGDC) standard. The overall project objectives for the vegetation mapping project were to classify and map the plant communities on MCBCP, which included the following five tasks:

Task 1: Acquisition of Aerial Photographs and Light Detection and Ranging (LiDAR) data in 2016 (GeoTerra 2018a, b).

Task 2: Preparation of an USNVC compliant classification, a floristic vegetation key to the final classification, and a crosswalk to prior classifications (AECOM 2019).

Task 3: Production and validation of a vegetation map for MCBCP based on the above referenced classification (Aerial Information Systems 2019).

Task 4: Completion of a third-party Accuracy Assessment of the map products (Mulligan Biological Consulting 2019).

Task 5: Comparison of the results of this mapping effort to historic mapping (Change Analysis) (GMI-AECOM Joint Venture 2019).

The goal of the vegetation classification portion of the project was to classify all vegetation aboard the Base to the alliance level, except as necessary to capture unique stands at the association level, or in some cases at the group level for poorly differentiated stands that could not be classified at a finer scale. Ninety-seven vegetation types were included in the vegetation classification for MCBCP, including four types classified to the group level, 76 vegetation alliances, seven vegetation associations, and 10 "special stands" that are unique to the Base (Table 1). The full USNVC hierarchy for each mapping unit is provided in Table 1 along with the acreage mapped on the Base. The hierarchy names (Class, Subclass, Formation, Division, MacroGroup, Group, Alliance, Association) were changed to agree with the Manual of California Vegetation (MCV) classification that is provided on the California Native Plant Society website (http://vegetation.cnps.org). Map unit names were updated to the current nomenclature provided in the San Diego Natural History Museum Checklist of vascular plants known to occur on Base. If the MCV name is different, it is provided after the map unit name in parenthesis.

Table 1
Plant Communities Mapped at Camp Pendleton
during the 2018 Vegetation Mapping Project

USNVC Classification Code[1]	USNVC Mapping Unit[2]	Holland Classification Code[3]	Holland Mapping Unit[3]	Colloquial Mapping Unit[4]	Acres
1	**Class:** Mesomorphic Tree Vegetation (Forest and Woodland)				
1.B	**Subclass:** Temperate Forest				
1.B.1	**Formation:** Warm Temperate Forest				
1.B.1.Nc	**Division:** Madrean Forest and Woodland				
1.B.1.Nc.1	**MacroGroup:** California Forest and Woodland				
1.B.1.Nc.1.a	**Group:** Californian Broadleaf Forest and Woodland				
1.B.1.Nc.1.a	*Quercus agrifolia* Woodland Alliance	71160	Coast Live Oak Woodland	Coast Live Oak Woodland	2,264.64
1.B.1.Nc.1.a	*Quercus engelmannii* Woodland Alliance	71180	Engelmann Oak Woodland	Engelmann Oak Woodland	2,000.49
1.B.1	**Formation:** Cool Temperate Forest				
1.B.1.Nc	**Division:** North American Introduced Evergreen Broadleaf and Conifer Forest				
1.B.1.Nc.90	**MacroGroup:** Introduced North American Mediterranean Woodland and Forest				
1.B.1.Nc.90.a	**Group:** Introduced North American Mediterranean Woodland and Forest				
1.B.1.Nc.90.a	*Eucalyptus* (*globulus, camaldulensis*) Woodland Semi-Natural Alliance	79100	Eucalyptus Woodland	Eucalyptus Woodland	104.97
1.B.3	**Formation:** Temperate Flooded and Swamp Forest				
1.B.3.Nd	**Division:** Western North America Warm Temperate Flooded and Swamp Forest				
1.B.3.Nd.2	**MacroGroup:** Southwestern North American Riparian, Flooded and Swamp Forest				
1.B.3.Nd.2.b	**Group:** Southwestern North American Riparian Evergreen and Deciduous Woodland				
1.B.3.Nd.2.b	*Platanus racemosa* Woodland Alliance	62400	Southern Sycamore-Alder Riparian Woodland	Riparian Woodland	1,908.17
1.B.3.Nd.2.b	*Salix gooddingii* Woodland Alliance	62500	Southern Riparian Woodland	Riparian Woodland	608.50
1.B.3.Nd.2.b	*Salix laevigata* Woodland Alliance	62500	Southern Riparian Woodland	Riparian Woodland	272.36
1.B.3.Nd.2.b	Southwestern North American Riparian Evergreen and Deciduous Woodland Group	62500	Southern Riparian Woodland	Riparian Woodland	0.89
1.B.3.Nd.2.b[5]	**Group:** Southwestern North American Riparian/Wash Scrub				
1.B.3.Nd.2.b[5]	*Baccharis salicifolia* Shrubland Alliance	63310	Mule Fat Scrub	Riparian Scrub	1,881.64
1.B.3.Nd.2.b[5]	*Salix exigua* Shrubland Alliance	63320	Southern Willow Scrub	Riparian Scrub	243.63
1.B.3.Nd.2.b[5]	*Salix lasiolepis* Shrubland Alliance	63320	Southern Willow Scrub	Riparian Scrub	1,965.75

USNVC Classification Code[1]	USNVC Mapping Unit[2]	Holland Classification Code[3]	Holland Mapping Unit[3]	Colloquial Mapping Unit[4]	Acres
1.B.3.Nd.2.b[5]	*Sambucus nigra* Shrubland Alliance	N/A	[Not Treated]	Riparian Scrub	200.42
1.B.3.Nd.2.b[5]	Southwestern North American Riparian/Wash Scrub Group	63300	Southern Riparian Scrub	Riparian Scrub	98.28
1.B.3.Nd.90.a	**Group:** Southwestern North American Introduced Riparian Scrub				
1.B.3.Nd.90.a	*Tamarix* spp. Shrubland Semi-Natural Alliance	63810	Tamarisk Scrub	Tamarisk Scrub	25.31
1.B.3.Ng	**Division:** Western North America Flooded and Swamp Forest				
1.B.3.Ng.1	**MacroGroup:** Western Cordilleran Montane-Boreal Riparian Scrub				
1.B.3.Ng.1.a	**Group:** Vancouverian Riparian Deciduous Forest				
1.B.3.Ng.1.a	*Alnus rhombifolia* Forest Alliance	62400	Southern Sycamore-Alder Riparian Woodland	Riparian Woodland	23.02
1.B.3.Ng.1.a	*Populus trichocarpa* Forest Alliance	61330	Southern Cottonwood-Willow Riparian Forest	Riparian Woodland	1.57
2	**Class:** Mesomorphic Shrub and Herb Vegetation (Shrubland and Grassland)				
2.B	**Subclass:** Mediterranean Scrub and Grassland				
2.B.1	**Formation:** Mediterranean Scrub				
2.B.1.Na	**Division:** California Scrub				
2.B.1.Na.1	**MacroGroup:** California Chaparral				
2.B.1.Na.1.a	**Group:** Californian Xeric Chaparral				
2.B.1.Na.1.a	*Adenostoma fasciculatum - Xylococcus bicolor* Shrubland Alliance	37000	Chamise Chaparral	Chaparral	765.61
2.B.1.Na.1.a	*Adenostoma fasciculatum* Shrubland Alliance	37000	Chamise Chaparral	Chaparral	3,748.48
2.B.1.Na.1.a	*Ceanothus crassifolius* Shrubland Alliance	37830	Ceanothus crassifolius Chaparral	Chaparral	4,994.13
2.B.1.Na.1.a	*Ceanothus tomentosus* Shrubland Alliance	37120	Southern Mixed Chaparral	Chaparral	325.51
2.B.1.Na.1.b	**Group:** Californian Mesic Chaparral				
2.B.1.Na.1.b	*Ceanothus pendletonensis* Shrubland Special Stand	37120	Southern Mixed Chaparral	Chaparral	3.14
2.B.1.Na.1.b	*Ceanothus spinosus* Shrubland Alliance	37800	Upper Sonoran Ceanothus Chaparral	Chaparral	664.73
2.B.1.Na.1.b	*Cercocarpus minutiflorus* Shrubland Alliance (=MCV *C. betuloides*)	37120	Southern Mixed Chaparral	Chaparral	138.67
2.B.1.Na.1.b	*Chamaebatia australis* Shrubland Special Stand	37120	Southern Mixed Chaparral	Chaparral	0.17
2.B.1.Na.1.b	*Comarostaphylis diversifolia* Shrubland Special Stand	37120	Southern Mixed Chaparral	Chaparral	23.16

USNVC Classification Code[1]	USNVC Mapping Unit[2]	Holland Classification Code[3]	Holland Mapping Unit[3]	Colloquial Mapping Unit[4]	Acres
2.B.1.Na.1.b	*Heteromeles arbutifolia* Shrubland Alliance	37120	Southern Mixed Chaparral	Chaparral	262.31
2.B.1.Na.1.b	*Quercus (berberidifolia, xacutidens) - Adenostoma fasciculatum* Shrubland Alliance (=MCV *Q. berberidifolia – A. fasciculatum*)	37900	Scrub Oak Chaparral	Chaparral	903.72
2.B.1.Na.1.b	*Quercus (berberidifolia, xacutidens)* Shrubland Alliance (=MCV *Q. berberidifolia*)	37900	Scrub Oak Chaparral	Chaparral	1,616.78
2.B.1.Na.1.b	Californian Mesic Chaparral Group	37000	Chaparral	Chaparral	0.47
2.B.1.Na.1.b	**Group:** Californian Pre-Montane Chaparral				
2.B.1.Na.1.b	*Arctostaphylos glandulosa* Shrubland Alliance	37120	Southern Mixed Chaparral	Chaparral	283.98
2.B.1.Na.1.c	**Group:** Californian Maritime Chaparral				
2.B.1.Na.1.c	*Malosma laurina - Acmispon glaber* Shrubland Association	32500	Diegan Coastal Sage Scrub	Coastal Scrub	15,116.75
2.B.1.Na.1.c	*Malosma laurina* Shrubland Alliance	32500	Diegan Coastal Sage Scrub	Coastal Scrub	1,290.02
2.B.1.Na.1.c	*Rhus integrifolia* Shrubland Alliance	32500	Diegan Coastal Sage Scrub	Coastal Scrub	638.63
2.B.1.Na.2	**MacroGroup:** California Coastal Scrub				
2.B.1.Na.2.a	**Group:** Central and South Coastal California Seral Scrub				
2.B.1.Na.2.a	*Acmispon glaber* Shrubland Alliance (=MCV *Lotus scoparius*)	32000	Coastal Scrub	Coastal Scrub	550.03
2.B.1.Na.2.a	*Isocoma menziesii* Shrubland Alliance	32000	Coastal Scrub	Coastal Scrub	269.16
2.B.1.Na.2.a	*Malacothamnus fasciculatus* Shrubland Alliance	32500	Diegan Coastal Sage Scrub	Coastal Scrub	1,875.95
2.B.1.Na.2.b	**Group:** Central and South Coastal Californian Coastal Sage Scrub				
2.B.1.Na.2.b	*Artemisia californica* Shrubland Alliance	32500	Diegan Coastal Sage Scrub	Coastal Scrub	10,428.73
2.B.1.Na.2.b	*Artemisia californica - Eriogonum fasciculatum* Shrubland Alliance	32500	Diegan Coastal Sage Scrub	Coastal Scrub	9,147.84
2.B.1.Na.2.b	*Artemisia californica - Eriogonum fasciculatum - Opuntia littoralis/Dudleya (edulis)* Coastal Association	32400	Maritime Succulent Scrub	Succulent Scrub	1,720.15
2.B.1.Na.2.b	*Artemisia californica - Eriogonum fasciculatum - Opuntia littoralis/Dudleya (edulis) Inland* Association	32500	Diegan Coastal Sage Scrub	Succulent Scrub	58.57
2.B.1.Na.2.b	*Artemisia californica - Salvia mellifera* Shrubland Alliance	32500	Diegan Coastal Sage Scrub	Coastal Scrub	7,939.49

USNVC Classification Code[1]	USNVC Mapping Unit[2]	Holland Classification Code[3]	Holland Mapping Unit[3]	Colloquial Mapping Unit[4]	Acres
2.B.1.Na.2.b	*Bahiopsis laciniata* Shrubland Alliance	32500	Diegan Coastal Sage Scrub	Coastal Scrub	523.05
2.B.1.Na.2.b	*Encelia californica* Shrubland Alliance	32500	Diegan Coastal Sage Scrub	Coastal Scrub	427.28
2.B.1.Na.2.b	*Eriogonum fasciculatum* Shrubland Alliance	32800	Flat-topped Buckwheat	Coastal Scrub	189.50
2.B.1.Na.2.b	*Salvia apiana* Shrubland Alliance	32500	Diegan Coastal Sage Scrub	Coastal Scrub	1,342.43
2.B.1.Na.2.b	*Salvia mellifera* Shrubland Alliance	32500	Diegan Coastal Sage Scrub	Coastal Scrub	1,948.32
2.B.1.Na.2.b	Central and South Coastal Californian Coastal Sage Scrub Group	32500	Diegan Coastal Sage Scrub	Coastal Scrub	741.92
2.B.1	**Formation:** Mediterranean Grassland and Forb Meadow				
2.B.1.Na	**Division:** California Grassland and Meadow				
2.B.1.Na.3	**MacroGroup:** California Annual and Perennial Grassland				
2.B.1.Na.3.b	**Group:** California Perennial Grassland				
2.B.1.Na.3.b	*Bromus carinatus* Herbaceous Association	42100	Native Grassland	Native Grassland	2.67
2.B.1.Na.3.b	*Elymus condensatus* Herbaceous Alliance (=MCV *Leymus condensatus*)	42100	Native Grassland	Native Grassland	2.29
2.B.1.Na.3.b	*Stipa* species - *Melica* species Herbaceous Alliance	42100	Native Grassland	Native Grassland	13,636.91
2.B.1.Na.90.a	**Group:** Mediterranean California Naturalized Annual and Perennial Grassland				
2.B.1.Na.90.a	*Avena (barbata, fatua)* Herbaceous Semi-Natural Alliance	42200	Non-Native Grassland	Non-Native Grassland	35.49
2.B.1.Na.90.a	*Brassica (nigra)* and Other Mustards Herbaceous Semi-Natural Alliance	42210	Non-Native Grassland: Broadleaf-dominated	Non-Native Forbland	1,769.83
2.B.1.Na.90.a	*Bromus (diandrus, hordeaceus) - Brachypodium distachyon* Herbaceous Semi-Natural Alliance	42210	Non-Native Grassland	Non-Native Grassland	29.34
2.B.1.Na.90.a	*Centaurea (solstitialis, melitensis)* Herbaceous Semi-Natural Alliance	42210	Non-Native Grassland: Broadleaf-dominated	Non-Native Forbland	1.67
2.B.1.Na.90.a	*Conium maculatum* Herbaceous Semi-Natural Association	42210	Non-Native Grassland: Broadleaf-dominated	Non-Native Forbland	28.31
2.B.1.Na.90.a	*Festuca perennis* Herbaceous Semi-Natural Alliance (=MCV *Lolium perenne*)	42210	Non-Native Grassland	Non-Native Grassland	74.14

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2.B.1.Na.90.a	*Foeniculum vulgare* Herbaceous Semi-Natural Association	42210	Non-Native Grassland: Broadleaf-dominated	Non-Native Forbland	192.71
2.B.1.Na.90.a	Mediterranean California Naturalized Annual and Perennial Grassland Group	42210	Non-Native Grassland: Broadleaf-dominated	Non-Native Forbland	8,289.27
2.B.1.Na.3.b	California Annual and Perennial Grassland Macrogroup	42000	Valleys and Foothill Grassland	Non-Native Grassland	6,967.71
2.B.2	**Formation:** Temperate Grassland, Meadow, and Shrubland				
2.B.2.Na	**Division:** Vancouverian and Rocky Mountain Grassland and Shrubland				
2.B.2.Na.4	**MacroGroup:** Vancouverian Lowland Grassland and Shrubland				
2.B.2.Na.4.a	**Group:** Vancouverian Coastal Deciduous Scrub				
2.B.2.Na.4.a	*Toxicodendron diversilobum* Shrubland Alliance	N/A	[Not Treated]	Coastal Scrub	28.42
2.B.2.Na.4.a	*Toxicodendron diversilobum* Shrubland Alliance	N/A	[Not Treated]	Riparian Scrub	43.14
2.B.4	**Formation:** Temperate and Boreal Scrub and Herb Coastal Vegetation				
2.B.4.Nb	**Division:** Pacific Coast Scrub and Herb Littoral Vegetation				
2.B.4.Nb.2	**MacroGroup:** Vancouverian Coastal Dune and Bluff				
2.B.4.Nb.2.a	**Group:** Vancouverian/Pacific Dune Mat				
2.B.4.Nb.2.a	*Abronia maritima - Ambrosia chamissonis* Herbaceous Alliance (=MCV *A. latifolia – A. chamissonis*)	21230	Southern Foredunes	Coastal Dunes/ Strand	143.26
2.B.4.Nb.3	**MacroGroup:** Pacific Coastal Cliff & Bluff Macrogroup				
2.B.4.Nb.3.a	**Group:** California Coastal Evergreen Bluff and Dune Scrub				
2.B.4.Nb.3.a	*Baccharis pilularis* Shrubland Alliance	32530	Diegan Coastal Sage Scrub: Baccharis-dominated	Coastal Scrub	957.97
2.B.4.Nb.3.a	*Baccharis pilularis* Shrubland Alliance	32530	Diegan Coastal Sage Scrub: Baccharis-dominated	Riparian Scrub	402.44
2.B.4.Nb.3.a	*Eriogonum giganteum* Shrubland Unique Stand	32000	Coastal Scrub	Coastal Scrub	0.58
2.B.4.Nb.3.a	*Eriogonum parvifolium* Shrubland Special Stand	31200	Southern Coastal Bluff Scrub	Coastal Bluff Scrub	8.32
2.B.4.Nb.3.a	*Venegasia carpesioides* Shrubland Alliance	32000	Coastal Scrub	Coastal Scrub	11.39

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2.B.4.Nb.90	**MacroGroup:** North Pacific Coastal Ruderal Grassland & Shrubland				
2.B.4.Nb.90.a	**Group:** California-Vancouverian Semi-Natural Littoral Scrub and Herb Vegetation				
2.B.4.Nb.90.a	*Carpobrotus edulis* or Other Ice Plants Herbaceous Semi-Natural Alliance	11300	Disturbed Habitat	Disturbed Habitat	16.27
2.C	**Subclass:** Temperate and Boreal Shrubland and Grassland				
2.C.4	**Formation:** Temperate and Boreal Freshwater Marsh				
2.C.4.Nb	**Division:** Western North American Freshwater Marsh				
2.C.4.Nb.1	**MacroGroup:** Western North American Freshwater Marsh				
2.C.4.Nb.1.a	**Group:** Arid West Freshwater Emergent Marsh				
2.C.4.Nb.1.a	Arid West Freshwater Emergent Marsh Group	52410	Coastal and Valley Freshwater Marsh	Freshwater Marsh	41.58
2.C.4.Nb.1.a	*Schoenoplectus acutus* Herbaceous Alliance	52410	Coastal and Valley Freshwater Marsh	Freshwater Marsh	12.69
2.C.4.Nb.1.a	*Schoenoplectus californicus* Herbaceous Alliance	52410	Coastal and Valley Freshwater Marsh	Freshwater Marsh	36.02
2.C.4.Nb.1.a	*Typha (angustifolia, domingensis, latifolia)* Herbaceous Alliance	52410	Coastal and Valley Freshwater Marsh	Freshwater Marsh	40.89
2.C.4.Nb.2	**MacroGroup:** Western North America Wet Meadow and Low Shrub Carr				
2.C.4.Nb.2.b	**Group:** Californian Warm Temperate Marsh/Seep				
2.C.4.Nb.2.b	*Juncus arcticus* (var. *balticus, mexicanus*) Herbaceous Alliance	52410	Coastal and Valley Freshwater Marsh	Freshwater Marsh	0.71
2.C.4.Nb.3	**MacroGroup:** Western North America Vernal Pool				
2.C.4.Nb.3.a	**Group:** Californian Mixed Annual/Perennial Freshwater Vernal Pool/Swale Bottomland				
2.C.4.Nb.3.a	*Cressa truxillensis - Distichlis spicata* Herbaceous Alliance	52120	Southern Coastal Salt Marsh	Coastal Salt Marsh	4.38
2.C.4.Nb.3.a	*Cressa truxillensis - Distichlis spicata* Herbaceous Alliance	52310	Cismontane Alkali Marsh	Alkali Marsh	1.61
2.C.4.Nb.3.a	*Deinandra fasciculata* Herbaceous Alliance	42100	Native Grassland	Native Forbland	108.39
2.C.4.Nb.90	**MacroGroup:** Naturalized Warm-Temperate Riparian and Wetland				
2.C.4.Nb.90.a	**Group:** Naturalized Warm-Temperate Riparian and Wetland				
2.C.4.Nb.90.a	*Arundo donax* Herbaceous Semi-Natural Alliance	65100	Arundo-Dominated Riparian	Arundo Scrub	16.80
2.C.4.Nb.90.a	*Phragmites australis* Herbaceous Alliance	52410	Coastal and Valley Freshwater Marsh	Freshwater Marsh	9.49
2.C.4.Nb.90.a	Naturalized Warm-Temperate Riparian and Wetland Group	11200	Disturbed Wetland	Freshwater Marsh	158.60

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2.C.5	**Formation:** Temperate and Boreal Salt Marsh				
2.C.5.Nc	**Division:** Temperate & Boreal Pacific Coastal Salt Marsh				
2.C.5.Nc.1	**MacroGroup:** North American Pacific Coastal Salt Marsh				
2.C.5.Nc.1.a	**Group:** Temperate Pacific Tidal Salt and Brackish Meadow				
2.C.5.Nc.1.a	*Distichlis spicata* Herbaceous Alliance	42130	Saltgrass Grassland	Native Grassland	41.82
2.C.5.Nc.1.a	*Distichlis spicata* Herbaceous Alliance	42130	Saltgrass Grassland	Coastal Salt Marsh	11.75
2.C.5.Nc.1.a	*Juncus acutus* Provisional Herbaceous Alliance	52120	Southern Coastal Salt Marsh	Coastal Salt Marsh	1.22
2.C.5.Nc.1.a	*Salicornia pacifica (Salicornia depressa)* Herbaceous Alliance	52120	Southern Coastal Salt Marsh	Coastal Salt Marsh	109.27
2.C.5.Nc.1.a	*Salicornia pacifica (Salicornia depressa)* Herbaceous Alliance	52310	Cismontane Alkali Marsh	Alkali Marsh	45.09
2.C.5.Nc.1.a	Temperate Pacific Tidal Salt and Brackish Meadow Group	52120	Southern Coastal Salt Marsh	Coastal Salt Marsh	13.80
2.C.5.Nc.1.a	Temperate Pacific Tidal Salt and Brackish Meadow Group	52310	Cismontane Alkali Marsh	Alkali Marsh	230.07
2.C.5.Nc	**Division:** Western North American Interior Alkali-Saline Wetland				
2.C.5.Nc.1	**MacroGroup:** Warm Semi-Desert/Mediterranean Alkali-Saline Wetland				
2.C.5.Nc.1.a	**Group:** Southwestern North American Alkali Marsh/Seep Vegetation				
2.C.5.Nc.1.a	*Anemopsis californica* Herbaceous Alliance	52120	Southern Coastal Salt Marsh	Coastal Salt Marsh	1.56
2.C.5.Nc.1.a	*Schoenoplectus americanus* Herbaceous Alliance	52120	Southern Coastal Salt Marsh	Coastal Salt Marsh	13.23
2.C.5.Nc.1.a	*Schoenoplectus americanus* Herbaceous Alliance	52310	Cismontane Alkali Marsh	Alkali Marsh	0.49
2.C.5.Nc.1.a	**Group:** Southwestern North American Alkali Marsh/Seep Vegetation				
2.C.5.Nc.1.a	*Arthrocnemum subterminale* Herbaceous Alliance	52120	Southern Coastal Salt Marsh	Coastal Salt Marsh	11.88
2.C.5.Nc.1.a	*Frankenia salina* Herbaceous Alliance	52120	Southern Coastal Salt Marsh	Coastal Salt Marsh	11.87
2.C.5.Nc.1.a	*Frankenia salina* Herbaceous Alliance	52310	Cismontane Alkali Marsh	Alkali Marsh	2.11
2.C.5.Nd.1.b	*Atriplex lentiformis* Shrubland Alliance	31200	Southern Coastal Bluff Scrub	Coastal Scrub	2.10
2.C.5.Nd.1.b	*Atriplex lentiformis* Shrubland Alliance	52120	Southern Coastal Salt Marsh	Coastal Scrub	2.10
2.C.5.Nd.1.b	*Atriplex lentiformis* Shrubland Alliance	31200	Southern Coastal Bluff Scrub	Coastal Bluff Scrub	17.36
2.C.5.Nd.1	**MacroGroup:** Warm Semi-Desert/Mediterranean Alkali-Saline Wetland				
2.C.5.Nd.1.a	**Group:** Southwestern North American Alkali Marsh/Seep Vegetation				
2.C.5.Nd.1.a	*Elymus triticoides* Herbaceous Alliance (=MCV *Leymus triticoides)*	42100	Native Grassland	Alkali Marsh	1.01

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3	**Class:** Xeromorphic Scrub and Herb Vegetation (Semi-Desert)				
3.A	**Subclass:** Warm Semi-Desert Scrub and Grassland				
3.A.2	**Formation:** Warm Semi-Desert Scrub and Grassland				
3.A.2.Na	**Division:** Sonoran and Chihuahuan Semi-Desert Scrub and Grassland				
3.A.2.Na.4	**MacroGroup:** Viscaino-Baja California Desert Scrub				
3.A.2.Na.4.a	**Group:** Coastal Baja California Norte Maritime Succulent Scrub				
3.A.2.Na.4.a	*Aldama purisimae* Shrubland Special Stand	32000	Coastal Scrub	Coastal Scrub	2.16
3.A.2.Na.4.a	*Lycium californicum* Shrubland Alliance	32400	Maritime Succulent Scrub	Coastal Bluff Scrub	103.75
3.A.2.Na.4.a	*Opuntia littoralis* Shrubland Alliance	32400	Maritime Succulent Scrub	Succulent Scrub	12.16
3.A.2.Na.7	**MacroGroup:** Madrean Warm Semi-Desert Wash Woodland/Scrub				
3.A.2.Na.7.a	**Group:** Mojavean Semi-Desert Wash Scrub				
3.A.2.Na.7.a	*Lepidospartum squamatum* Shrubland Alliance	32720	Alluvial Fan Scrub	Riparian Scrub	667.10
3.A.2.Na.7.a	**Group:** Sonoran-Coloradan Semi-Desert Wash Woodland/Scrub				
3.A.2.Na.7.a	*Pluchea sericea* Shrubland Alliance	63820	Arrowweed Scrub	Riparian Scrub	8.25
3.B	**Subclass:** Cool Semi-Desert Scrub and Grassland				
3.B.1	**Formation:** Cool Semi-Desert Scrub and Grassland				
3.B.1.Ne	**Division:** Western North American Cool Semi-Desert Scrub and Grassland				
3.B.1.Ne.1	**MacroGroup:** Inter-Mountain Dry Shrubland and Grassland				
3.B.1.Ne.1.a	**Group:** Intermontane Deep or Well-Drained Soil Scrub				
3.B.1.Ne.1.a	*Lycium andersonii* Shrubland Alliance	36110	Desert Saltbush Scrub	Succulent Scrub	0.15
6	**Class:** Lithomorphic Vegetation (Nonvascular and Sparse Vascular Rock Vegetation)				
6.B	**Subclass:** Mediterranean, Temperate, and Boreal Nonvascular and Sparse Vegetation				
6.B.1	**Formation:** Mediterranean Cliff, Scree, and Rock Vegetation				
6.B.1.Nb	**Division:** Mediterranean California Cliff, Scree & Rock Vegetation				
6.B.1.Nb.1	**MacroGroup:** California Cliff, Scree, and Other Rock Vegetation				
6.B.1.Nb.1.a	**Group:** Central California Coast Ranges Cliff and Canyon Group				
6.B.1.Nb.1.a	*Dudleya blochmaniae* Herbaceous Special Stand	N/A	[Not Treated]	Clay Lens	3.28
6.B.1.Nb.1.a	Central California Coast Ranges Cliff and Canyon Group	31200	Southern Coastal Bluff Scrub	Coastal Bluff Scrub	83.42
6.B.1.Nb.1.a	Central California Coast Ranges Cliff and Canyon Group	N/A	[Not Treated]	Cliff-Face Scrub	3.32
Miscellaneous Mapping Units					
Not Applicable	Agriculture	18000	Agriculture	Agriculture	0.88
Not Applicable	Disturbed Vegetation in Urban Use	11300	Disturbed Habitat	Disturbed Habitat	2,030.69
Not Applicable	Planted Trees/Shrubs	11300	Disturbed Habitat	Planted Trees/Shrubs	72.77

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Not Applicable	Scraped/Cleared Land	11300	Disturbed Habitat	Disturbed Habitat	48.63
Not Applicable	Scraped/Cleared Land	11300	Disturbed Habitat	Firebreak	1,482.98
Not Applicable	Urban/Built Up	12000	Urban/Developed	Developed	7,799.80
Not Applicable	Mudflat	64300	Saltpan/Mudflats	Alkali Marsh	1.65
Not Applicable	Beach Sand	64400	Beach	Beach Sand	200.30
Not Applicable	Littoral	64110	Marine Ocean	Littoral	1,074.00
Not Applicable	Non-vegetated/Sparsely Vegetated Stream Channel	64200	Non-Vegetated Floodplain or Channel	Open Water/Open Gravel	124.85
Not Applicable	Salt Flats	64300	Saltpan/Mudflats	Mudflat	95.11
Not Applicable	Water Body	64100	Open Water	Open Water/Open Gravel	296.00

USNVC:	United States National Vegetation Classification
1	**USNVC Classification Code:** The United States National Vegetation Classification (USNVC) codes are from USNVC website: http://usnvc.org/explore-classification. However, USNVC codes and USNVC hierarchy names (Class, Subclass, Formation, Division, MacroGroup, Group) were changed to agree with the Manual of California Vegetation (MCV) hierarchy that is provided on the California Native Plant Society (CNPS) website at http://vegetation.cnps.org/. The CNPS website does not provide USNVC codes.
2	**USNVC Hierarchy Names:** USNVC hierarchy names (Class, Subclass, Formation, Division, MacroGroup, Group) were changed to agree with the MCV classification that is provided on the CNPS website (http://vegetation.cnps.org/). **USNVC Mapping Unit:** Scientific names were updated to the current nomenclature provided in the San Diego Natural History Museum Checklist of vascular plants known to occur on Base. If a species does not occur on the Base, such as *Abronia latifolia*, then the name was changed to the species that does occur on Base to avoid confusion (e.g., *Abronia maritima - Ambrosia chamissonis* Herbaceous Alliance). If the MCV name is different, it is provided after the map unit name in parenthesis. Some USNVC mapping units are listed multiple times in this table depending on the situation. For example, if *Distichlis spicata* Herbaceous Alliance was located within an estuary, then it would have a colloquial mapping unit name of Coastal Salt Marsh. If *Distichlis spicata* Herbaceous Alliance was located within an upland area, then it would have a colloquial mapping unit name of Native Grassland.
3	**Holland Classification Codes and Mapping Unit Names:** The Holland classification codes and names correspond to Oberbauer et al. 2008, which is based on the "Preliminary Descriptions of the Terrestrial Natural Communities of California" that was prepared by Robert F. Holland, Ph.D. in 1986.
4	**Colloquial Mapping Unit:** Some USNVC mapping units are listed multiple times in this table depending on the situation. For example, if *Distichlis spicata* Herbaceous Alliance was located within an estuary, then it would have a colloquial mapping unit name of Coastal Salt Marsh. If *Distichlis spicata* Herbaceous Alliance was located within an upland area, then it would have a colloquial mapping unit name of Native Grassland.
5	***Baccharis salicifolia* Shrubland Alliance, *Sambucus nigra* Shrubland Alliance, *Salix exigua* Shrubland Alliance, *Salix lasiolepis* Shrubland Alliance, and Southwestern North American Riparian/Wash Scrub Group:** Although these are shrublands, the MCV places them in the tree hierarchy. The USNVC code would be 2.C.4.Nc.1.b for these mapping units.

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Appendix E

Plant Species on MCB Camp Pendleton

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FAMILY	Scientific Name	Common Name	Native or Exotic	Life History	Growth Form
MONOCOTS					
AGAVACEAE	*Agave americana*	AMERICAN AGAVE	E	P	S
AGAVACEAE	*Agave attenuata*	FOX-TAIL AGAVE	E	P	S
AGAVACEAE	*Chlorogalum parviflorum*	SMALL-FLOWER SOAP-PLANT; AMOLE	N	P	F
AGAVACEAE	*Chlorogalum pomeridianum var. pomeridianum*	WAVY-LEAF SOAP-PLANT	N	P	F
AGAVACEAE	*Hesperoyucca whipplei*	CHAPARRAL CANDLE	N	P	S
AGAVACEAE	*Yucca schidigera*	MOHAVE YUCCA	N	P	S
ALISMATACEAE	*Alisma triviale*	WATER-PLANTAIN	N	P	F
ALLIACEAE	*Allium haematochiton*	RED-SKIN ONION	N	P	F
ALLIACEAE	*Allium peninsulare var. peninsulare*	RED-FLOWER ONION	N	P	F
ALLIACEAE	*Allium praecox*	EARLY ONION	N	P	F
AMARYLLIDACEAE	*Leucojum aestivum*	SUMMER SNOWFLAKE	E	P	F
ARACEAE	*Lemna cf. gibba*	SWOLLEN DUCKWEED	N	P	F
ARACEAE	*Lemna cf. turionifera*	TURION DUCKWEED	N	P	F
ARACEAE	*Lemna minor*	COMMON DUCKWEED	N	P	F
ARACEAE	*Lemna minuta*	LEAST DUCKWEED	N	P	F
ARACEAE	*Lemna sp.*	DUCKWEED	N	P	F
ARACEAE	*Zantedeschia aethiopica*	CALLA-LILY	E	P	F
ARECACEAE	*Phoenix canariensis*	CANARY ISLAND DATE PALM	E	P	T
ARECACEAE	*Washingtonia robusta*	MEXICAN FAN PALM	E	P	T
ASPARAGACEAE	*Asparagus asparagoides*	FLORIST'S-SMILAX	E	P	VF
ASPARAGACEAE	*Asparagus officinalis ssp. officinalis*	GARDEN ASPARAGUS	E	P	F
ASPHODELACEAE	*Asphodelus fistulosus*	HOLLOW-STEM ASPHODEL	E	P	F
COMMELINACEAE	*Commelina benghalensis*	DAYFLOWER	E	A	F

Abbreviations: native (n), exotic (E), annual (A), annual/perennial (AP), biennial (B), perennial (P), forb (F), grass (G), half-shrub (HS), shrub (S), Tree (T), tree/shrub (TS), vine/forb (VF), vine/shrub (VS).

FAMILY	Scientific Name	Common Name	Native or Exotic	Life History	Growth Form
CYPERACEAE	*Bolboschoenus maritimus ssp. paludosus*	PRAIRIE BULRUSH	N	P	G
CYPERACEAE	*Bolboschoenus robustus*	SEACOAST BULRUSH	N	P	G
CYPERACEAE	*Carex alma*	STURDY SEDGE	N	P	G
CYPERACEAE	*Carex barbarae*	SANTA BARBARA SEDGE	N	P	G
CYPERACEAE	*Carex praegracilis*	CLUSTER FIELD SEDGE	N	P	G
CYPERACEAE	*Carex schottii*	SCHOTT'S SEDGE	N	P	G
CYPERACEAE	*Carex senta*	ROUGH SEDGE	N	P	G
CYPERACEAE	*Carex spissa*	SAN DIEGO SEDGE	N	P	G
CYPERACEAE	*Carex triquetra*	TRIANGULAR-FRUIT SEDGE	N	P	G
CYPERACEAE	*Cyperus difformis*	RICE FLATSEDGE	E	A	G
CYPERACEAE	*Cyperus eragrostis*	TALL FLATSEDGE	N	P	G
CYPERACEAE	*Cyperus erythrorhizos*	RED-ROOT FLATSEDGE	N	A	G
CYPERACEAE	*Cyperus esculentus var. heermannii*	HEERMAN'S YELLOW NUTSEDGE	N	P	G
CYPERACEAE	*Cyperus esculentus var. leptostachyus*	YELLOW NUTSEDGE	N	P	G
CYPERACEAE	*Cyperus esculentus var. macrostachyus*	LARGE SPIKE YELLOW NUTSEDGE	N	P	G
CYPERACEAE	*Cyperus flavescens*	YELLOW FLATSEDGE	E	A	G
CYPERACEAE	*Cyperus involucratus*	AFRICAN UMBRELLA PLANT	E	P	G
CYPERACEAE	*Cyperus niger*	BROWN UMBRELLA-SEDGE	N	P	G
CYPERACEAE	*Cyperus odoratus*	FRAGRANT FLATSEDGE	N	A	G
CYPERACEAE	*Cyperus strigosus*	FALSE NUTSEDGE	N	A	G
CYPERACEAE	*Eleocharis erythropoda*	BALD SPIKE-RUSH	N	P	G
CYPERACEAE	*Eleocharis macrostachya*	PALE SPIKE-RUSH	N	P	G
CYPERACEAE	*Eleocharis montevidensis*	DOMBEY'S SPIKE-RUSH	N	P	G
CYPERACEAE	*Eleocharis parishii*	PARISH'S SPIKE-RUSH	N	P	G

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FAMILY	Scientific Name	Common Name	Native or Exotic	Life History	Growth Form
CYPERACEAE	*Isolepis cernua*	LOW BULRUSH	N	A	G
CYPERACEAE	*Schoenoplectus acutus var. occidentalis*	VISCID BULRUSH	N	P	G
CYPERACEAE	*Schoenoplectus americanus*	OLNEY'S BULRUSH	N	P	G
CYPERACEAE	*Schoenoplectus californicus*	CALIFORNIA BULRUSH	N	P	G
CYPERACEAE	*Schoenoplectus pungens var. longispicatus*	COMMON THREESQUARE	N	P	G
CYPERACEAE	*Scirpus microcarpus*	SMALL-FRUIT BULRUSH	N	P	G
IRIDACEAE	*Chasmanthe floribunda*	AFRICAN CORN FLAG	E	A	F
IRIDACEAE	*Iris cf. pallida*	SWEET IRIS	E	P	F
IRIDACEAE	*Sisyrinchium bellum*	BLUE-EYED-GRASS	N	P	F
JUNCACEAE	*Juncus acutus ssp. leopoldii*	SOUTHWESTERN SPINY RUSH	N	P	G
JUNCACEAE	*Juncus ambiguus*	FASCICULATE TOAD RUSH	N	A	G
JUNCACEAE	*Juncus balticus ssp. ater*	WIRE RUSH	N	P	G
JUNCACEAE	*Juncus bufonius var. bufonius*	TOAD RUSH	N	A	G
JUNCACEAE	*Juncus bufonius var. congestus*	CLUSTERED TOAD RUSH	E	A	G
JUNCACEAE	*Juncus bufonius var. occidentalis*	WESTERN TOAD RUSH	N	A	G
JUNCACEAE	*Juncus dubius*	MARIPOSA RUSH	N	P	G
JUNCACEAE	*Juncus effusus var. austrocalifornicus*	PACIFIC RUSH	N	P	G
JUNCACEAE	*Juncus macrophyllus*	LONG-LEAF RUSH	N	P	G
JUNCACEAE	*Juncus mexicanus*	MEXICAN RUSH	N	P	G
JUNCACEAE	*Juncus oxymeris*	POINTED RUSH	N	P	G
JUNCACEAE	*Juncus patens*	SPREADING RUSH	N	P	G
JUNCACEAE	*Juncus phaeocephalus var. paniculatus*	BROWN-HEAD RUSH	N	P	G
JUNCACEAE	*Juncus rugulosus*	WRINKLED RUSH	N	P	G
JUNCACEAE	*Juncus textilis*	BASKET RUSH	N	P	G

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FAMILY	Scientific Name	Common Name	Native or Exotic	Life History	Growth Form
JUNCACEAE	*Juncus torreyi*	TORREY'S RUSH	N	P	G
JUNCACEAE	*Juncus xiphioides*	IRIS-LEAF RUSH	N	P	G
JUNCAGINACEAE	*Triglochin concinna var. concinna*	SEASIDE ARROW-GRASS	N	P	G
LILIACEAE	*Calochortus albus*	WHITE GLOBE LILY; FAIRY-LANTERN	N	P	F
LILIACEAE	*Calochortus catalinae*	CATALINA MARIPOSA LILY	N	P	F
LILIACEAE	*Calochortus splendens*	SPLENDID MARIPOSA LILY	N	P	F
LILIACEAE	*Calochortus weedii var. weedii*	WEED'S MARIPOSA LILY	N	P	F
LILIACEAE	*Fritillaria biflora var. biflora*	CHOCOLATE LILY	N	P	F
LILIACEAE	*Lilium humboldtii ssp. ocellatum*	OCELLATED LILY	N	P	F
MELANTHIACEAE	*Toxicoscordion fremontii*	FREMONT'S CAMUS	N	P	F
ORCHIDACEAE	*Epipactis gigantea*	STREAM ORCHID	N	P	F
ORCHIDACEAE	*Piperia cooperi*	COOPER'S REIN ORCHID	N	P	F
ORCHIDACEAE	*Piperia elongata*	DENSE-FLOWER REIN ORCHID	N	P	F
POACEAE	*Agrostis avenacea*	PACIFIC BENT GRASS	E	A	G
POACEAE	*Agrostis exarata*	SPIKE REDTOP	N	P	G
POACEAE	*Agrostis pallens*	SEASHORE BENT GRASS	N	P	G
POACEAE	*Aira caryophyllea*	SILVER EUROPEAN HAIR GRASS	E	A	G
POACEAE	*Aristida adscensionis*	SIX-WEEKS THREE-AWN	N	A	G
POACEAE	*Aristida purpurea var. nealleyi*	NEALLEY'S THREE-AWN	N	P	G
POACEAE	*Aristida purpurea var. parishii*	PARISH THREE-AWN	N	P	G
POACEAE	*Aristida purpurea var. purpurea*	PURPLE THREE-AWN	N	P	G
POACEAE	*Aristida ternipes var. gentilis*	HOOK THREE-AWN	N	P	G
POACEAE	*Arundo donax*	GIANT REED	E	P	G
POACEAE	*Avena barbata*	SLENDER WILD OAT	E	A	G
POACEAE	*Avena fatua*	WILD OAT	E	A	G
POACEAE	*Avena occidentalis*	WESTERN OAT	E	A	G

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FAMILY	Scientific Name	Common Name	Native or Exotic	Life History	Growth Form
POACEAE	*Avena sterilis*	ANIMATED OAT	E	A	G
POACEAE	*Bothriochloa barbinodis*	CANE BLUESTEM	N	P	G
POACEAE	*Bothriochloa ischaemum*	YELLOW BLUESTEM	E	P	G
POACEAE	*Bothriochloa laguroides ssp. torreyana*	SILVER BLUSTEM	E	P	G
POACEAE	*Brachypodium distachyon*	PURPLE FALSE BROME	E	A	G
POACEAE	*Briza minor*	QUAKING GRASS	E	A	G
POACEAE	*Bromus arizonicus*	ARIZONA CHESS	N	A	G
POACEAE	*Bromus carinatus var. carinatus*	CALIFORNIA BROME	N	P	G
POACEAE	*Bromus catharticus var. catharticus*	RESCUE GRASS	E	P	G
POACEAE	*Bromus cf. sitchensis*	SITKA BROME, ALASKA BROME	N	P	G
POACEAE	*Bromus diandrus*	RIPGUT GRASS	E	A	G
POACEAE	*Bromus grandis*	TALL BROME	N	P	G
POACEAE	*Bromus hordeaceus*	SOFT CHESS	E	A	G
POACEAE	*Bromus laevipes*	CHINOOK BROME	N	P	G
POACEAE	*Bromus madritensis ssp. madritensis*	COMPACT BROME	E	A	G
POACEAE	*Bromus madritensis ssp. rubens*	RED BROME	E	A	G
POACEAE	*Bromus pseudolaevipes*	COAST RANGE BROME	N	P	G
POACEAE	*Bromus sterilis*	POVERTY BROME	E	A	G
POACEAE	*Bromus tectorum*	CHEAT GRASS; DOWNY BROME	E	A	G
POACEAE	*Cenchrus clandestinus*	KIKUYU GRASS	E	P	G
POACEAE	*Cenchrus setaceus*	AFRICAN FOUNTAIN GRASS	E	P	G
POACEAE	*Cenchrus spinifex*	COAST SANDBUR	E	A	G
POACEAE	*Chloris gayana*	RHODES GRASS	E	A	G
POACEAE	*Cortaderia jubata*	PURPLE PAMPAS GRASS	E	P	G
POACEAE	*Cortaderia selloana*	SELLOA PAMPAS GRASS	E	P	G
POACEAE	*Crypsis schoenoides*	PRICKLE GRASS	E	A	G

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FAMILY	Scientific Name	Common Name	Native or Exotic	Life History	Growth Form
POACEAE	*Crypsis vaginiflora*	SWAMP GRASS	E	A	G
POACEAE	*Cynodon dactylon*	BERMUDA GRASS	E	P	G
POACEAE	*Deschampsia danthonioides*	ANNUAL HAIR GRASS	N	A	G
POACEAE	*Desmazeria rigida*	RIGID FERN GRASS	E	A	G
POACEAE	*Digitaria ciliaris var. ciliaris*	SOUTHERN CRAB GRASS	E	A	G
POACEAE	*Digitaria sanguinalis*	LARGE CRAB GRASS	E	A	G
POACEAE	*Diplachne fusca var. uninervia*	MEXICAN SPRANGLETOP	N	A	G
POACEAE	*Distichlis littoralis*	SHORE GRASS	N	P	G
POACEAE	*Distichlis spicata*	SALT GRASS	N	P	G
POACEAE	*Echinochloa colona*	JUNGLE-RICE	E	A	G
POACEAE	*Echinochloa crus-galli*	COMMON BARNYARD GRASS	E	A	G
POACEAE	*Ehrharta calycina*	PERENNIAL VELDT GRASS	E	P	G
POACEAE	*Ehrharta erecta*	PANIC VELDT GRASS	E	P	G
POACEAE	*Ehrharta longiflora*	LONG-FLOWER VELDT GRASS	E	P	G
POACEAE	*Eleusine coracana ssp. africana*	GOOSE GRASS	E	AP	G
POACEAE	*Eleusine indica*	INDIAN GOOSEGRASS	E	A	G
POACEAE	*Elymus ×gouldii*	MANY-FLOWER WILD-RYE	N	P	G
POACEAE	*Elymus condensatus*	GIANT WILD-RYE	N	P	G
POACEAE	*Elymus glaucus ssp. glaucus*	BLUE WILDRYE	N	P	G
POACEAE	*Elymus multisetus*	BIG SQUIRRELTAIL	N	P	G
POACEAE	*Elymus triticoides*	BEARDLESS WILD-RYE	N	P	G
POACEAE	*Eragrostis barrelieri*	MEDITERRANEAN LOVE GRASS	E	A	G
POACEAE	*Eragrostis cilianensis*	STINK GRASS	E	A	G
POACEAE	*Eragrostis lehmanniana*	LEHMANN'S LOVE GRASS	E	P	G
POACEAE	*Eragrostis mexicana ssp. virescens*	CHILEAN LOVE GRASS	N	A	G
POACEAE	*Eragrostis minor*	LITTLE LOVE GRASS	E	A	G

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FAMILY	Scientific Name	Common Name	Native or Exotic	Life History	Growth Form
POACEAE	*Eragrostis pectinacea var. pectinacea*	SPREADING LOVE GRASS	N	A	G
POACEAE	*Festuca arundinacea*	TALL FESCUE	E	P	G
POACEAE	*Festuca bromoides*	BROME FESCUE	E	A	G
POACEAE	*Festuca microstachys*	GRAY'S FESCUE	N	A	G
POACEAE	*Festuca myuros*	RAT-TAIL FESCUE	E	A	G
POACEAE	*Festuca octoflora*	TUFTED FESCUE	N	A	G
POACEAE	*Festuca perennis*	PERENNIAL RYE GRASS	E	P	G
POACEAE	*Festuca temulenta*	DARNEL	E	A	G
POACEAE	*Gastridium phleoides*	NIT GRASS	E	A	G
POACEAE	*Hainardia cylindrica*	BARB GRASS	E	A	G
POACEAE	*Hordeum brachyantherum ssp. californicum*	CALIFORNIA BARLEY	N	P	G
POACEAE	*Hordeum depressum*	LOW BARLEY	N	A	G
POACEAE	*Hordeum intercedens*	VERNAL BARLEY	N	A	G
POACEAE	*Hordeum marinum ssp. gussoneanum*	MEDITERRANEAN BARLEY	E	A	G
POACEAE	*Hordeum murinum ssp. glaucum*	GLAUCOUS BARLEY	E	A	G
POACEAE	*Hordeum murinum ssp. leporinum*	HARE BARLEY	E	A	G
POACEAE	*Hordeum vulgare var. trifurcatum*	CULTIVATED BARLEY	E	A	G
POACEAE	*Koeleria gerardii*	BRISTLY KOELER'S GRASS	E	A	G
POACEAE	*Koeleria macrantha*	JUNEGRASS	N	P	G
POACEAE	*Lamarckia aurea*	GOLDEN-TOP	E	A	G
POACEAE	*Melica frutescens*	TALL MELIC	N	P	G
POACEAE	*Melica imperfecta*	COAST RANGE MELIC	N	P	G
POACEAE	*Melinis repens ssp. repens*	NATAL GRASS	E	P	G
POACEAE	*Muhlenbergia microsperma*	LITTLE-SEED MUHLY	N	A	G
POACEAE	*Muhlenbergia rigens*	DEERGRASS	N	P	G

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FAMILY	Scientific Name	Common Name	Native or Exotic	Life History	Growth Form
POACEAE	*Orcuttia californica*	CALIFORNIA ORCUTT GRASS	N	A	G
POACEAE	*Panicum acuminatum var. fasciculatum*	WESTERN PANIC GRASS	N	P	G
POACEAE	*Panicum capillare*	WITCHGRASS	N	A	G
POACEAE	*Panicum miliaceum ssp. miliaceum*	BROOMCORN MILLET	E	A	G
POACEAE	*Parapholis incurva*	SICKLEGRASS	E	A	G
POACEAE	*Paspalum dilatatum*	DALLIS GRASS	E	P	G
POACEAE	*Paspalum distichum*	COMMON KNOTGRASS	N	P	G
POACEAE	*Paspalum vaginatum*	SEASHORE PASPALUM	E	P	G
POACEAE	*Pentameris airoides ssp. airoides*	FALSE HAIR GRASS	E	P	G
POACEAE	*Phalaris lemmonii*	LEMMON'S CANARY GRASS	N	A	G
POACEAE	*Phalaris minor*	LITTLE-SEED CANARY GRASS	E	A	G
POACEAE	*Phalaris paradoxa*	PARADOX CANARY GRASS	E	A	G
POACEAE	*Phragmites australis ssp. americanus*	AMERICAN COMMON REED	N	P	G
POACEAE	*Phragmites australis ssp. australis*	EUROPEAN COMMON REED	E	P	G
POACEAE	*Poa annua*	ANNUAL BLUE GRASS	E	A	G
POACEAE	*Poa infirma*	WEAK BLUE GRASS	E	A	G
POACEAE	*Poa secunda ssp. secunda*	ONE-SIDED BLUE GRASS	N	P	G
POACEAE	*Polypogon interruptus*	DITCH BEARD GRASS	E	P	G
POACEAE	*Polypogon maritimus*	MEDITERRANEAN BEARD GRASS	E	A	G
POACEAE	*Polypogon monspeliensis*	ANNUAL BEARD GRASS	E	A	G
POACEAE	*Polypogon viridis*	WATER BEARD GRASS	E	P	G
POACEAE	*Schismus arabicus*	ARABIAN SCHISMUS	E	A	G
POACEAE	*Schismus barbatus*	MEDITERRANEAN SCHISMUS	E	A	G
POACEAE	*Setaria parviflora*	KNOTROOT BRISTLE GRASS	N	P	G
POACEAE	*Setaria verticilliformis*	BARBED BRISTLE GRASS	E	P	G
POACEAE	*Sorghum halepense*	JOHNSON GRASS	E	P	G

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POACEAE	*Sporobolus indicus*	SMUTGRASS	E	P	G
POACEAE	*Stenotaphrum secundatum*	SAINT AUGUSTINE GRASS	E	P	G
POACEAE	*Stipa cernua*	NODDING NEEDLE GRASS	N	P	G
POACEAE	*Stipa coronata*	GIANT STIPA	N	P	G
POACEAE	*Stipa lepida*	FOOTHILL NEEDLE GRASS	N	P	G
POACEAE	*Stipa miliacea var. miliacea*	SMILO GRASS	E	P	G
POACEAE	*Stipa pulchra*	PURPLE NEEDLE GRASS	N	P	G
POACEAE	*Triticum aestivum*	CEREAL WHEAT	E	A	G
POACEAE	*Zea mays*	MAIZE	E	A	G
POTAMOGETONACEAE	*Stuckenia pectinata*	FENNEL-LEAF PONDWEED	N	P	F
RUPPIACEAE	*Ruppia cirrhosa*	SPIRAL DITCH-GRASS	N	A	F
RUPPIACEAE	*Ruppia maritima*	BEADFRUIT SEA-TASSEL	N	A	F
RUSCACEAE	*Nolina cismontana*	CHAPARRAL BEAR-GRASS	N	P	S
THEMIDACEAE	*Bloomeria crocea var. crocea*	COMMON GOLDENSTAR	N	P	F
THEMIDACEAE	*Brodiaea filifolia*	THREAD-LEAF BRODIAEA	N	P	F
THEMIDACEAE	*Brodiaea orcuttii*	ORCUTT'S BRODIAEA	N	P	F
THEMIDACEAE	*Brodiaea terrestris ssp. kernensis*	DWARF BRODIAEA	N	P	F
THEMIDACEAE	*Dichelostemma capitatum ssp. capitatum*	BLUE DICKS, SCHOOL BELLS	N	P	F
THEMIDACEAE	*Muilla maritima*	COMMON MUILLA	N	P	F
TYPHACEAE	*Sparganium eurycarpum var. eurycarpum*	BROAD-FRUIT BUR-WEED	N	P	G
TYPHACEAE	*Typha domingensis*	SOUTHERN CATTAIL	N	P	G
TYPHACEAE	*Typha latifolia*	BROAD-LEAF CATTAIL	N	P	G
CONIFERS, FERNS, AND BRYOPHYTES					

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Plant Species on MCB Camp Pendleton

FAMILY	Scientific Name	Common Name	Native or Exotic	Life History	Growth Form
PINACEAE	*Pinus halepensis*	ALEPPO PINE	E	P	T
ASPLENIACEAE	*Asplenium vespertinum*	WESTERN SPLEENWORT	N	P	F
AZOLLACEAE	*Azolla filiculoides*	PACIFIC MOSQUITO FERN	N	P	F
BLECHNACEAE	*Woodwardia fimbriata*	GIANT CHAIN FERN	N	P	F
DENNSTAEDTIACEAE	*Pteridium aquilinum var. pubescens*	WESTERN BRACKEN	N	P	F
DRYOPTERIDACEAE	*Dryopteris arguta*	COASTAL WOOD FERN	N	P	F
EQUISETACEAE	*Equisetum ×ferrissii*	FERRIS'S SCOURING-RUSH	N	P	F
EQUISETACEAE	*Equisetum arvense*	COMMON HORSETAIL	N	P	F
EQUISETACEAE	*Equisetum hyemale ssp. affine*	COMMON SCOURING-RUSH	N	P	F
EQUISETACEAE	*Equisetum laevigatum*	SMOOTH SCOURING-RUSH	N	P	F
EQUISETACEAE	*Equisetum telmateia ssp. braunii*	GIANT HORSETAIL	N	P	F
ISOETACEAE	*Isoetes orcuttii*	ORCUTT'S QUILLWORT	N	P	F
LOMARIOPSIDACEAE	*Nephrolepis cordifolia*	NARROW SWORD FERN	E	P	F
MARSILEACEAE	*Marsilea vestita ssp. vestita*	HAIRY CLOVER FERN	N	P	F
MARSILEACEAE	*Pilularia americana*	AMERICAN PILLWORT	N	P	F
OPHIOGLOSSACEAE	*Ophioglossum californicum*	CALIFORNIA ADDER'S TONGUE	N	p	F
POLYPODIACEAE	*Polypodium californicum*	CALIFORNIA POLYPODY	N	P	F
PTERIDACEAE	*Adiantum capillus-veneris*	SOUTHERN MAIDENHAIR	N	P	F
PTERIDACEAE	*Adiantum jordanii*	CALIFORNIA MAIDENHAIR	N	P	F
PTERIDACEAE	*Aspidotis californica*	CALIFORNIA LACE FERN	N	P	F
PTERIDACEAE	*Myriopteris clevelandii*	CLEVELAND'S LIP FERN	N	P	F
PTERIDACEAE	*Myriopteris newberryi*	CALIFORNIA COTTON FERN	N	P	F
PTERIDACEAE	*Pellaea andromedifolia var. andromedifolia*	COFFEE FERN	N	P	F
PTERIDACEAE	*Pellaea andromedifolia var. pubescens*	HAIRY COFFEE FERN	N	P	F
PTERIDACEAE	*Pellaea mucronata var. mucronata*	BIRD'S FOOT CLIFF-BRAKE	N	P	F

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FAMILY	Scientific Name	Common Name	Native or Exotic	Life History	Growth Form
PTERIDACEAE	*Pentagramma glanduloviscida*	SAN DIEGO SILVERBACK FERN	N	P	F
PTERIDACEAE	*Pentagramma triangularis*	CALIFORNIA GOLDBACK FERN	N	P	F
PTERIDACEAE	*Pentagramma viscosa*	STICKY SILVERBACK FERN	N	P	F
SELAGINELLACEAE	*Selaginella bigelovii*	BIGELOW'S SPIKE-MOSS	N	P	F
SELAGINELLACEAE	*Selaginella cinerascens*	MESA SPIKE-MOSS	N	P	F
EUDICOTS					
ADOXACEAE	*Sambucus nigra ssp. caerulea*	BLUE ELDERBERRY	N	P	S
AIZOACEAE	*Aptenia cordifolia*	BABY SUN ROSE; SHRUBBY DEWPLANT	E	P	HS
AIZOACEAE	*Carpobrotus chilensis*	SEA-FIG	E	P	HS
AIZOACEAE	*Carpobrotus edulis*	HOTTENTOT-FIG	E	P	HS
AIZOACEAE	*Malephora crocea var. crocea*	CROCEA ICEPLANT	E	P	HS
AIZOACEAE	*Malephora luteola*	ROCKY POINT ICEPLANT	E	P	HS
AIZOACEAE	*Mesembryanthemum crystallinum*	CRYSTALLINE ICEPLANT	E	A	F
AIZOACEAE	*Mesembryanthemum nodiflorum*	SLENDER-LEAF ICEPLANT	E	A	F
AIZOACEAE	*Sesuvium verrucosum*	WESTERN SEA-PURSLANE	N	P	F
AIZOACEAE	*Tetragonia tetragonioides*	NEW ZEALAND-SPINACH	E	A	F
AMARANTHACEAE	*Alternanthera caracasana*	MEXICAN ALTERNANTHERA	E	P	F
AMARANTHACEAE	*Amaranthus albus*	WHITE TUMBLEWEED	E	A	F
AMARANTHACEAE	*Amaranthus blitoides*	PROSTRATE AMARANTH	N	A	F
AMARANTHACEAE	*Amaranthus blitum ssp. emarginatus*	PURPLE AMARANTH	E	A	F
AMARANTHACEAE	*Amaranthus cruentus*	PURPLE AMARANTH	E	A	F
AMARANTHACEAE	*Amaranthus hybridus*	SLENDER PIGWEED	E	A	F
AMARANTHACEAE	*Amaranthus retroflexus*	ROUGH PIGWEED	E	A	F
ANACARDIACEAE	*Malosma laurina*	LAUREL SUMAC	N	P	S

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FAMILY	Scientific Name	Common Name	Native or Exotic	Life History	Growth Form
ANACARDIACEAE	*Rhus aromatica var. aromatica*	SKUNKBRUSH	N	P	S
ANACARDIACEAE	*Rhus integrifolia*	LEMONADEBERRY	N	P	S
ANACARDIACEAE	*Rhus integrifolia × R. ovata*	HYBRID SUGARBERRY	N	P	S
ANACARDIACEAE	*Rhus ovata*	SUGAR BUSH	N	P	S
ANACARDIACEAE	*Schinus molle*	PERUVIAN PEPPER TREE	E	P	T
ANACARDIACEAE	*Schinus terebinthifolius*	BRAZILIAN PEPPER TREE	E	P	T
ANACARDIACEAE	*Toxicodendron diversilobum*	WESTERN POISON-OAK	N	P	S
APIACEAE	*Anthriscus caucalis*	BUR CHERVIL	E	A	F
APIACEAE	*Apiastrum angustifolium*	MOCK-PARSLEY	N	A	F
APIACEAE	*Apium graveolens*	COMMON CELERY	E	A	F
APIACEAE	*Berula erecta*	CUT-LEAF WATER-PARSNIP	N	P	F
APIACEAE	*Bowlesia incana*	AMERICAN BOWLESIA	N	A	F
APIACEAE	*Conium maculatum*	COMMON POISON HEMLOCK	E	P	F
APIACEAE	*Cyclospermum leptophyllum*	MARSH-PARSLEY	E	A	F
APIACEAE	*Daucus carota*	CARROT, QUEEN ANNE'S LACE	E	P	F
APIACEAE	*Daucus pusillus*	RATTLESNAKE WEED	N	A	F
APIACEAE	*Eryngium aristulatum var. parishii*	SAN DIEGO BUTTON-CELERY	N	P	F
APIACEAE	*Eryngium pendletonense*	PENDLETON BUTTON-CELERY	N	P	F
APIACEAE	*Foeniculum vulgare*	SWEET FENNEL	E	P	F
APIACEAE	*Lomatium dasycarpum ssp. dasycarpum*	WOOLLY-FRUIT LOMATIUM	N	P	F
APIACEAE	*Osmorhiza brachypoda*	CALIFORNIA SWEET-CICELY	N	P	F
APIACEAE	*Sanicula arguta*	SHARP-TOOTH SANICLE	N	P	F
APIACEAE	*Sanicula crassicaulis*	PACIFIC SANICLE	N	P	F
APIACEAE	*Sanicula tuberosa*	TURKEY PEA SANICLE	N	P	F
APIACEAE	*Tauschia arguta*	SOUTHERN TAUSCHIA	N	P	F

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APIACEAE	*Torilis arvensis*	JAPANESE HEDGE-PARSLEY	E	A	F
APIACEAE	*Torilis nodosa*	KNOT HEDGE-PARSLEY	E	A	F
APIACEAE	*Yabea microcarpa*	CALIFORNIA HEDGE-PARSLEY	N	A	F
APOCYNACEAE	*Apocynum cannabinum*	INDIAN-HEMP	N	P	F
APOCYNACEAE	*Araujia sericifera*	BLADDER FLOWER	E	P	VF
APOCYNACEAE	*Asclepias eriocarpa*	KOTOLO, INDIAN MILKWEED	N	P	F
APOCYNACEAE	*Asclepias fascicularis*	NARROW-LEAF MILKWEED	N	P	F
APOCYNACEAE	*Funastrum cynanchoides var. hartwegii*	CLIMBING MILKWEED	N	P	VF
APOCYNACEAE	*Nerium oleander*	OLEANDER	E	P	S
APOCYNACEAE	*Vinca major*	GREATER PERIWINKLE	E	P	F
ARALIACEAE	*Hydrocotyle umbellata*	MANY-FLOWER MARSH-PENNYWORT	N	P	F
ARALIACEAE	*Hydrocotyle verticillata*	WHORLED MARSH-PENNYWORT	N	P	F
ASTERACEAE	*Achillea millefolium*	YARROW	N	P	F
ASTERACEAE	*Acourtia microcephala*	SACAPELLOTE	N	P	F
ASTERACEAE	*Ageratina adenophora*	STICKY EUPATORIUM	E	P	F
ASTERACEAE	*Agoseris grandiflora var. grandiflora*	LARGE-FLOWER AGOSERIS	N	P	F
ASTERACEAE	*Aldama purisimae*	LA PURISIMA SUNFLOWER	N	P	S
ASTERACEAE	*Amblyopappus pusillus*	PINEAPPLE-WEED	N	A	F
ASTERACEAE	*Ambrosia acanthicarpa*	ANNUAL BUR-SAGE	N	A	F
ASTERACEAE	*Ambrosia chamissonis*	BEACH-BUR	N	P	F
ASTERACEAE	*Ambrosia confertiflora*	WEAK-LEAF BUR-SAGE	N	P	F
ASTERACEAE	*Ambrosia psilostachya*	WESTERN RAGWEED	N	P	F
ASTERACEAE	*Anthemis cotula*	MAYWEED; STINKWEED; DOG-FENNEL	E	A	F
ASTERACEAE	*Arctotheca calendula*	CAPEWEED	E	A	F
ASTERACEAE	*Artemisia californica*	COASTAL SAGEBRUSH	N	P	S
ASTERACEAE	*Artemisia douglasiana*	DOUGLAS MUGWORT	N	P	F

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ASTERACEAE	*Artemisia dracunculus*	TARRAGON; DRAGON SAGEWORT	N	P	F
ASTERACEAE	*Artemisia palmeri*	PALMER'S SAGEWORT	N	P	F
ASTERACEAE	*Artemisia tridentata ssp. tridentata*	BIG SAGEBRUSH	N	P	S
ASTERACEAE	*Baccharis pilularis ssp. consanguinea*	COYOTE BRUSH	N	P	S
ASTERACEAE	*Baccharis pilularis ssp. consanguinea × B. sarothroides*	HYBRID COYOTE BRUSH	N	P	S
ASTERACEAE	*Baccharis salicifolia*	MULE-FAT; SEEP-WILLOW	N	P	S
ASTERACEAE	*Baccharis salicina*	WILLOW BACCHARIS	N	P	S
ASTERACEAE	*Baccharis sarothroides*	BROOM BACCHARIS	N	P	S
ASTERACEAE	*Baccharis vanessae*	ENCINITAS BACCHARIS	N	P	S
ASTERACEAE	*Bahiopsis laciniata*	SAN DIEGO SUNFLOWER	N	P	S
ASTERACEAE	*Bebbia juncea var. aspera*	RUSH SWEETBUSH	N	P	S
ASTERACEAE	*Bidens frondosa*	STICKTIGHT	N	A	F
ASTERACEAE	*Bidens laevis*	SMOOTH BEGGAR'S TICK	N	P	F
ASTERACEAE	*Bidens pilosa*	COMMON BEGGAR'S TICK; BUR-MARIGOLD	E	A	F
ASTERACEAE	*Brickellia californica*	CALIFORNIA BRICKELLBUSH	N	P	S
ASTERACEAE	*Carduus pycnocephalus ssp. pycnocephalus*	ITALIAN THISTLE	E	A	F
ASTERACEAE	*Carduus tenuiflorus*	SLENDER THISTLE	E	A	F
ASTERACEAE	*Centaurea benedicta*	BLESSED THISTLE	E	A	F
ASTERACEAE	*Centaurea melitensis*	TOCALOTE	E	A	F
ASTERACEAE	*Centromadia pungens ssp. laevis*	SMOOTH TARPLANT	N	A	F
ASTERACEAE	*Chaenactis artemisiifolia*	WHITE PINCUSHION	N	A	F
ASTERACEAE	*Chaenactis glabriuscula var. glabriuscula*	YELLOW PINCUSION	N	A	F
ASTERACEAE	*Cichorium intybus*	MEDITERRANEAN CHICORY	E	P	F

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FAMILY	Scientific Name	Common Name	Native or Exotic	Life History	Growth Form
ASTERACEAE	*Cirsium occidentale var. californicum*	CALIFORNIA THISTLE	N	P	F
ASTERACEAE	*Cirsium occidentale var. occidentale*	COBWEBBY THISTLE	N	P	F
ASTERACEAE	*Cirsium vulgare*	BULL THISTLE	E	P	F
ASTERACEAE	*Corethrogyne filaginifolia var. filaginifolia*	COMMON SAND-ASTER	N	P	F
ASTERACEAE	*Cotula australis*	AUSTRALIAN BRASS-BUTTONS	E	A	F
ASTERACEAE	*Cotula coronopifolia*	AFRICAN BRASS-BUTTONS	E	P	F
ASTERACEAE	*Cynara cardunculus ssp. flavescens*	ARTICHOKE THISTLE	E	P	F
ASTERACEAE	*Deinandra fasciculata*	FASCICLED TARWEED	N	A	F
ASTERACEAE	*Deinandra kelloggii*	KELLOGG TARPLANT	N	A	F
ASTERACEAE	*Deinandra paniculata*	SAN DIEGO TARPLANT	N	A	F
ASTERACEAE	*Dimorphotheca fruticosa*	TRAILING AFRICAN DAISY	E	P	F
ASTERACEAE	*Dimorphotheca sinuata*	BLUE-EYE CAPE-MARIGOLD	E	A	F
ASTERACEAE	*Dittrichia graveolens*	STINKWORT	E	A	F
ASTERACEAE	*Eclipta prostrata*	FALSE DAISY	N	A	F
ASTERACEAE	*Encelia californica*	CALIFORNIA ENCELIA	N	P	S
ASTERACEAE	*Encelia farinosa var. farinosa*	BRITTLEBUSH, INCIENSO	E	P	S
ASTERACEAE	*Ericameria brachylepis*	BOUNDARY GOLDENBUSH	N	P	S
ASTERACEAE	*Ericameria palmeri var. pachylepis*	THICKBRACTED GOLDENBUSH	N	P	S
ASTERACEAE	*Erigeron bonariensis*	FLAX-LEAF FLEABANE	E	A	F
ASTERACEAE	*Erigeron canadensis*	HORSEWEED	N	A	F
ASTERACEAE	*Erigeron foliosus var. foliosus*	LEAFY DAISY	N	P	F
ASTERACEAE	*Erigeron sumatrensis*	ASTHMAWEED	E	A	F
ASTERACEAE	*Eriophyllum confertiflorum var. confertiflorum*	LONG-STEM GOLDEN-YARROW	N	P	HS
ASTERACEAE	*Euthamia occidentalis*	WESTERN GOLDENROD	N	P	F

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ASTERACEAE	*Galinsoga parviflora var. parviflora*	SMALL-FLOWER GALINSOGA	E	A	F
ASTERACEAE	*Gamochaeta pensylvanica*	PURPLE CUDWEED	E	A	F
ASTERACEAE	*Gamochaeta stachydifolia*	STACHYS-LEAF CUDWEED	E	A	F
ASTERACEAE	*Gamochaeta stagnalis*	DESERT CUDWEED	N	A	F
ASTERACEAE	*Gamochaeta ustulata*	PACIFIC CUDWEED	N	P	F
ASTERACEAE	*Gazania linearis*	TREASURE FLOWER	E	P	F
ASTERACEAE	*Glebionis coronaria*	CROWN DAISY; GARLAND	E	A	F
ASTERACEAE	*Gnaphalium palustre*	LOWLAND CUDWEED	N	A	F
ASTERACEAE	*Grindelia camporum*	GUMPLANT	N	P	F
ASTERACEAE	*Gutierrezia sarothrae*	BROOM MATCHWEED	N	P	HS
ASTERACEAE	*Hazardia squarrosa var. grindelioides*	SOUTHERN SAWTOOTH GOLDENBUSH	N	P	S
ASTERACEAE	*Hedypnois rhagadioloides*	CRETE HEDYPNOIS	E	A	F
ASTERACEAE	*Helianthus annuus*	WESTERN SUNFLOWER	N	A	F
ASTERACEAE	*Helianthus gracilentus*	SLENDER SUNFLOWER	N	P	F
ASTERACEAE	*Helminthotheca echioides*	BRISTLY OX-TONGUE	E	A	F
ASTERACEAE	*Heterotheca grandiflora*	TELEGRAPH WEED	N	A	F
ASTERACEAE	*Heterotheca sessiliflora ssp. echioides*	BRISTLY GOLDENASTER	N	P	F
ASTERACEAE	*Holocarpha virgata ssp. elongata*	GRACEFUL TARPLANT	N	A	F
ASTERACEAE	*Hypochaeris glabra*	SMOOTH CAT'S EAR	E	A	F
ASTERACEAE	*Hypochaeris radicata*	HAIRY CAT'S EAR	E	P	F
ASTERACEAE	*Isocoma menziesii var. decumbens*	DECUMBENT GOLDENBUSH	N	P	HS
ASTERACEAE	*Isocoma menziesii var. menziesii*	SPREADING GOLDENBUSH	N	P	HS
ASTERACEAE	*Isocoma menziesii var. vernonioides*	COASTAL GOLDENBUSH	N	P	HS
ASTERACEAE	*Iva axillaris*	POVERTY WEED	N	P	S
ASTERACEAE	*Iva hayesiana*	SAN DIEGO MARSH-ELDER	N	P	F
ASTERACEAE	*Jaumea carnosa*	SALTY SUSAN; FLESHY JAUMEA	N	P	F

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ASTERACEAE	*Lactuca serriola*	PRICKLY LETTUCE	E	A	F
ASTERACEAE	*Laennecia coulteri*	COULTER'S FLEABANE	N	A	F
ASTERACEAE	*Lagophylla ramosissima*	COMMON HARELEAF	N	A	F
ASTERACEAE	*Lasthenia glabrata ssp. coulteri*	COULTER'S SALT-MARSH DAISY	N	A	F
ASTERACEAE	*Lasthenia gracilis*	COMMON GOLDFIELDS	N	A	F
ASTERACEAE	*Layia platyglossa*	TIDY TIPS	N	A	F
ASTERACEAE	*Lepidospartum squamatum*	SCALE-BROOM	N	P	S
ASTERACEAE	*Leptosyne gigantea*	GIANT SEA-DAHLIA	N	P	S
ASTERACEAE	*Leptosyne maritima*	SAN DIEGO SEA-DAHLIA	N	P	F
ASTERACEAE	*Logfia arizonica*	ARIZONA COTTONROSE	N	A	F
ASTERACEAE	*Logfia filaginoides*	CALIFORNIA COTTONROSE	N	A	F
ASTERACEAE	*Logfia gallica*	NARROW-LEAF COTTONROSE	E	A	F
ASTERACEAE	*Madia gracilis*	SLENDER MADIA	N	A	F
ASTERACEAE	*Madia sativa*	COAST MADIA	N	A	F
ASTERACEAE	*Malacothrix saxatilis var. tenuifolia*	CLIFF MALACOTHRIX	N	P	F
ASTERACEAE	*Matricaria discoidea*	COMMON PINEAPPLE-WEED	E	A	F
ASTERACEAE	*Micropus californicus var. californicus*	SLENDER COTTONWEED	N	A	F
ASTERACEAE	*Microseris douglasii ssp. platycarpha*	SMALL-FLOWER MICROSERIS	N	A	F
ASTERACEAE	*Microseris elegans*	ELEGANT MICROSERIS	N	A	F
ASTERACEAE	*Oncosiphon piluliferum*	STINKNET	E	A	F
ASTERACEAE	*Osmadenia tenella*	OSMADENIA	N	A	F
ASTERACEAE	*Pentachaeta aurea ssp. aurea*	GOLDEN-RAY PENTACHAETA	N	A	F
ASTERACEAE	*Perityle emoryi*	EMORY'S ROCK DAISY	N	A	F
ASTERACEAE	*Plecostachys serpyllifolia*	PETITE-LICORICE	E	P	S
ASTERACEAE	*Pluchea odorata var. odorata*	SALT MARSH FLEABANE	N	P	F
ASTERACEAE	*Pluchea sericea*	ARROWWEED	N	P	S

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ASTERACEAE	*Porophyllum gracile*	ODORA	N	P	HS
ASTERACEAE	*Pseudognaphalium beneolens*	FRAGRANT EVERLASTING	N	P	F
ASTERACEAE	*Pseudognaphalium biolettii*	BICOLOR CUDWEED	N	P	F
ASTERACEAE	*Pseudognaphalium californicum*	CALIFORNIA EVERLASTING	N	A	F
ASTERACEAE	*Pseudognaphalium canescens*	EVERLASTING CUDWEED	N	P	F
ASTERACEAE	*Pseudognaphalium leucocephalum*	WHITE-HEAD CUDWEED	N	P	F
ASTERACEAE	*Pseudognaphalium luteoalbum*	FRAGRANT EVERLASTING CUDWEED	E	A	F
ASTERACEAE	*Pseudognaphalium microcephalum*	WHITE EVERLASTING	N	P	F
ASTERACEAE	*Pseudognaphalium ramosissimum*	PINK EVERLASTING	N	P	F
ASTERACEAE	*Pseudognaphalium stramineum*	COTTON-BATTING PLANT	N	A	F
ASTERACEAE	*Psilocarphus brevissimus var. brevissimus*	DWARF WOOLLY-MARBLES	N	A	F
ASTERACEAE	*Psilocarphus tenellus*	SLENDER WOOLLY-MARBLES	N	A	F
ASTERACEAE	*Pulicaria paludosa*	SPANISH FALSE-FLEABANE	E	AP	F
ASTERACEAE	*Rafinesquia californica*	CALIFORNIA CHICORY	N	A	F
ASTERACEAE	*Senecio aphanactis*	CALIFORNIA GROUNDSEL	N	A	F
ASTERACEAE	*Senecio californicus*	CALIFORNIA BUTTERWEED	N	A	F
ASTERACEAE	*Senecio flaccidus var. douglasii*	SAND-WASH BUTTERWEED	N	P	HS
ASTERACEAE	*Senecio quadridentatus*	COTTON FIREWEED	E	P	HS
ASTERACEAE	*Senecio vulgaris*	COMMON GROUNDSEL	E	A	F
ASTERACEAE	*Silybum marianum*	MILK THISTLE	E	A	F
ASTERACEAE	*Solidago velutina ssp. californica*	CALIFORNIA GOLDENROD	N	P	F
ASTERACEAE	*Soliva sessilis*	COAST SOLIVA	E	A	F
ASTERACEAE	*Sonchus asper ssp. asper*	PRICKLY SOW-THISTLE	E	A	F
ASTERACEAE	*Sonchus oleraceus*	COMMON SOW-THISTLE	E	A	F
ASTERACEAE	*Stebbinsoseris heterocarpa*	GRASSLAND STEBBINSOSERIS	N	A	F

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FAMILY	Scientific Name	Common Name	Native or Exotic	Life History	Growth Form
ASTERACEAE	*Stephanomeria cichoriacea*	CHICORY-LEAF WIRELETTUCE	N	P	F
ASTERACEAE	*Stephanomeria diegensis*	SAN DIEGO WREATH-PLANT	N	A	F
ASTERACEAE	*Stephanomeria exigua ssp. deanei*	DEANE'S SMALL WREATH-PLANT	N	A	F
ASTERACEAE	*Stephanomeria virgata*	TALL WREATH-PLANT	N	A	F
ASTERACEAE	*Stylocline gnaphaloides*	EVERLASTING NEST-STRAW	N	A	F
ASTERACEAE	*Symphyotrichum subulatum var. parviflorum*	SOUTHWESTERN ANNUAL SALTMARSH ASTER	N	A	F
ASTERACEAE	*Tagetes erecta*	MARIGOLD	E	A	F
ASTERACEAE	*Taraxacum officinale*	COMMON DANDELION	E	P	F
ASTERACEAE	*Uropappus lindleyi*	SILVER PUFFS	N	A	F
ASTERACEAE	*Venegasia carpesioides*	JESUIT FLOWER	N	P	HS
ASTERACEAE	*Xanthium spinosum*	SPINY COCKLEBUR	N	A	F
ASTERACEAE	*Xanthium strumarium*	COCKLEBUR	N	A	F
BASELLACEAE	*Anredera cordifolia*	MIGNONETTE VINE	E	P	VF
BETULACEAE	*Alnus rhombifolia*	WHITE ALDER	N	P	T
BIGNONIACEAE	*Tecoma capensis*	CAPE HONEYSUCKLE	E	P	VS
BORAGINACEAE	*Amsinckia intermedia*	RANCHER'S FIDDLENECK	N	A	F
BORAGINACEAE	*Amsinckia menziesii*	RIGID FIDDLENECK	N	A	F
BORAGINACEAE	*Cryptantha clevelandii var. clevelandii*	CLEVELAND'S CRYPTANTHA	N	A	F
BORAGINACEAE	*Cryptantha clevelandii var. florosa*	LARGE-FLOWER CLEVELAND'S CRYPTANTHA	N	A	F
BORAGINACEAE	*Cryptantha intermedia var. intermedia*	NIEVITAS CRYPTANTHA	N	A	F
BORAGINACEAE	*Cryptantha intermedia var. johnstonii*	JOHNSTON'S NIEVITAS CRYPTANTHA	N	A	F
BORAGINACEAE	*Cryptantha microstachys*	TEJON CRYPTANTHA	N	A	F
BORAGINACEAE	*Cryptantha muricata var. jonesii*	JONES' PRICKLY CRYPTANTHA	N	A	F
BORAGINACEAE	*Cryptantha wigginsii*	WIGGINS'S CRYPTANTHA	N	A	F

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BORAGINACEAE	*Echium candicans*	PRIDE OF MADEIRA	E	P	S
BORAGINACEAE	*Emmenanthe penduliflora var. penduliflora*	WHISPERING BELLS	N	A	F
BORAGINACEAE	*Eriodictyon crassifolium var. crassifolium*	FELT-LEAF YERBA SANTA	N	P	S
BORAGINACEAE	*Eucrypta chrysanthemifolia var. chrysanthemifolia*	COMMON EUCRYPTA	N	A	F
BORAGINACEAE	*Harpagonella palmeri*	PALMER'S GRAPPLING-HOOK	N	A	F
BORAGINACEAE	*Heliotropium curassavicum var. oculatum*	SALT HELIOTROPE	N	P	F
BORAGINACEAE	*Heliotropium europaeum*	EUROPEAN HELIOTROPE	E	P	F
BORAGINACEAE	*Johnstonella micromeres*	MINUTE-FLOWER CRYPTANTHA	N	A	F
BORAGINACEAE	*Nemophila menziesii var. integrifolia*	SMALL-FLOWER BABY BLUE EYES	N	A	F
BORAGINACEAE	*Nemophila pedunculata*	MEADOW NEMOPHILA	N	A	F
BORAGINACEAE	*Pectocarya linearis ssp. ferocula*	SLENDER COMBSEED	N	A	F
BORAGINACEAE	*Pectocarya penicillata*	WINGED COMBSEED	N	A	F
BORAGINACEAE	*Phacelia aff. cicutaria*	CATERPILLAR PHACELIA	N	A	F
BORAGINACEAE	*Phacelia brachyloba*	SHORT-LOBE PHACELIA	N	A	F
BORAGINACEAE	*Phacelia cicutaria var. hispida*	CATERPILLAR PHACELIA	N	A	F
BORAGINACEAE	*Phacelia distans*	WILD-HELIOTROPE	N	A	F
BORAGINACEAE	*Phacelia grandiflora*	GIANT-FLOWER PHACELIA	N	A	F
BORAGINACEAE	*Phacelia imbricata var. imbricata*	IMBRICATE PHACELIA	N	P	F
BORAGINACEAE	*Phacelia imbricata var. patula*	ROCK PHACELIA	N	P	F
BORAGINACEAE	*Phacelia lyonii*	LYON'S PHACELIA	N	A	F
BORAGINACEAE	*Phacelia minor*	WILD CANTERBURY-BELL	N	A	F
BORAGINACEAE	*Phacelia minor × P. parryi*	HYBRID CANTERBURY-BELL	N	A	F
BORAGINACEAE	*Phacelia parryi*	PARRY'S PHACELIA	N	A	F

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BORAGINACEAE	*Phacelia ramosissima var. latifolia*	BRANCHING PHACELIA	N	P	F
BORAGINACEAE	*Phacelia stellaris*	BRAND'S PHACELIA	N	A	F
BORAGINACEAE	*Pholistoma auritum var. auritum*	FIESTA FLOWER	N	A	F
BORAGINACEAE	*Pholistoma racemosum*	SAN DIEGO FIESTA FLOWER	N	A	F
BORAGINACEAE	*Plagiobothrys acanthocarpus*	ADOBE POPCORNFLOWER	N	A	F
BORAGINACEAE	*Plagiobothrys arizonicus*	ARIZONA POPCORNFLOWER	N	A	F
BORAGINACEAE	*Plagiobothrys canescens*	VALLEY POPCORNFLOWER	N	A	F
BORAGINACEAE	*Plagiobothrys collinus var. californicus*	CALIFORNIA POPCORNFLOWER	N	A	F
BORAGINACEAE	*Plagiobothrys collinus var. fulvescens*	ROUGH POPCORNFLOWER	N	A	F
BORAGINACEAE	*Plagiobothrys collinus var. gracilis*	SAN DIEGO POPCORNFLOWER	N	A	F
BORAGINACEAE	*Plagiobothrys nothofulvus*	RUSTY POPCORNFLOWER	N	A	F
BRASSICACEAE	*Athysanus pusillus*	DWARF AHTYSANUS	N	A	F
BRASSICACEAE	*Barbarea orthoceras*	ERECT-POD WINTER-CRESS	N	P	F
BRASSICACEAE	*Brassica juncea*	INDIA MUSTARD	E	A	F
BRASSICACEAE	*Brassica napus*	SWEDE RAPE; RAPESEED	E	A	F
BRASSICACEAE	*Brassica nigra*	BLACK MUSTARD	E	A	F
BRASSICACEAE	*Brassica rapa*	TURNIP; FIELD MUSTARD	E	A	F
BRASSICACEAE	*Brassica tournefortii*	SAHARA MUSTARD	E	A	F
BRASSICACEAE	*Cakile edentula*	AMERICAN SEAROCKET	E	A	F
BRASSICACEAE	*Cakile maritima*	EUROPEAN SEAROCKET	E	A	F
BRASSICACEAE	*Capsella bursa-pastoris*	SHEPHERD'S PURSE	E	A	F
BRASSICACEAE	*Cardamine californica*	MILKMAIDS; TOOTHWORT	N	P	F
BRASSICACEAE	*Cardamine hirsuta*	HAIRY BITTERCRESS	E	A	F
BRASSICACEAE	*Carrichtera annua*	WARD'S WEED	E	A	F
BRASSICACEAE	*Caulanthus heterophyllus*	SAN DIEGO JEWELFLOWER	N	A	F
BRASSICACEAE	*Caulanthus lasiophyllus*	CALIFORNIA MUSTARD	N	A	F

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BRASSICACEAE	*Caulanthus simulans*	PAYSON'S CAULANTHUS	N	A	F
BRASSICACEAE	*Descurainia pinnata ssp. brachycarpa*	WESTERN TANSY-MUSTARD	N	A	F
BRASSICACEAE	*Diplotaxis muralis*	WALL ROCKET	E	A	F
BRASSICACEAE	*Draba cuneifolia var. integrifolia*	DESERT WHITLOW-GRASS	N	A	F
BRASSICACEAE	*Erysimum aff. ammophilum*	COAST WALLFLOWER	N	P	F
BRASSICACEAE	*Erysimum capitatum ssp. capitatum*	WESTERN WALLFLOWER	N	P	F
BRASSICACEAE	*Hirschfeldia incana*	SHORT-POD MUSTARD	E	P	F
BRASSICACEAE	*Lepidium chalepense*	LENS-POD HOARY-CRESS	E	P	F
BRASSICACEAE	*Lepidium densiflorum*	COMMON PEPPERGRASS	N	A	F
BRASSICACEAE	*Lepidium didymum*	LESSER WART-CRESS	E	A	F
BRASSICACEAE	*Lepidium draba*	HEART-POD HOARY-CRESS	E	P	F
BRASSICACEAE	*Lepidium lasiocarpum ssp. lasiocarpum*	SAND PEPPERGRASS	N	A	F
BRASSICACEAE	*Lepidium latifolium*	BROAD-LEAF PEPPERGRASS	E	P	F
BRASSICACEAE	*Lepidium latipes*	DWARF PEPPERGRASS	N	A	F
BRASSICACEAE	*Lepidium nitidum*	SHINING PEPPERGRASS	N	A	F
BRASSICACEAE	*Lepidium oblongum var. insulare*	VEINY PEPPERGRASS	N	A	F
BRASSICACEAE	*Lepidium oblongum var. oblongum*	WAYSIDE PEPPERGRASS	N	A	F
BRASSICACEAE	*Lepidium pinnatifidum*	FEATHER-LEAFED PEPPERGRASS	E	A	F
BRASSICACEAE	*Lepidium ramosissimum*	BRANCHED PEPPERGRASS	N	A	F
BRASSICACEAE	*Lepidium strictum*	UPRIGHT PEPPERGRASS	N	A	F
BRASSICACEAE	*Lepidium virginicum ssp. menziesii*	MENZIES'S PEPPERGRASS	N	A	F
BRASSICACEAE	*Lepidium virginicum var. robinsonii*	ROBINSON'S PEPPERGRASS	N	A	F
BRASSICACEAE	*Lepidium virginicum var. virginicum*	VIRGINIA PEPPERGRASS	N	A	F
BRASSICACEAE	*Lobularia maritima*	SWEET ALYSSUM	E	P	F
BRASSICACEAE	*Nasturtium officinale*	WATER-CRESS	N	P	F
BRASSICACEAE	*Planodes virginicum*	VIRGINIA ROCK-CRESS	N	A	F

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BRASSICACEAE	*Raphanus raphanistrum*	JOINTED CHARLOCK	E	A	F
BRASSICACEAE	*Raphanus sativus*	WILD RADISH	E	A	F
BRASSICACEAE	*Rapistrum rugosum*	ANNUAL BASTARD-CABBAGE	E	A	F
BRASSICACEAE	*Rorippa palustris ssp. palustris*	BOG YELLOWCRESS	N	P	F
BRASSICACEAE	*Sisymbrium altissimum*	TUMBLE MUSTARD	E	A	F
BRASSICACEAE	*Sisymbrium irio*	LONDON ROCKET	E	A	F
BRASSICACEAE	*Sisymbrium officinale*	HEDGE MUSTARD	E	A	F
BRASSICACEAE	*Sisymbrium orientale*	HARE'S-EAR CABBAGE	E	A	F
BRASSICACEAE	*Thysanocarpus curvipes ssp. curvipes*	LACEPOD; FRINGEPOD	N	A	F
BRASSICACEAE	*Thysanocarpus laciniatus*	NOTCH FRINGEPOD	N	A	F
BRASSICACEAE	*Tropidocarpum gracile*	SLENDERDOBIE-POD	N	A	F
BRASSICACEAE	*Turritis glabra*	TOWER MUSTARD	N	A	F
CACTACEAE	*Cylindropuntia prolifera*	COAST CHOLLA	N	P	S
CACTACEAE	*Mammillaria dioica*	FISH-HOOK CACTUS	N	P	S
CACTACEAE	*Opuntia ×occidentalis*	WESTERN PRICKLY-PEAR	N	P	S
CACTACEAE	*Opuntia ×vaseyi*	MESA PRICKLY-PEAR	N	P	S
CACTACEAE	*Opuntia ficus-indica*	MISSION PRICKLY-PEAR, INDIAN-FIG	E	P	S
CACTACEAE	*Opuntia littoralis*	COAST PRICKLY-PEAR	N	P	S
CACTACEAE	*Opuntia oricola*	CHAPARRAL PRICKLY-PEAR	N	P	S
CACTACEAE	*Opuntia phaeacantha*	DESERT PRICKLY-PEAR	N	P	S
CAMPANULACEAE	*Githopsis diffusa ssp. candida*	SAN GABRIEL BLUECUP	N	A	F
CAMPANULACEAE	*Githopsis diffusa ssp. filicaulis*	MISSION CANYON BLUECUP	N	A	F
CAMPANULACEAE	*Heterocodon rariflorum*	HETEROCODON	N	A	F
CAMPANULACEAE	*Nemacladus ramosissimus*	NUTTALL'S THREADPLANT	N	A	F
CAMPANULACEAE	*Triodanis biflora*	SMALL VENUS LOOKING-GLASS	N	A	F
CAPRIFOLIACEAE	*Lonicera japonica*	JAPANESE HONEYSUCKLE	E	P	VS

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CAPRIFOLIACEAE	*Lonicera subspicata var. denudata*	JOHNSTON'S HONEYSUCKLE	N	P	VS
CAPRIFOLIACEAE	*Symphoricarpos mollis*	CREEPING SNOWBERRY; TRIP VINE	N	P	S
CARYOPHYLLACEAE	*Cardionema ramosissimum*	TREAD LIGHTLY	N	P	F
CARYOPHYLLACEAE	*Cerastium glomeratum*	MOUSE-EAR CHICKWEED	E	A	F
CARYOPHYLLACEAE	*Gypsophila paniculata*	BABY'S-BREATH	E	A	F
CARYOPHYLLACEAE	*Herniaria hirsuta var. cinerea*	GRAY HERNARIA	E	A	F
CARYOPHYLLACEAE	*Loeflingia squarrosa*	CALIFORNIA LOEFINGIA	N	A	F
CARYOPHYLLACEAE	*Petrorhagia dubia*	HAIRY PINK	E	A	F
CARYOPHYLLACEAE	*Polycarpon depressum*	CALIFORNIA POLYCARP	N	A	F
CARYOPHYLLACEAE	*Polycarpon tetraphyllum ssp. tetraphyllum*	FOUR-LEAF ALLSEED	E	A	F
CARYOPHYLLACEAE	*Sagina apetala*	DWARF/STICKY PEARLWORT	N	A	F
CARYOPHYLLACEAE	*Sagina decumbens ssp. occidentalis*	WESTERN PEARLWORT	N	A	F
CARYOPHYLLACEAE	*Silene antirrhina*	SNAPDRAGON CATCHFLY	N	A	F
CARYOPHYLLACEAE	*Silene gallica*	COMMON CATCHFLY	E	A	F
CARYOPHYLLACEAE	*Silene laciniata ssp. laciniata*	SOUTHERN PINK	N	P	F
CARYOPHYLLACEAE	*Spergula arvensis*	STICKWORT; STARWORT	E	A	F
CARYOPHYLLACEAE	*Spergularia bocconi*	BOCCONE'S SAND-SPURREY	E	A	F
CARYOPHYLLACEAE	*Spergularia macrotheca var. macrotheca*	STICKY SAND-SPURREY	N	P	F
CARYOPHYLLACEAE	*Spergularia marina*	SALTMARSH SAND-SPURREY	N	A	F
CARYOPHYLLACEAE	*Spergularia rubra*	RUBY SAND-SPURREY	E	A	F
CARYOPHYLLACEAE	*Spergularia villosa*	VILLOUS SAND-SPURREY	E	P	F
CARYOPHYLLACEAE	*Stellaria media*	COMMON CHICKWEED	E	A	F
CARYOPHYLLACEAE	*Stellaria neglecta*	GREATER CHICKWEED	E	A	F
CARYOPHYLLACEAE	*Stellaria nitens*	SHINING CHICKWEED	N	A	F

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CARYOPHYLLACEAE	*Stellaria pallida*	PALE STARWORT	E	A	F
CASUARINACEAE	*Casuarina equisetifolia*	HORSETAIL TREE	E	P	T
CHENOPODIACEAE	*Aphanisma blitoides*	APHANISMA	N	A	F
CHENOPODIACEAE	*Arthrocnemum subterminale*	PARISH'S PICKLEWEED	N	P	F
CHENOPODIACEAE	*Atriplex amnicola*	SWAMP SALTBUSH	E	P	S
CHENOPODIACEAE	*Atriplex canescens var. canescens*	FOUR-WING SALTBUSH; SHAD SCALE	N	P	S
CHENOPODIACEAE	*Atriplex cf. crassipes*	THICK-STALKED SALTBUSH	E	P	S
CHENOPODIACEAE	*Atriplex coulteri*	COULTER'S SALTBUSH	N	P	F
CHENOPODIACEAE	*Atriplex glauca*	WAXY SALTBUSH	E	P	S
CHENOPODIACEAE	*Atriplex lentiformis*	BIG SALTBUSH	N	P	S
CHENOPODIACEAE	*Atriplex leucophylla*	SEASCALE, BEACH SALTBUSH	N	P	F
CHENOPODIACEAE	*Atriplex lindleyi*	LINDLEY'S SALTBUSH	E	A	F
CHENOPODIACEAE	*Atriplex pacifica*	SOUTH COAST SALTBUSH	N	A	F
CHENOPODIACEAE	*Atriplex prostrata*	PROSTRATE SPEARSCALE	E	A	F
CHENOPODIACEAE	*Atriplex rosea*	TUMBLING ORACLE	E	A	F
CHENOPODIACEAE	*Atriplex semibaccata*	AUSTRALIAN SALTBUSH	E	P	HS
CHENOPODIACEAE	*Atriplex serenana var. serenana*	BRACTSCALE	N	A	F
CHENOPODIACEAE	*Atriplex suberecta*	PEREGRINE SALTBUSH	E	A	F
CHENOPODIACEAE	*Bassia hyssopifolia*	FIVE-HOOK BASSIA	E	A	F
CHENOPODIACEAE	*Beta vulgaris ssp. maritima*	SEA BEET	E	A	F
CHENOPODIACEAE	*Chenopodium album*	LAMB'S QUARTERS	E	A	F
CHENOPODIACEAE	*Chenopodium berlandieri var. sinuatum*	PIT-SEED GOOSEFOOT	N	A	F
CHENOPODIACEAE	*Chenopodium berlandieri var. zschackei*	ZSCHACKEI'S PIT-SEED GOOSEFOOT	N	A	F
CHENOPODIACEAE	*Chenopodium californicum*	CALIFORNIA GOOSEFOOT	N	P	F
CHENOPODIACEAE	*Chenopodium glaucum var. salinum*	OAK-LEAF GOOSEFOOT	N	P	F
CHENOPODIACEAE	*Chenopodium macrospermum*	LARGESEED GOOSEFOOT	E	A	F

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CHENOPODIACEAE	*Chenopodium murale*	NETTLE-LEAF GOOSEFOOT	E	A	F
CHENOPODIACEAE	*Chenopodium rubrum var. rubrum*	RED PIGWEED	N	A	F
CHENOPODIACEAE	*Chenopodium strictum var. glaucophyllum*	WHITE-LEAF GOOSEFOOT	E	A	F
CHENOPODIACEAE	*Dysphania ambrosioides*	MEXICAN TEA	E	A	F
CHENOPODIACEAE	*Dysphania multifida*	CUT-LEAF GOOSEFOOT	E	A	F
CHENOPODIACEAE	*Dysphania pumilio*	TASMANIAN GOOSEFOOT	E	A	F
CHENOPODIACEAE	*Extriplex californica*	CALIFORNIA ORACH	N	P	F
CHENOPODIACEAE	*Salicornia pacifica*	PACIFIC PICKLEWEED	N	P	HS
CHENOPODIACEAE	*Salsola australis*	AUSTRALIAN TUMBLEWEED	E	A	F
CHENOPODIACEAE	*Salsola tragus*	PRICKLY RUSSIAN-THISTLE, TUMBLEWEED	E	A	F
CHENOPODIACEAE	*Suaeda calceoliformis*	HORNED SEA-BLITE	N	A	F
CHENOPODIACEAE	*Suaeda esteroa*	ESTUARY SEA-BLITE	N	P	F
CHENOPODIACEAE	*Suaeda taxifolia*	WOOLLY SEA-BLITE	N	P	S
CISTACEAE	*Crocanthemum aldersonii*	ALDERSON'S RUSH-ROSE	N	P	S
CISTACEAE	*Crocanthemum scoparium var. scoparium*	PEAK RUSH-ROSE	N	P	HS
CISTACEAE	*Crocanthemum scoparium var. vulgare*	COAST PEAK RUSH-ROSE	N	P	HS
CLEOMACEAE	*Peritoma arborea var. arborea*	COAST BLADDERPOD	N	P	S
CLEOMACEAE	*Peritoma arborea var. globosa*	LARGE BLADDERPOD	N	P	S
CONVOLVULACEAE	*Calystegia macrostegia ssp. arida*	SOUTHERN CALIFORNIA MORNING-GLORY	N	P	VF
CONVOLVULACEAE	*Calystegia macrostegia ssp. cyclostegia*	COAST MORNING-GLORY	N	P	VF
CONVOLVULACEAE	*Calystegia macrostegia ssp. intermedia*	SOUTH COAST MORNING-GLORY	N	P	VF
CONVOLVULACEAE	*Calystegia macrostegia ssp. tenuifolia*	SAN DIEGO MORNING-GLORY	N	P	VF

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FAMILY	Scientific Name	Common Name	Native or Exotic	Life History	Growth Form
CONVOLVULACEAE	*Calystegia soldanella*	SEA SHORE MORNING-GLORY	N	P	VF
CONVOLVULACEAE	*Convolvulus arvensis*	FIELD BINDWEED	E	P	VF
CONVOLVULACEAE	*Convolvulus simulans*	SMALL-FLOWER BINDWEED	N	A	VF
CONVOLVULACEAE	*Cressa truxillensis*	ALKALI WEED	N	P	F
CONVOLVULACEAE	*Cuscuta californica var. californica*	CHAPARRAL DODDER	N	A	VF
CONVOLVULACEAE	*Cuscuta campestris*	FIELD DODDER	N	A	VF
CONVOLVULACEAE	*Cuscuta indecora var. indecora*	BIG-SEED ALFALFA DODDER	N	A	VF
CONVOLVULACEAE	*Cuscuta pacifica var. pacifica*	LARGE-FLOWER SALTMARSH DODDER	N	A	VF
CONVOLVULACEAE	*Cuscuta subinclusa*	CANYON DODDER	N	A	VF
CONVOLVULACEAE	*Dichondra micrantha*	ASIAN PONYFOOT	E	P	F
CONVOLVULACEAE	*Dichondra occidentalis*	WESTERN DICHONDRA; WESTERN PONYFOOT	N	P	F
CONVOLVULACEAE	*Ipomoea cairica*	IVY-LEAF MORNING-GLORY	E	P	F
CRASSULACEAE	*Crassula aquatica*	WATER PYGMYWEED	N	A	F
CRASSULACEAE	*Crassula connata*	PYGMYWEED	N	A	F
CRASSULACEAE	*Crassula ovata*	JADE PLANT	E	P	S
CRASSULACEAE	*Crassula solieri*	SMOOTH-SEED PYGMYWEED	N	A	F
CRASSULACEAE	*Crassula tillaea*	MOSSY STONECROP	E	A	F
CRASSULACEAE	*Dudleya blochmaniae ssp. blochmaniae*	BLOCHMAN'S DUDLEYA	N	P	F
CRASSULACEAE	*Dudleya edulis*	LADIES' FINGERS	N	P	F
CRASSULACEAE	*Dudleya lanceolata*	LANCE-LEAF DUDLEYA	N	P	F
CRASSULACEAE	*Dudleya multicaulis*	MANY-STEM DUDLEYA	N	P	F
CRASSULACEAE	*Dudleya pulverulenta*	CHALK DUDLEYA	N	P	F
CRASSULACEAE	*Dudleya viscida*	STICKY DUDLEYA	N	P	F
CUCURBITACEAE	*Cucurbita foetidissima*	CALABAZILLA	N	P	VF

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CUCURBITACEAE	*Lagenaria siceraria*	BOTTLE GOURD	E	A	VF
CUCURBITACEAE	*Marah macrocarpa*	MANROOT; WILD-CUCUMBER	N	P	VF
DATISCACEAE	*Datisca glomerata*	DURANGO ROOT	N	P	F
DIDIEREACEAE	*Portulacaria afra*	ELEPHANT FOOD, DWARF JADE	E	P	S
ELATINACEAE	*Elatine brachysperma*	SHORT-SEED WATERWORT	N	A	F
ELATINACEAE	*Elatine californica*	CALIFORNIA WATERWORT	N	A	F
ERICACEAE	*Arctostaphylos glandulosa ssp. adamsii*	LAGUNA MOUNTAIN MANZANITA	N	P	S
ERICACEAE	*Arctostaphylos glandulosa ssp. cushingiana*	CUSHING'S MANZANITA	N	P	S
ERICACEAE	*Arctostaphylos glandulosa ssp. glandulosa*	EASTWOOD'S MANZANITA	N	P	S
ERICACEAE	*Arctostaphylos glauca*	BIG-BERRY MANZANITA	N	P	S
ERICACEAE	*Arctostaphylos rainbowensis*	RAINBOW MANZANITA	N	P	S
ERICACEAE	*Comarostaphylis diversifolia ssp. aff. planifolia*	FLAT-LEAF SUMMER-HOLLY	N	P	S
ERICACEAE	*Comarostaphylis diversifolia ssp. diversifolia*	SUMMER-HOLLY	N	P	S
ERICACEAE	*Xylococcus bicolor*	MISSION MANZANITA	N	P	S
EUPHORBIACEAE	*Croton californicus*	CALIFORNIA CROTON	N	P	HS
EUPHORBIACEAE	*Croton setiger*	DOVEWEED	N	A	F
EUPHORBIACEAE	*Euphorbia lathyris*	CAPER SPURGE; GOPHER PLANT	E	A	F
EUPHORBIACEAE	*Euphorbia maculata*	SPOTTED SPURGE	E	A	F
EUPHORBIACEAE	*Euphorbia peplus*	PETTY SPURGE	E	A	F
EUPHORBIACEAE	*Euphorbia polycarpa*	SMALL-SEED SANDMAT	N	P	F
EUPHORBIACEAE	*Euphorbia serpens*	CREEPING SPURGE	E	A	F
EUPHORBIACEAE	*Euphorbia spathulata*	RETICULATE-SEED SPURGE	N	A	F

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EUPHORBIACEAE	*Euphorbia terracina*	GERALDTON CARNATION SPURGE	E	A	F
EUPHORBIACEAE	*Manihot sp.*	MANIHOT	E	P	F
EUPHORBIACEAE	*Ricinus communis*	CASTOR BEAN	E	P	S
EUPHORBIACEAE	*Stillingia linearifolia*	LINEAR-LEAF STILLINGIA	N	P	F
FABACEAE	*Acacia baileyana*	COOTAMUNDRA WATTLE	E	P	T
FABACEAE	*Acacia cultriformis*	KNIFE-LEAF WATTLE	E	P	S
FABACEAE	*Acacia cyclops*	WESTERN COASTAL WATTLE	E	P	S
FABACEAE	*Acacia dealbata*	SILVER WATTLE	E	P	T
FABACEAE	*Acacia longifolia*	SYDNEY GOLDEN WATTLE	E	P	S
FABACEAE	*Acacia melanoxylon*	BLACKWOOD ACACIA	E	P	T
FABACEAE	*Acacia retinodes*	EVERBLOOMING ACACIA	E	P	T
FABACEAE	*Acacia saligna*	GOLDEN WREATH WATTLE	E	P	S
FABACEAE	*Acmispon americanus var. americanus*	SPANISH-CLOVER	N	A	F
FABACEAE	*Acmispon brachycarpus*	HILL LOTUS	N	A	F
FABACEAE	*Acmispon glaber var. brevialatus*	SHORT-WING DEERWEED	N	P	HS
FABACEAE	*Acmispon glaber var. glaber*	COASTAL DEERWEED	N	P	HS
FABACEAE	*Acmispon heermannii var. heermannii*	HEERMAN'S LOTUS	N	P	F
FABACEAE	*Acmispon maritimus var. maritimus*	ALKALI LOTUS	N	A	F
FABACEAE	*Acmispon micranthus*	GRAB LOTUS	N	A	F
FABACEAE	*Acmispon prostratus*	PROSTRATE/NUTTALL'S LOTUS	N	A	F
FABACEAE	*Acmispon strigosus*	BISHOP'S/STRIGOSE LOTUS	N	A	F
FABACEAE	*Acmispon wrangelianus*	CALF LOTUS	N	A	F
FABACEAE	*Amorpha fruticosa*	FALSE INDIGO	N	P	S
FABACEAE	*Astragalus didymocarpus var. didymocarpus*	WHITE DWARF LOCOWEED	N	A	F
FABACEAE	*Astragalus gambelianus*	GAMBEL'S LOCOWEED	N	A	F

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FABACEAE	*Astragalus pomonensis*	POMONA LOCOWEED	N	P	F
FABACEAE	*Astragalus trichopodus var. lonchus*	OCEAN LOCOWEED	N	P	F
FABACEAE	*Caesalpinia spinosa*	TARA	E	P	S
FABACEAE	*Genista monosperma*	BRIDAL VEIL BROOM	E	P	S
FABACEAE	*Gleditsia triacanthos*	HONEYLOCUST	E	P	T
FABACEAE	*Glycyrrhiza lepidota*	WILD-LICORICE	N	P	F
FABACEAE	*Hoita macrostachya*	LEATHER ROOT	N	P	F
FABACEAE	*Lathyrus odoratus*	SWEET PEA	E	A	VF
FABACEAE	*Lathyrus vestitus var. alefeldii*	SAN DIEGO SWEET PEA	N	P	VF
FABACEAE	*Lathyrus vestitus var. vestitus*	CANYON SWEET PEA	N	P	VF
FABACEAE	*Lotus corniculatus*	BIRDFOOT TREFOIL	E	P	F
FABACEAE	*Lupinus albifrons var. albifrons*	SILVER BUSH LUPINE	N	P	HS
FABACEAE	*Lupinus bicolor*	MINIATURE LUPINE	N	A	F
FABACEAE	*Lupinus concinnus*	BAJADA LUPINE	N	A	F
FABACEAE	*Lupinus excubitus var. austromontanus*	GRAPE SODA LUPINE	N	P	S
FABACEAE	*Lupinus excubitus var. hallii*	HALL'S BUSH LUPINE	N	P	S
FABACEAE	*Lupinus hirsutissimus*	STINGING LUPINE	N	A	F
FABACEAE	*Lupinus latifolius var. parishii*	PARISH'S STREAM LUPINE	N	P	S
FABACEAE	*Lupinus longifolius*	PAUMA LUPINE	N	P	S
FABACEAE	*Lupinus microcarpus var. densiflorus*	CHICK LUPINE	N	A	F
FABACEAE	*Lupinus microcarpus var. microcarpus*	RED-FLOWER LUPINE	N	A	F
FABACEAE	*Lupinus sparsiflorus*	COULTER'S LUPINE	N	A	F
FABACEAE	*Lupinus succulentus*	ARROYO LUPINE	N	A	F
FABACEAE	*Lupinus truncatus*	COLLAR LUPINE	N	A	F
FABACEAE	*Medicago lupulina*	BLACK MEDICK, YELLOW TREFOIL	E	A	F
FABACEAE	*Medicago polymorpha*	CALIFORNIA BURCLOVER	E	A	F

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FABACEAE	*Medicago sativa*	ALFALFA; LUCERNE	E	P	F
FABACEAE	*Melilotus albus*	WHITE SWEETCLOVER	E	A	F
FABACEAE	*Melilotus indicus*	INDIAN SWEETCLOVER	E	A	F
FABACEAE	*Parkinsonia aculeata*	MEXICAN PALO VERDE	E	P	T
FABACEAE	*Pickeringia montana var. tomentosa*	HAIRY CHAPARRAL-PEA	N	P	S
FABACEAE	*Robinia pseudoacacia*	BLACK LOCUST	E	P	T
FABACEAE	*Senna didymobotrya*	AFRICAN SENNA	E	P	S
FABACEAE	*Spartium junceum*	SPANISH BROOM	E	P	S
FABACEAE	*Trifolium ciliolatum*	TREE CLOVER	N	A	F
FABACEAE	*Trifolium depauperatum var. truncatum*	DWARF-SACK CLOVER	N	A	F
FABACEAE	*Trifolium gracilentum*	PIN-POINT CLOVER	N	A	F
FABACEAE	*Trifolium hirtum*	ROSE CLOVER	E	A	F
FABACEAE	*Trifolium microcephalum*	MAIDEN CLOVER	N	A	F
FABACEAE	*Trifolium obtusiflorum*	CREEK CLOVER	N	A	F
FABACEAE	*Trifolium subterraneum*	SUBTERRANEUM CLOVER	E	A	F
FABACEAE	*Trifolium variegatum var. major*	LARGE VARIEGATED CLOVER	N	A	F
FABACEAE	*Trifolium willdenovii*	VALLEY CLOVER	N	A	F
FABACEAE	*Trifolium wormskioldii*	COW CLOVER	N	P	F
FABACEAE	*Vicia americana var. americana*	AMERICAN VETCH	N	P	VF
FABACEAE	*Vicia benghalensis*	PURPLE VETCH	E	A	VF
FABACEAE	*Vicia hassei*	SLENDER VETCH	N	A	VF
FABACEAE	*Vicia ludoviciana var. ludoviciana*	DEER PEA VETCH	N	A	VF
FABACEAE	*Vicia sativa ssp. nigra*	NARROW-LEAF VETCH; COMMON VETCH	E	A	VF
FABACEAE	*Vicia sativa ssp. sativa*	SPRING VETCH	E	A	VF
FABACEAE	*Vicia villosa ssp. varia*	HAIRY VETCH	E	A	VF

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FABACEAE	*Vicia villosa ssp. villosa*	WINTER VETCH	E	A	VF
FAGACEAE	*Quercus ×acutidens*	TORREY'S SCRUB OAK	N	P	TS
FAGACEAE	*Quercus ×engelmannii*	HYBRID ENGELMANN OAK	N	P	T
FAGACEAE	*Quercus agrifolia var. agrifolia*	COAST LIVE OAK	N	P	T
FAGACEAE	*Quercus berberidifolia*	SCRUB OAK	N	P	S
FAGACEAE	*Quercus berberidifolia × engelmannii*	HYBRID SCRUB OAK	N	P	S
FAGACEAE	*Quercus dumosa*	NUTTALL'S SCRUB OAK	N	P	S
FAGACEAE	*Quercus engelmannii*	MESA BLUE OAK; ENGELMANN OAK	N	P	T
FAGACEAE	*Quercus ilex*	HOLLY OAK	E	P	T
FAGACEAE	*Quercus wislizeni var. frutescens*	INTERIOR LIVE OAK; SCRUB LIVE OAK	N	P	T
FRANKENIACEAE	*Frankenia salina*	ALKALI-HEATH	N	P	HS
GENTIANACEAE	*Centaurium pulchellum*	LESSER CENTUARY	E	A	F
GENTIANACEAE	*Centaurium tenuiflorum*	SLENDER CENTAURY	E	A	F
GENTIANACEAE	*Eustoma exaltatum*	ALKALI CHALICE	N	A	F
GENTIANACEAE	*Frasera parryi*	DEER'S EARS	N	P	F
GENTIANACEAE	*Zeltnera venusta*	CANCHALAGUA	N	A	F
GERANIACEAE	*Erodium botrys*	LONG-BEAK FILAREE/STORKSBILL	E	A	F
GERANIACEAE	*Erodium brachycarpum*	SHORT-BEAK FILAREE/STORKSBILL	E	A	F
GERANIACEAE	*Erodium cicutarium*	RED-STEM FILAREE/STORKSBILL	E	A	F
GERANIACEAE	*Erodium moschatum*	WHITE-STEM FILAREE/STORKSBILL	E	A	F
GERANIACEAE	*Geranium carolinianum*	CAROLINA GERANIUM	N	A	F
GERANIACEAE	*Geranium dissectum*	CUT-LEAF GERANIUM	E	A	F
GERANIACEAE	*Pelargonium ×hortorum*	ZONAL GERANIUM	E	P	HS
GERANIACEAE	*Pelargonium grossularioides*	COCONUT-SCENT GERANIUM	E	P	F
GERANIACEAE	*Pelargonium peltatum hybrid*	IVY GERANIUM	E	P	F
GRATIOLACEAE	*Bacopa monnieri*	WATER-HYSSOP	E	P	F

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GROSSULARIACEAE	*Ribes indecorum*	WHITE-FLOWER CURRANT	N	P	S
GROSSULARIACEAE	*Ribes speciosum*	FUCHSIA-FLOWER GOOSEBERRY	N	P	S
HYPERICACEAE	*Hypericum anagalloides*	TINKER'S PENNY	N	A	F
HYPERICACEAE	*Hypericum scouleri*	SCOULER'S SAINT JOHN'S WORT	N	P	F
JUGLANDACEAE	*Carya illinoinensis*	PECAN	E	P	T
JUGLANDACEAE	*Juglans californica*	SOUTHERN CALIFORNIA BLACK WALNUT	E	P	T
JUGLANDACEAE	*Juglans nigra*	BLACK WALNUT	E	P	T
LAMIACEAE	*Lamium amplexicaule*	HENBIT	E	A	F
LAMIACEAE	*Marrubium vulgare*	HOREHOUND	E	P	F
LAMIACEAE	*Mentha ×smithiana*	RED-STEM MINT	E	P	F
LAMIACEAE	*Mentha spicata*	SPEARMINT	E	P	F
LAMIACEAE	*Monardella hypoleuca ssp. intermedia*	BICOLOR MONARDELLA	N	P	F
LAMIACEAE	*Salvia apiana*	WHITE SAGE	N	P	S
LAMIACEAE	*Salvia apiana × S. mellifera*	HYBRID WHITE SAGE	N	P	S
LAMIACEAE	*Salvia clevelandii*	FRAGRANT SAGE	N	P	S
LAMIACEAE	*Salvia columbariae*	CHIA	N	A	F
LAMIACEAE	*Salvia leucophylla*	SAN LUIS PURPLE SAGE	N	P	S
LAMIACEAE	*Salvia mellifera*	BLACK SAGE	N	P	S
LAMIACEAE	*Salvia munzii*	MUNZ'S SAGE	N	P	S
LAMIACEAE	*Salvia spathacea*	HUMMINGBIRD SAGE	N	P	F
LAMIACEAE	*Scutellaria tuberosa*	DANNY'S SKULLCAP	N	P	F
LAMIACEAE	*Stachys ajugoides*	AJUGA HEDGE-NETTLE	N	P	F
LAMIACEAE	*Stachys bullata*	CALIFORNIA HEDGE-NETTLE	N	P	F
LAMIACEAE	*Stachys rigida var. quercetorum*	OAK HEDGE-NETTLE	N	P	F
LAMIACEAE	*Stachys stebbinsii*	STEBBINS'S HEDGE-NETTLE	N	P	F

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LAMIACEAE	*Trichostema lanceolatum*	VINEGAR WEED	N	A	F
LAMIACEAE	*Westringia fruticosa*	COAST ROSEMARY	E	P	S
LAURACEAE	*Cinnamomum camphora*	CAMPHOR TREE	E	P	T
LAURACEAE	*Umbellularia californica*	CALIFORNIA BAY	N	P	T
LINACEAE	*Hesperolinon micranthum*	THREAD-STEM DWARF-FLAX	N	A	F
LINACEAE	*Linum usitatissimum*	COMMON FLAX	E	A	F
LOASACEAE	*Mentzelia micrantha*	SMALL-FLOWER STICK-LEAF	N	A	F
LYTHRACEAE	*Ammannia coccinea*	VALLEY RED-STEM	N	A	F
LYTHRACEAE	*Ammannia robusta*	GRAND RED-STEM	N	A	F
LYTHRACEAE	*Lythrum californicum*	CALIFORNIA LOOSESTRIFE	N	P	F
LYTHRACEAE	*Lythrum hyssopifolia*	GRASS POLY	E	A	F
LYTHRACEAE	*Punica granatum*	POMEGRANATE	E	P	T
MALVACEAE	*Abutilon palmeri*	INDIAN MALLOW	E	P	S
MALVACEAE	*Abutilon theophrasti*	VELVET-LEAF	E	A	F
MALVACEAE	*Lagunaria patersonia*	COW ITCH TREE	E	P	T
MALVACEAE	*Malacothamnus fasciculatus*	CHAPARRAL BUSHMALLOW	N	P	S
MALVACEAE	*Malva parviflora*	CHEESEWEED	E	A	F
MALVACEAE	*Malvella leprosa*	ALKALI MALLOW	N	P	F
MALVACEAE	*Sidalcea sparsifolia*	CHECKER-BLOOM	N	P	F
MELIACEAE	*Melia azedarach*	CHINA BERRY, PERSIAN-LILAC	E	P	T
MOLLUGINACEAE	*Glinus lotoides*	LOTUS SWEETJUICE	E	A	F
MOLLUGINACEAE	*Mollugo verticillata*	INDIAN CARPETWEED	E	A	F
MONTIACEAE	*Calandrinia breweri*	BREWER'S CALANDRINIA	N	A	F
MONTIACEAE	*Calandrinia menziesii*	RED MAIDS	N	A	F
MONTIACEAE	*Calyptridium monandrum*	COMMON CALYPTRIDIUM	N	A	F
MONTIACEAE	*Cistanthe maritima*	SEASIDE CISTANTHE	N	A	F

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MONTIACEAE	*Claytonia parviflora ssp. parviflora*	NARROW-LEAF MINER'S-LETTUCE	N	A	F
MONTIACEAE	*Claytonia perfoliata ssp. mexicana*	MEXICAN MINER'S-LETTUCE	N	A	F
MONTIACEAE	*Claytonia perfoliata ssp. perfoliata*	MINER'S-LETTUCE	N	A	F
MORACEAE	*Morus alba*	WHITE MULBERRY	E	P	T
MYRSINACEAE	*Lysimachia arvensis*	SCARLET PIMPERNEL; POOR MAN'S WEATHERGLASS	E	A	F
MYRSINACEAE	*Lysimachia minima*	COMMON CHAFFWEED	N	A	F
MYRTACEAE	*Eucalyptus camaldulensis*	RIVER RED GUM	E	P	T
MYRTACEAE	*Eucalyptus cf. sideroxylon*	RED IRON BARK	E	P	T
MYRTACEAE	*Eucalyptus citriodora*	LEMON-SCENT GUM	E	P	T
MYRTACEAE	*Eucalyptus cladocalyx*	SUGAR GUM	E	P	T
MYRTACEAE	*Eucalyptus cornuta*	YATE	E	P	T
MYRTACEAE	*Eucalyptus globulus*	BLUE GUM	E	P	T
MYRTACEAE	*Eucalyptus leucoxylon*	YELLOW GUM, WHITE IRON BARK	E	P	T
MYRTACEAE	*Eucalyptus polyanthemos*	SILVER DOLLAR GUM; RED BOX	E	P	T
MYRTACEAE	*Eucalyptus rudis*	AUSTRALIAN FLOODED GUM	E	P	T
MYRTACEAE	*Melaleuca armillaris*	BRACELET HONEY MYRTLE	E	P	T
MYRTACEAE	*Melaleuca nesophila*	SHOWY HONEY-MYRTLE; PINK MELALEUCA	E	P	S
MYRTACEAE	*Melaleuca viminalis*	WEEPING BOTTLEBRUSH	E	P	S
NYCTAGINACEAE	*Abronia maritima*	RED SAND-VERBENA	N	P	F
NYCTAGINACEAE	*Abronia maritima × A. umbellata*	BEACH SAND-VERBENA	N	A	F
NYCTAGINACEAE	*Abronia umbellata var. umbellata*	BEACH SAND-VERBENA	N	A	F
NYCTAGINACEAE	*Abronia villosa var. aurita*	CHAPARRAL SAND-VERBENA	N	A	F
NYCTAGINACEAE	*Mirabilis laevis var. crassifolia*	COASTAL WISHBONE PLANT	N	P	F
NYMPHAEACEAE	*Nymphaea cf. mexicana*	YELLOW WATERLILY	E	P	F

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Plant Species on MCB Camp Pendleton

FAMILY	Scientific Name	Common Name	Native or Exotic	Life History	Growth Form
NYMPHAEACEAE	*Nymphaea cf. odorata*	FRAGRANT WATERLILY	E	P	F
OLEACEAE	*Fraxinus dipetala*	CALIFORNIA ASH	N	P	T
OLEACEAE	*Fraxinus latifolia*	OREGON ASH	N	P	T
OLEACEAE	*Fraxinus uhdei*	SHAMEL ASH	E	P	T
OLEACEAE	*Fraxinus velutina*	VELVET ASH	N	P	T
OLEACEAE	*Olea europaea*	OLIVE	E	P	T
ONAGRACEAE	*Camissonia strigulosa*	SANDYSOIL SUN CUP	N	A	F
ONAGRACEAE	*Camissoniopsis bistorta*	CALIFORNIA SUN CUP	N	A	F
ONAGRACEAE	*Camissoniopsis bistorta × C. cheiranthifolia subsp. suffruticosa*	HYBRID BEACH EVENING-PRIMROSE	N	P	F
ONAGRACEAE	*Camissoniopsis cheiranthifolia ssp. suffruticosa*	BEACH SUN CUP	N	AP	F
ONAGRACEAE	*Camissoniopsis confusa*	SAN BERNARDINO SUN CUP	N	A	F
ONAGRACEAE	*Camissoniopsis hirtella*	FIELD SUN CUP	N	A	F
ONAGRACEAE	*Camissoniopsis ignota*	JURUPA HILLS SUN CUP	N	A	F
ONAGRACEAE	*Camissoniopsis intermedia*	INTERMEDIATE SUN CUP	N	A	F
ONAGRACEAE	*Camissoniopsis lewisii*	LEWIS' EVENING-PRIMROSE	N	A	F
ONAGRACEAE	*Camissoniopsis micrantha*	MINIATURE SUN CUP	N	A	F
ONAGRACEAE	*Camissoniopsis robusta*	ROBUST SUN CUP	N	A	F
ONAGRACEAE	*Clarkia bottae*	PUNCHBOWL GODETIA	N	A	F
ONAGRACEAE	*Clarkia epilobioides*	CANYON GODETIA	N	A	F
ONAGRACEAE	*Clarkia purpurea ssp. quadrivulnera*	FOUR-SPOT CLARKIA	N	A	F
ONAGRACEAE	*Clarkia similis*	CANYON CLARKIA	N	A	F
ONAGRACEAE	*Epilobium campestre*	SMOOTH BOISDUVALIA	N	A	F
ONAGRACEAE	*Epilobium canum ssp. canum*	CALIFORNIA FUCHSIA	N	P	HS
ONAGRACEAE	*Epilobium canum ssp. latifolium*	BROAD-LEAF CALIFORNIA FUCHSIA	N	P	HS

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FAMILY	Scientific Name	Common Name	Native or Exotic	Life History	Growth Form
ONAGRACEAE	*Epilobium ciliatum ssp. ciliatum*	WILLOW HERB	N	P	F
ONAGRACEAE	*Eulobus californicus*	FALSE-MUSTARD	N	A	F
ONAGRACEAE	*Ludwigia grandiflora*	LARGE-FLOWER PRIMROSE-WILLOW	E	P	F
ONAGRACEAE	*Ludwigia hexapetala*	URUGUAYAN PRIMROSE-WILLOW; URUGUAYAN MARSH-PURSLANE	E	P	F
ONAGRACEAE	*Ludwigia peploides ssp. peploides*	WATER-PRIMROSE	N	P	F
ONAGRACEAE	*Oenothera californica ssp. californica*	CALIFORNIA EVENING-PRIMROSE	N	P	F
ONAGRACEAE	*Oenothera elata ssp. hirsutissima*	HAIRY EVENING-PRIMROSE	N	P	F
ONAGRACEAE	*Oenothera elata ssp. hookeri*	HOOKER'S EVENING-PRIMROSE	N	P	F
ONAGRACEAE	*Oenothera speciosa*	BEAUTIFUL EVENING-PRIMROSE	E	P	F
OROBANCHACEAE	*Aphyllon parishii ssp. brachylobum*	BEACH/SHORT-LOBE BROOM-RAPE	N	P	F
OROBANCHACEAE	*Aphyllon tuberosum*	CHAPARRAL BROOM-RAPE	N	P	F
OROBANCHACEAE	*Castilleja affinis ssp. affinis*	COAST PAINTBRUSH	N	P	F
OROBANCHACEAE	*Castilleja densiflora ssp. gracilis*	PARISH'S OWL'S-CLOVER	N	A	F
OROBANCHACEAE	*Castilleja exserta ssp. exserta*	PURPLE OWL'S-CLOVER	N	A	F
OROBANCHACEAE	*Castilleja foliolosa*	WOOLLY INDIAN PAINTBRUSH	N	P	HS
OROBANCHACEAE	*Castilleja minor ssp. spiralis*	CALIFORNIA THREAD-TORCH	N	A	F
OROBANCHACEAE	*Cordylanthus rigidus ssp. setigerus*	DARK-TIP BIRD'S BEAK	N	A	F
OROBANCHACEAE	*Pedicularis densiflora*	INDIAN WARRIOR	N	P	F
OXALIDACEAE	*Oxalis californica*	CALIFORNIA WOOD-SORREL	N	P	F
OXALIDACEAE	*Oxalis corniculata*	CREEPING WOODSORREL	E	P	F
OXALIDACEAE	*Oxalis pes-caprae*	BERMUDA-BUTTERCUP	E	P	F
OXALIDACEAE	*Oxalis pilosa*	HAIRY WOOD-SORREL	N	P	F
PAEONIACEAE	*Paeonia californica*	CALIFORNIA PEONY	N	P	F
PAPAVERACEAE	*Argemone munita*	CHICALOTE, PRICKLY POPPY	N	P	F
PAPAVERACEAE	*Dendromecon rigida*	BUSH POPPY	N	P	S

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PAPAVERACEAE	*Ehrendorferia chrysantha*	GOLDEN EAR-DROPS	N	P	F
PAPAVERACEAE	*Eschscholzia californica*	CALIFORNIA POPPY	N	A	F
PAPAVERACEAE	*Meconella denticulata*	SMALL-FLOWER MECONELLA	N	A	F
PAPAVERACEAE	*Papaver californicum*	FIRE POPPY	N	A	F
PAPAVERACEAE	*Papaver heterophyllum*	WIND POPPY	N	A	F
PAPAVERACEAE	*Platystemon californicus*	CREAM CUPS	N	A	F
PAPAVERACEAE	*Romneya coulteri*	COULTER'S MATILIJA POPPY	N	P	HS
PAPAVERACEAE	*Romneya trichocalyx*	HAIRY MATILIJA POPPY	N	P	HS
PHRYMACEAE	*Diplacus ×australis*	SAN DIEGO MONKEY FLOWER	N	P	S
PHRYMACEAE	*Diplacus brevipes*	SLOPE SEMIPHORE	N	A	F
PHRYMACEAE	*Diplacus puniceus*	COAST MONKEY FLOWER	N	P	S
PHRYMACEAE	*Erythranthe cardinalis*	SCARLET MONKEY FLOWER	N	P	F
PHRYMACEAE	*Erythranthe floribunda*	SHOWY MONKEY FLOWER	N	A	F
PHRYMACEAE	*Erythranthe guttata*	SEEP MONKEY FLOWER	N	AP	F
PHRYMACEAE	*Mimetanthe pilosa*	DOWNY MONKEY FLOWER	N	A	F
PHYTOLACCACEAE	*Phytolacca americana var. americana*	POKEWEED	E	P	F
PHYTOLACCACEAE	*Phytolacca icosandra*	TROPICAL POKEWEED	E	P	S
PITTOSPORACEAE	*Pittosporum tobira*	JAPANESE PITTOSPORUM	E	P	S
PLANTAGINACEAE	*Antirrhinum coulterianum*	COULTER'S SNAPDRAGON	N	A	F
PLANTAGINACEAE	*Antirrhinum kelloggii*	CLIMBING SNAPDRAGON	N	A	F
PLANTAGINACEAE	*Antirrhinum nuttallianum ssp. nuttallianum*	NUTTALL'S SNAPDRAGON	N	A	F
PLANTAGINACEAE	*Antirrhinum nuttallianum ssp. subsessile*	BIG-GLAND NUTTALL'S SNAPDRAGON	N	A	F
PLANTAGINACEAE	*Callitriche marginata*	WINGED WATER-STARWORT	N	A	F
PLANTAGINACEAE	*Collinsia heterophylla var. heterophylla*	CHINESE HOUSES	N	A	F

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FAMILY	Scientific Name	Common Name	Native or Exotic	Life History	Growth Form
PLANTAGINACEAE	*Keckiella antirrhinoides var. antirrhinoides*	YELLOW BUSH PENSTEMON	N	P	S
PLANTAGINACEAE	*Keckiella cordifolia*	CLIMBING BUSH PENSTEMON	N	P	S
PLANTAGINACEAE	*Kickxia elatine*	FLUELLIN	E	P	S
PLANTAGINACEAE	*Kickxia spuria*	ROUNDLEAF CANCERWORT	E	A	F
PLANTAGINACEAE	*Nuttallanthus texanus*	LARGE BLUE TOADFLAX	N	A	F
PLANTAGINACEAE	*Penstemon centranthifolius*	SCARLET BUGLER	N	P	F
PLANTAGINACEAE	*Penstemon heterophyllus var. australis*	CHAPARRAL PENSTEMON	N	P	F
PLANTAGINACEAE	*Penstemon spectabilis var. spectabilis*	SHOWY PENSTEMON	N	P	F
PLANTAGINACEAE	*Plantago coronopus*	CUT-LEAF PLANTAIN	E	A	F
PLANTAGINACEAE	*Plantago elongata*	PRAIRIE PLANTAIN	N	A	F
PLANTAGINACEAE	*Plantago erecta*	DOT-SEED PLANTAIN	N	A	F
PLANTAGINACEAE	*Plantago lanceolata*	ENGLISH PLANTAIN; RIB-GRASS	E	P	F
PLANTAGINACEAE	*Plantago major*	COMMON PLANTAIN	E	P	F
PLANTAGINACEAE	*Plantago rhodosperma*	RED-SEED PLANTAIN	N	A	F
PLANTAGINACEAE	*Veronica anagallis-aquatica*	WATER SPEEDWELL	E	P	F
PLANTAGINACEAE	*Veronica arvensis*	CORN SPEEDWELL	E	A	F
PLANTAGINACEAE	*Veronica catenata*	BROAD-FRUIT/CHAIN SPEEDWELL	E	P	F
PLANTAGINACEAE	*Veronica peregrina ssp. Xalapensis*	MEXICAN/PURSLANE SPEEDWELL	N	A	F
PLATANACEAE	*Platanus racemosa*	WESTERN SYCAMORE	N	P	T
PLUMBAGINACEAE	*Limonium californicum*	WESTERN MARSH-ROSEMARY	N	P	F
PLUMBAGINACEAE	*Limonium perezii*	PEREZ'S SEA LAVENDER	E	P	F
PLUMBAGINACEAE	*Limonium ramosissimum*	ALGERIAN SEA-LAVENDER	E	P	HS
PLUMBAGINACEAE	*Limonium sinuatum*	NOTCH-LEAF MARSH-ROSEMARY	E	P	F
PLUMBAGINACEAE	*Plumbago auriculata*	CAPE LEADWORT	E	P	S
POLEMONIACEAE	*Allophyllum glutinosum*	BLUE FALSE-GILIA	N	A	F

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POLEMONIACEAE	*Eriastrum filifolium*	THREAD-LEAF WOOLLY-STAR	N	A	F
POLEMONIACEAE	*Eriastrum sapphirinum ssp. dasyanthum*	MANY-FLOWER WOOLLY-STAR	N	A	F
POLEMONIACEAE	*Eriastrum sapphirinum ssp. sapphirinum*	SAPPHIRE WOOLY-STAR	N	A	F
POLEMONIACEAE	*Gilia achilleifolia ssp. multicaulis*	MANY-STEM CALIFORNIA GILIA	N	A	F
POLEMONIACEAE	*Gilia angelensis*	GRASSLAND GILIA	N	A	F
POLEMONIACEAE	*Gilia capitata ssp. abrotanifolia*	BALL GILIA	N	A	F
POLEMONIACEAE	*Gilia ochroleuca ssp. exilis*	VOLCANIC GILIA	N	A	F
POLEMONIACEAE	*Leptosiphon liniflorus*	GREAT BASIN LINANTHUS	N	A	F
POLEMONIACEAE	*Leptosiphon parviflorus*	COAST BABY-STAR	N	A	F
POLEMONIACEAE	*Linanthus dianthiflorus*	FARINOSE GROUND PINK	N	A	F
POLEMONIACEAE	*Navarretia fossalis*	SPREADING NAVARRETIA	N	A	F
POLEMONIACEAE	*Navarretia hamata ssp. hamata*	HOOKED SKUNKWEED	N	A	F
POLEMONIACEAE	*Navarretia hamata ssp. leptantha*	HOOKED PINCUSHION PLANT	N	A	F
POLEMONIACEAE	*Saltugilia australis*	SOUTHERN GILIA	N	A	F
POLEMONIACEAE	*Saltugilia caruifolia*	CARAWAY LEAF-GILIA	N	A	F
POLYGALACEAE	*Rhinotropis cornuta var. fishiae*	FISH'S MILKWORT	N	P	S
POLYGONACEAE	*Chorizanthe fimbriata var. fimbriata*	FRINGED SPINEFLOWER	N	A	F
POLYGONACEAE	*Chorizanthe polygonoides var. longispina*	KNOTWEED SPINEFLOWER	N	A	F
POLYGONACEAE	*Chorizanthe procumbens*	PROSTRATE SPINEFLOWER	N	A	F
POLYGONACEAE	*Chorizanthe staticoides*	TURKISH RUGGING	N	A	F
POLYGONACEAE	*Emex spinosa*	DEVIL'S THORN; SPINY EMEX	E	A	F
POLYGONACEAE	*Eriogonum elongatum var. elongatum*	TALL BUCKWHEAT	N	P	F
POLYGONACEAE	*Eriogonum fasciculatum var. fasciculatum*	COAST CALIFORNIA BUCKWHEAT	N	P	S

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POLYGONACEAE	*Eriogonum fasciculatum var. foliolosum*	INLAND CALIFORNIA BUCKWHEAT	N	P	S
POLYGONACEAE	*Eriogonum giganteum var. giganteum*	SANTA CATALINA ISLAND BUCKWHEAT	E	P	S
POLYGONACEAE	*Eriogonum gracile var. gracile*	SLENDER BUCKWHEAT	N	A	F
POLYGONACEAE	*Eriogonum gracile var. incultum*	SMOOTH SLENDER BUCKWHEAT	N	A	F
POLYGONACEAE	*Eriogonum parvifolium*	BLUFF BUCKWHEAT	N	P	S
POLYGONACEAE	*Lastarriaea coriacea*	LASTARRIAEA	N	A	F
POLYGONACEAE	*Nemacaulis denudata var. denudata*	COAST WOOLY-HEADS	N	A	F
POLYGONACEAE	*Persicaria amphibia*	KELP SMARTWEED	N	P	F
POLYGONACEAE	*Persicaria lapathifolia*	WILLOW SMARTWEED; WILLOW WEED	N	A	F
POLYGONACEAE	*Persicaria maculosa*	LADY'S THUMB	E	A	F
POLYGONACEAE	*Persicaria punctata*	PERENNIAL SMARTWEED	N	A	F
POLYGONACEAE	*Polygonum aviculare ssp. depressum*	COMMON KNOTWEED, DOOR WEED	E	A	F
POLYGONACEAE	*Polygonum aviculare ssp. neglectum*	PROSTRATE KNOTWEED	E	A	F
POLYGONACEAE	*Pterostegia drymarioides*	GRANNY'S HAIRNET; G.C.P.	N	A	F
POLYGONACEAE	*Rumex californicus*	TOOTHED WILLOW DOCK	N	P	F
POLYGONACEAE	*Rumex conglomeratus*	WHORLED DOCK	E	P	F
POLYGONACEAE	*Rumex crispus*	CURLY DOCK	E	P	F
POLYGONACEAE	*Rumex dentatus*	TOOTHED DOCK	E	A	F
POLYGONACEAE	*Rumex fueginus*	GOLDEN DOCK	N	A	F
POLYGONACEAE	*Rumex hymenosepalus*	DESERT RHUBARB	N	P	F
POLYGONACEAE	*Rumex obtusifolius*	BITTER DOCK	E	P	F
POLYGONACEAE	*Rumex persicarioides*	YELLOW DOCK	N	A	F
POLYGONACEAE	*Rumex pulcher*	FIDDLE DOCK	E	P	F
POLYGONACEAE	*Rumex salicifolius*	WILLOW DOCK	N	P	F
POLYGONACEAE	*Rumex stenophyllus*	NARROW-LEAF DOCK	E	P	F
PORTULACACEAE	*Portulaca oleracea*	COMMON PURSLANE	E	A	F

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PRIMULACEAE	*Primula clevelandii ssp. clevelandii*	PADRE'S SHOOTING STAR	N	P	F
PROTEACEAE	*Macadamia integrifolia*	MACADAMIA NUT	E	P	T
RANUNCULACEAE	*Clematis lasiantha*	PIPESTEM VIRGIN'S BOWER	N	P	VS
RANUNCULACEAE	*Clematis lasiantha × C. pauciflora*	HYBRID ROPEVINE CLEMATIS	N	P	VS
RANUNCULACEAE	*Clematis ligusticifolia*	YERBA DE CHIVA	N	P	VS
RANUNCULACEAE	*Clematis pauciflora*	ROPEVINE CLEMATIS	N	P	VS
RANUNCULACEAE	*Delphinium cardinale*	CARDINAL/SCARLET LARKSPUR	N	P	F
RANUNCULACEAE	*Delphinium parryi ssp. parryi*	PARRY'S LARKSPUR	N	P	F
RANUNCULACEAE	*Myosurus minimus*	LITTLE MOUSETAIL	N	A	F
RANUNCULACEAE	*Ranunculus aquatilis var. diffusus*	HAIR-LEAF WATER BUTTERCUP	N	P	F
RANUNCULACEAE	*Ranunculus californicus var. californicus*	CALIFORNIA BUTTERCUP	N	P	F
RANUNCULACEAE	*Ranunculus hebecarpus*	HAIRY-FRUIT BUTTERCUP	N	A	F
RANUNCULACEAE	*Thalictrum fendleri var. polycarpum*	SMOOTH-LEAF MEADOW-RUE	N	P	F
RESEDACEAE	*Oligomeris linifolia*	NARROWA-LEAF OLIGOMERIS	N	A	F
RHAMNACEAE	*Ceanothus aff. thyrsiflorus*	BLUE BLOSSOM	N	P	S
RHAMNACEAE	*Ceanothus crassifolius*	THICK-LEAF-LILAC	N	P	S
RHAMNACEAE	*Ceanothus leucodermis*	CHAPARRAL WHITETHORN	N	P	S
RHAMNACEAE	*Ceanothus oliganthus var. orcuttii*	ORCUTT'S HAIRY CEANOTHUS	N	P	S
RHAMNACEAE	*Ceanothus oliganthus var. sorediatus*	JIM BRUSH	N	P	S
RHAMNACEAE	*Ceanothus pendletonensis*	PENDLETON-LILAC	N	P	S
RHAMNACEAE	*Ceanothus spinosus*	GREEN-BARK-LILAC	N	P	S
RHAMNACEAE	*Ceanothus spinosus × C. tomentosus*	HYBRID GREEN-BARK-LILAC	N	P	S
RHAMNACEAE	*Ceanothus tomentosus*	RAMONA-LILAC	N	P	S
RHAMNACEAE	*Ceanothus tomentosus × C. leucodermis*	HYBRID RAMONA-LILAC	N	P	S
RHAMNACEAE	*Frangula californica ssp. californica*	CALIFORNIA COFFEEBERRY	N	P	S

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RHAMNACEAE	*Frangula californica ssp. tomentella*	CHAPARRAL COFFEEBERRY	N	P	S
RHAMNACEAE	*Rhamnus ilicifolia*	HOLLY-LEAF REDBERRY	N	P	S
ROSACEAE	*Adenostoma fasciculatum var. fasciculatum*	CHAMISE	N	P	S
ROSACEAE	*Adenostoma fasciculatum var. obtusifolium*	SAN DIEGO CHAMISE	N	P	S
ROSACEAE	*Aphanes occidentalis*	WESTERN LADY'S MANTLE	N	A	F
ROSACEAE	*Cercocarpus betuloides var. betuloides*	BIRCH-LEAF MOUNTAIN-MAHOGANY	N	P	S
ROSACEAE	*Cercocarpus minutiflorus*	SAN DIEGO MOUNTAIN-MAHOGANY	N	P	S
ROSACEAE	*Chamaebatia australis*	SOUTHERN MOUNTAIN MISERY	N	P	S
ROSACEAE	*Coleogyne ramosissima*	BLACKBUSH	N	P	S
ROSACEAE	*Drymocallis glandulosa var. glandulosa*	STICKY CINQUEFOIL	N	P	F
ROSACEAE	*Drymocallis glandulosa var. reflexa*	GREENE'S CINQUEFOIL	N	P	F
ROSACEAE	*Drymocallis glandulosa var. wrangelliana*	WRANGEL CINQUEFOIL	N	P	S
ROSACEAE	*Heteromeles arbutifolia*	CHRISTMAS BERRY; TOYON	N	P	S
ROSACEAE	*Horkelia cuneata var. cuneata*	COAST HORKELIA	N	P	F
ROSACEAE	*Horkelia cuneata var. puberula*	MESA HORKELIA	N	P	F
ROSACEAE	*Horkelia truncata*	RAMONA HORKELIA	N	P	F
ROSACEAE	*Potentilla anserina ssp. pacifica*	PACIFIC SILVERWEED	N	P	F
ROSACEAE	*Prunus ilicifolia ssp. ilicifolia*	HOLLY-LEAF CHERRY	N	P	S
ROSACEAE	*Prunus ilicifolia ssp. lyonii*	CATALINA ISLAND CHERRY	E	P	S
ROSACEAE	*Rosa californica*	CALIFORNIA ROSE	N	P	S
ROSACEAE	*Rubus armeniacus*	HIMALAYAN BLACKBERRY	E	P	VS
ROSACEAE	*Rubus ursinus*	CALIFORNIA BLACKBERRY	N	P	VS
RUBIACEAE	*Galium angustifolium ssp. angustifolium*	NARROW-LEAF BEDSTRAW	N	P	HS

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FAMILY	Scientific Name	Common Name	Native or Exotic	Life History	Growth Form
RUBIACEAE	*Galium aparine*	COMMON BEDSTRAW; GOOSE GRASS	N	A	VF
RUBIACEAE	*Galium nuttallii ssp. nuttallii*	SAN DIEGO BEDSTRAW	N	P	VF
RUBIACEAE	*Galium parisiense*	WALL BEDSTRAW	E	A	F
RUBIACEAE	*Galium porrigens var. porrigens*	CLIMBING/OVAL-LEAF BEDSTRAW	N	P	VS
RUTACEAE	*Cneoridium dumosum*	COAST SPICE BUSH; BUSH-RUE	N	P	S
SALICACEAE	*Populus fremontii ssp. fremontii*	WESTERN COTTONWOOD	N	P	T
SALICACEAE	*Populus trichocarpa*	BLACK COTTONWOOD	N	P	T
SALICACEAE	*Salix exigua var. hindsiana*	HINDS'S WILLOW	N	P	S
SALICACEAE	*Salix gooddingii*	GOODDING'S BLACK WILLOW	N	P	T
SALICACEAE	*Salix laevigata*	RED WILLOW	N	P	T
SALICACEAE	*Salix lasiandra var. lasiandra*	SHINING WILLOW	N	P	T
SALICACEAE	*Salix lasiolepis*	ARROYO WILLOW	N	P	T
SAPINDACEAE	*Dodonaea viscosa*	HOP BUSH	E	P	T
SAURURACEAE	*Anemopsis californica*	YERBA MANSA	N	P	F
SAXIFRAGACEAE	*Jepsonia parryi*	COAST JEPSONIA	N	P	F
SAXIFRAGACEAE	*Lithophragma affine*	WOODLAND STAR	N	P	F
SCROPHULARIACEAE	*Myoporum laetum*	NGAIO, MOUSEHOLE TREE	E	P	T
SCROPHULARIACEAE	*Myoporum montanum*	WATERBUSH, BOOBIALA	E	P	S
SCROPHULARIACEAE	*Myoporum parvifolium*	SLENDER MYOPORUM	E	P	S
SCROPHULARIACEAE	*Scrophularia californica ssp. floribunda*	CALIFORNIA BEE PLANT; CALIFORNIA FIGWORT	N	AP	F
SCROPHULARIACEAE	*Verbascum thapsus*	COMMON MULLEIN	E	A	F
SCROPHULARIACEAE	*Verbascum virgatum*	WAND MULLEIN	E	B	F
SIMAROUBACEAE	*Ailanthus altissima*	TREE-OF-HEAVEN	E	P	T
SOLANACEAE	*Datura wrightii*	WESTERN JIMSON WEED	N	AP	F
SOLANACEAE	*Lycium andersonii*	WATERJACKET	N	P	S

Abbreviations: native (n), exotic (E), annual (A), annual/perennial (AP), biennial (B), perennial (P), forb (F), grass (G), half-shrub (HS), shrub (S), Tree (T), tree/shrub (TS), vine/forb (VF), vine/shrub (VS).

Appendix E
Plant Species on MCB Camp Pendleton

FAMILY	Scientific Name	Common Name	Native or Exotic	Life History	Growth Form
SOLANACEAE	*Lycium californicum*	CALIFORNIA DESERT THORN	N	P	S
SOLANACEAE	*Lycopersicon esculentum*	GARDEN TOMATO	E	A	F
SOLANACEAE	*Nicotiana clevelandii*	CLEVELAND'S TOBACCO	N	A	F
SOLANACEAE	*Nicotiana glauca*	TREE TOBACCO	E	P	T
SOLANACEAE	*Nicotiana quadrivalvis*	INDIAN TOBACCO	N	A	F
SOLANACEAE	*Physalis aff. greenei*	GREENE'S GROUND-CHERRY	N	A	F
SOLANACEAE	*Physalis philadelphica*	TOMATILLO	E	A	F
SOLANACEAE	*Physalis pubescens var. grisea*	STRAWBERRY-TOMATO GROUND-CHERRY	E	A	F
SOLANACEAE	*Solanum americanum*	WHITE NIGHTSHADE	N	AP	F
SOLANACEAE	*Solanum douglasii*	DOUGLAS'S NIGHTSHADE	N	P	F
SOLANACEAE	*Solanum elaeagnifolium*	WHITE/SILVER-LEAF HORSE-NETTLE	E	A	F
SOLANACEAE	*Solanum furcatum*	FORKED NIGHTSHADE	E	AP	F
SOLANACEAE	*Solanum nigrum*	BLACK NIGHTSHADE	E	AP	F
SOLANACEAE	*Solanum parishii*	PARISH'S NIGHTSHADE	N	P	HS
SOLANACEAE	*Solanum tenuilobatum*	SAN DIEGO NIGHTSHADE	N	P	HS
SOLANACEAE	*Solanum umbelliferum*	BLUE WITCH	N	P	HS
SOLANACEAE	*Solanum xanti*	CHAPARRAL NIGHTSHADE	N	P	HS
STYRACACEAE	*Styrax redivivus*	SNOWDROP BUSH	N	P	S
TAMARICACEAE	*Tamarix gallica*	FRENCH TAMARISK	E	P	T
TAMARICACEAE	*Tamarix hohenackeri*	HOHENACKER TAMARISK	E	P	T
TAMARICACEAE	*Tamarix ramosissima*	SALTCEDAR	E	P	T
THEOPHRASTACEAE	*Samolus parviflorus*	WATER-PIMPERNEL, SEASIDE BROOKWEED	N	P	F
TROPAEOLACEAE	*Tropaeolum majus*	GARDEN NASTURTIUM	E	A	F
ULMACEAE	*Ulmus parvifolia*	CHINESE ELM	E	P	T

Abbreviations: native (n), exotic (E), annual (A), annual/perennial (AP), biennial (B), perennial (P), forb (F), grass (G), half-shrub (HS), shrub (S), Tree (T), tree/shrub (TS), vine/forb (VF), vine/shrub (VS).

Appendix E
Plant Species on MCB Camp Pendleton

FAMILY	Scientific Name	Common Name	Native or Exotic	Life History	Growth Form
URTICACEAE	*Hesperocnide tenella*	WESTERN NETTLE	N	A	F
URTICACEAE	*Parietaria hespera var. californica*	CALIFORNIA PELLITORY	N	A	F
URTICACEAE	*Parietaria hespera var. hespera*	WESTERN PELLITORY	N	A	F
URTICACEAE	*Urtica dioica ssp. holosericea*	HOARY NETTLE	N	P	F
URTICACEAE	*Urtica urens*	DWARF NETTLE	E	A	F
VALERIANACEAE	*Plectritis ciliosa*	LONG-SPUR PLECTRITIS	N	A	F
VALERIANACEAE	*Plectritis congesta ssp. brachystemon*	SHORT-SPUR PLECTRITIS	N	A	F
VERBENACEAE	*Glandularia pulchella*	SOUTH AMERICAN MOCK VERVAIN	E	AP	F
VERBENACEAE	*Lantana camara*	LANTANA	E	P	F
VERBENACEAE	*Phyla lanceolata*	GARDEN LIPPIA	N	P	F
VERBENACEAE	*Verbena bracteata*	BRACT VERVAIN	N	A	F
VERBENACEAE	*Verbena lasiostachys var. lasiostachys*	WESTERN VERVAIN	N	P	F
VERBENACEAE	*Verbena lasiostachys var. scabrida*	ROBUST VERVAIN	N	P	F
VERBENACEAE	*Verbena litoralis*	SEASHORE VERVAIN	E	P	F
VERBENACEAE	*Verbena menthifolia*	MINT-LEAF VERVAIN	N	P	F
VIOLACEAE	*Viola pedunculata*	JOHNNY JUMP-UP	N	P	F
VIOLACEAE	*Viola purpurea ssp. purpurea*	MOUNTAIN VIOLET	N	P	F
VISCACEAE	*Phoradendron leucarpum ssp. macrophyllum*	BIG-LEAF MISTLETOE	N	P	HS
VISCACEAE	*Phoradendron leucarpum ssp. tomentosum*	OAK MISTLETOE	N	P	HS
VITACEAE	*Vitis aff. girdiana*	SOUTHERN CALIFORNIA WILD GRAPE HYBRID	E	P	VS
VITACEAE	*Vitis girdiana*	SOUTHERN CALIFORNIA WILD GRAPE	N	P	VS
VITACEAE	*Vitis vinifera*	CULTIVATED GRAPE, WINE GRAPE	E	P	VS
ZYGOPHYLLACEAE	*Tribulus terrestris*	PUNCTUREVINE	E	A	F

Abbreviations: native (n), exotic (E), annual (A), annual/perennial (AP), biennial (B), perennial (P), forb (F), grass (G), half-shrub (HS), shrub (S), Tree (T), tree/shrub (TS), vine/forb (VF), vine/shrub (VS).

Appendix F

Wildlife Species on MCB Camp Pendleton

Appendix F
Vertebrate Wildlife Species Occurring on Marine Corps Base Camp Pendleton

All species are listed in ascending phylogenetic order and alphabetically by family.

Bolded text indicates exotic or vagrant species know to occur on, but not native to Camp Pendleton.

Fish			
Family	**Species**	**Common Name**	**Origin**
Atherinidae	*Atherinops affinis*	Topsmelt	Native
Atherinidae	*Atherinopsis californiensis*	Jacksmelt	Native
Atherinidae	*Leuresthes tenuis*	California Grunion	Native
Bothidae	*Citharichthys sordidus*	Pacific Sanddab	Native
Bothidae	*Citharichthys stigmaeus*	Speckled Sanddab	Native
Bothidae	*Citharichthys xanthostigma*	Longfin Sanddab	Native
Bothidae	*Paralichthys californicus*	California Halibut	Native
Carcharhinidae	*Mustelus californicus*	Gray Smoothhound	Native
Centrarchidae	***Lepomis cyanellus***	**Green Sunfish**	**Exotic**
Centrarchidae	***Lepomis macrochirus***	**Bluegill**	**Exotic**
Centrarchidae	***Lepomis microlophus***	**Redear Sunfish**	**Exotic**
Centrarchidae	***Micropterus coosae***	**Redeye Bass**	**Exotic**
Centrarchidae	***Micropterus salmonides***	**Largemouth Bass**	**Exotic**
Centrarchidae	***Micropterus dolomieu***	**Smallmouth bass**	**Exotic**
Centrarchidae	*Paralabrax clathratus*	Spotted Sand Bass	Native
Centrarchidae	***Pomoxis nigromaculatus***	**Black Crappie**	**Exotic**
Centrarchidae	*Stereolepis gigas*	Giant Sea Bass	Native
Clinidae	*Hypsoblennius gentilis*	Bay Blenny	Native
Cottidae	*Leptocottus armatus*	Staghorn Sculpin	Native
Cynoglossidae	*Symphurus atricauda*	California Tonguefish	Native
Cyprinidae	***Cyprinus carpio***	**Carp**	**Exotic**
Cyprinidae	*Gila orcutti*	Arroyo Chub	Native

Cyprinidae	***Notemigonus crysoleucas***	**Golden Shiner**	**Exotic**
Cyprinidae	***Pimphales promelas***	**Flathead Minnow**	**Exotic**
Cyprinodontidae	*Fundulus parvipinnis*	California Killifish	Native
Embiotocidae	*Amphistichus argenteus*	Barred Surfperch	Native
Embiotocidae	*Cymatogaster aggregata*	Shiner Surfperch	Native
Embiotocidae	*Micrometrus minimus*	Dwarf Surfperch	Native
Engraulididae	*Anchoa compressa*	Deepbody Anchovy	Native
Engraulididae	*Anchoa delicatissima*	Bay Anchovy	Native
Engraulididae	*Engraulis mordax*	Northern anchovy	Native
Gasterosteidae	*Gasterosteus aculeatus williamsoni*	Unarmored Threespine Stickleback	**Extirpated**
Girellidae	*Girella nigricans*	Opaleye	Native
Gobiidae	*Clevlandia ios*	Arrow Goby	Native
Gobiidae	*Ctenogobius sagitulla*	Longtail Goby	Native
Gobiidae	*Eucyclogobius kristinae* [=*Eucyclogobius newberryi*]	Southern Tidewater Goby [=Tidewater Goby]	Native
Gobiidae	*Gillichthys mirabilis*	Longjaw Mudsucker	Native
Gobiidae	*Ilypnus gilberti*	Cheekspot Goby	Native
Gobiidae	*Quietula y-cauda*	American Shadow Goby	Native
Ictaluridae	***Ameiurus melas***	**Black Bullhead**	**Exotic**
Ictaluridae	***Ameiurus natalis***	**Yellow Bullhead**	**Exotic**
Ictaluridae	***Ictalurus nebulosus***	**Brown Bullhead**	**Exotic**
Ictaluridae	***Ictalurus punctatus***	**Channel Catfish**	**Exotic**
Mugilidae	*Mugil cephalus*	Striped Mullet	Native
Myliobatididae	*Gymnura marmorata*	Butterfly Ray	Native
Myliobatididae	*Myliobatis californica*	Bat Ray	Native
Myliobatididae	*Urolophus halleri*	Round Stingray	Native
Percidae	***Acanthogobius flavimanus***	**Yellowfin Goby**	**Exotic**
Pleuronectidae	*Hypsopsetta guttulata*	Diamond Turbot	Native

Pleuronectidae	*Platyichthys stellatus*	Starry Flounder	Native
Poeciliidae	***Gambusia affinis***	**Mosquitofish**	**Exotic**
Salmonidae	*Oncorhynchus kisutch*	Silver Salmon	Native
Salmonidae	*Oncorhynchus mykiss*	Southern California Steelhead	Native
Sciaenidae	*Cynoscion nobilis*	White Seabass	Native
Sciaenidae	*Menticirrhus undulatus*	California Corbina	Native
Sciaenidae	*Roncador sternsii*	Spotfin Croaker	Native
Sciaenidae	*Seriphus politus*	Queenfish	Native
Sciaenidae	*Umbrina roncador*	Yellowfin Croaker	Native
Scombridae	*Sarda chiliensis*	Pacific Bonito	Native
Scombridae	*Scomber japonicus*	Pacific Mackerel	Native
Scombridae	*Thunnus alalunga*	Albacore	Native
Serranidae	***Morone saxatilis***	**Striped Bass**	**Exotic**
Serranidae	*Paralabrax clathratus*	Kelp Bass	Native
Serranidae	*Paralabrax maculatofasciatus*	Spotted Sand Bass	Native
Serranidae	*Paralabrax nebulifer*	Barred Sand Bass	Native
Serranidae	*Stereolepis gigas*	Giant Sea Bass	Native
Sphyraenidae	*Pimelometopon pulchrum*	California Sheephead	Native
Sphyraenidae	*Sphyraena argentea*	California Barracuda	Native
Syngnathidae	*Syngnathus auliscus*	Bay Pipefish	Native
Syngnathidae	*Syngnathus leptorhynchus*	Pipefish	Native
Amphibians			
Bufonidae	*Anaxyrus californicus*	Arroyo Toad	Native
Bufonidae	*Anaxyrus boreas halophilus*	Southern California Toad	Native
Hylidae	*Pseudacris cadaverina*	California Treefrog	Native
Hylidae	*Pseudacris hypochondriaca*	Baja California Treefrog	Native
Plethodontidae	*Aneides lugubris*	Arboreal Salamander	Native
Plethodontidae	*Batrachoseps major*	Garden Slender Salamander	Native

Plethodontidae	*Ensatina eschscholtzii eschscholtzii*	Monterey Ensatina	Native
Ranidae	***Rana catesbeiana***	**Bullfrog**	**Exotic**
Ranidae	*Rana draytonii*	California Red-legged Frog	**Extirpated**
Salamandridae	*Taricha torosa*	Coast Range Newt	Native
Scaphiopodidae	*Spea hammondii*	Western Spadefoot	Native
Reptiles			
Anguidae	*Elgaria multicarinata webbii*	Woodland Alligator Lizard [=San Diego Alligator Lizard]	Native
Anniellidae	*Anniella stebbinsi*	San Diegan Legless Lizard	Native
Boidae	*Lichanura orcutti*	Rosy Boa	Native
Cheloniidae	*Caretta caretta*	Loggerhead Sea Turtle	Native
Cheloniidae	*Chelonia mydas*	Green Sea Turtle	Native
Cheloniidae	*Lepidochelys olivacea*	Olive Ridley Sea Turtle	Native
Chelydridae	***Chelydra serpentina***	**Common Snapping Turtle**	**Exotic**
Colubridae	*Arizona elegans occidentalis*	California Glossy Snake	Native
Colubridae	*Coluber constrictor mormon*	Western Yellow-bellied Racer	Native
Colubridae	*Diadophis punctatus similis*	San Diego Ring-necked Snake	Native
Colubridae	*Hypsiglena ochrorhyncha klauberi*	San Diego Night Snake	Native
Colubridae	*Lampropeltis californiae*	California Kingsnake	Native
Colubridae	*Coluber flagellum piceus*	Red Racer	Native
Colubridae	*Coluber lateralis lateralis*	California Striped Racer	Native
Colubridae	*Pituophis catenifer annectens*	San Diego Gophersnake	Native
Colubridae	*Rhinoceilus lecontei*	Long-nosed Snake	Native
Colubridae	*Salvadora hexalepis virgultea*	Coast Patch-nosed Snake	Native
Colubridae	*Tantilla planiceps*	Western Black-headed Snake	Native
Colubridae	*Trimorphodon lyrophanes*	California Lyresnake	Native
Dermochelyidae	*Dermochelys coriacea*	Leatherback Sea Turtle	Native
Emydidae	***Chrysemys picta***	**Painted Turtle**[9]	**Exotic**

Emydidae	*Actinemys pallida*	Southwestern Pond Turtle	Native
Emydidae	***Pseudemys nelsoni***	**Florida Red-bellied Turtle**	**Exotic**
Emydidae	***Trachmys scripta elegans***	**Red-eared Slider**	**Exotic**
Eublepharidae	*Coleonyx variegatus abbotti*	San Diego Banded Gecko	Native
Leptotyphlopidae	*Rena humilis humilis*	Southwestern Threadsnake	Native
Natricidae	*Thamnophis hammondii*	Two-striped Garter Snake	Native
Natricidae	*Thamnophis sirtalis infernalis*	California Red-Sided Garter Snake	Native
Phrynosomatidae	*Phrynosoma blainvillii*	San Diego Horned Lizard	Native
Phrynosomatidae	*Sceloporus occidentalis longipes*	Great Basin Fence Lizard	Native
Phrynosomatidae	*Sceloporus orcutti*	Granite Spiny Lizard	Native
Phrynosomatidae	*Uta stansburiana elegans*	Western Side-blotched Lizard	Native
Scincidae	*Plestiodon gilberti rubricaudatus*	Western Red-tailed Skink	Native
Scincidae	*Plestiodon skiltonianus skiltonianus*	Skilton's Skink	Native
Teiidae	*Aspidoscelis hyperythra beldingi*	Belding's Orange-throated Whiptail	Native
Teiidae	*Aspidoscelis tigris stejnegeri*	Coastal Whiptail	Native
Viperidae	*Crotalus mitchelli pyrrhus*	Southwestern Speckled Rattlesnake	Native
Viperidae	*Crotalus ruber ruber*	Red Diamond Rattlesnake	Native
Viperidae	*Crotalus oreganus helleri*	Southern Pacific Rattlesnake	Native
Birds			
Accipitridae	*Accipiter cooperii*	Cooper's Hawk	Native
Accipitridae	*Accipiter striatus*	Sharp-shinned Hawk	Native
Accipitridae	*Aquila chrysaetos*	Golden Eagle	Native
Accipitridae	*Buteo albonotatus*	Zone-tailed Hawk	Native
Accipitridae	*Buteo jamaicensis*	Red-tailed Hawk	Native
Accipitridae	*Buteo lagopus*	Rough-legged Hawk	Native
Accipitridae	*Buteo lineatus*	Red-shouldered Hawk	Native

Accipitridae	*Buteo regalis*	Ferruginous Hawk	Native
Accipitridae	*Buteo swainsoni*	Swainson's Hawk	Native
Accipitridae	*Circus cyaneus*	Northern Harrier	Native
Accipitridae	*Elanus leucurus*	White-tailed Kite	Native
Accipitridae	*Haliaeetus leucocephalus*	Bald Eagle	Native
Aegithalidae	*Psaltriparus minimus*	Bushtit	Native
Alaudidae	*Eremophila alpestris actia*	California Horned Lark	Native
Alcedinidae	*Ceryle alcyon*	Belted Kingfisher	Native
Alcidae	*Cepphus columba*	Pigeon Guillemot	Native
Alcidae	*Cerorhinca monocerata*	Rhinoceros Auklet	Native
Alcidae	*Fratercula cirrhata*	Tufted Puffin	Native
Alcidae	*Ptychoramphus aleuticus*	Cassin's Auklet	Native
Alcidae	*Synthliboramphus hypoleucus*	Xantus' Murrelet	Native
Alcidae	*Uria aalge*	Common Murre	Native
Anatidae	***Aix galericulata***	**Mandarin Duck**	**Exotic**
Anatidae	*Aix sponsa*	Wood Duck	Native
Anatidae	*Anas acuta*	Northern Pintail	Native
Anatidae	*Anas americana*	American Wigeon	Native
Anatidae	*Anas clypeata*	Northern Shoveler	Native
Anatidae	*Anas crecca*	Green-winged Teal	Native
Anatidae	*Anas cyanoptera*	Cinnamon Teal	Native
Anatidae	*Anas discors*	Blue-winged Teal	Native
Anatidae	*Anas penelope*	Eurasian Wigeon	Native
Anatidae	*Anas platyrhynchos*	Mallard	Native
Anatidae	*Anas strepera*	Gadwall	Native
Anatidae	*Anser albifrons elgasi*	Tule Greater White-fronted Goose	Native
Anatidae	*Aythya affinis*	Lesser Scaup	Native
Anatidae	*Aythya americana*	Redhead	Native

Anatidae	*Aythya collaris*	Ring-necked Duck	Native
Anatidae	*Aythya marila*	Greater Scaup	Native
Anatidae	*Aythya valisineria*	Canvasback	Native
Anatidae	*Branta bernicla*	Brant	Native
Anatidae	*Branta hutchinsii leucopareia*	Aleutian Cackling Goose	Native
Anatidae	*Bucephala albeola*	Bufflehead	Native
Anatidae	*Bucephala clangula*	Common Goldeneye	Native
Anatidae	*Chen caerulescens*	Snow Goose	Native
Anatidae	*Chen rossii*	Ross's Goose	Native
Anatidae	*Clangula hyemalis*	Long-tailed Duck	Native
Anatidae	*Cygnus columbianus*	Tundra Swan	Native
Anatidae	*Lophodytes cucullatus*	Hooded Merganser	Native
Anatidae	*Melanitta fusca*	White-winged Scoter	Native
Anatidae	*Melanitta nigra*	Black Scoter	Native
Anatidae	*Melanitta perspicillata*	Surf Scoter	Native
Anatidae	*Mergus merganser*	Common Merganser	Native
Anatidae	*Mergus serrator*	Red-breasted Merganser	Native
Anatidae	*Oxyura jamaicensis*	Ruddy Duck	Native
Apodidae	*Aeronautes saxatalis*	White-throated Swift	Native
Apodidae	*Chaetura pelagica*	Chimney Swift	Native
Apodidae	*Chaetura vauxi*	Vaux's Swift	Native
Ardeidae	*Ardea alba*	Great Egret	Native
Ardeidae	*Ardea herodias*	Great Blue Heron	Native
Ardeidae	*Botaurus lentiginosus*	American Bittern	Native
Ardeidae	*Bubulcus ibis*	Cattle Egret	Native
Ardeidae	*Butorides virescens*	Green Heron	Native
Ardeidae	*Egretta caerulea*	Little Blue Heron	Native
Ardeidae	*Egretta rufescens*	Reddish Egret	Native
Ardeidae	*Egretta thula*	Snowy Egret	Native

Ardeidae	*Egretta tricolor*	Tricolored Heron	Native
Ardeidae	*Ixobrychus exilis*	Least Bittern	Native
Ardeidae	*Nyctanassa violacea*	Yellow-crowned Night Heron	Native
Ardeidae	*Nycticorax nycticorax*	Black-crowned Night Heron	Native
Bombycillidae	*Bombycilla cedrorum*	Cedar Waxwing	Native
Calcariidae	*Calcarius ornatus*	Chestnut-collared Longspur	Native
Caprimulgidae	*Chordeiles acutipennis*	Lesser Nighthawk	Native
Caprimulgidae	*Phalaenoptilus nuttallii*	Common Poorwill	Native
Cardinalidae	***Cardinalis cardinalis***	**Northern Cardinal**	**Exotic**
Cardinalidae	*Guiraca caerulea*	Blue Grosbeak	Native
Cardinalidae	*Passerina amoena*	Lazuli Bunting	Native
Cardinalidae	*Pheucticus ludovicianus*	Rose-breasted Grosbeak	Native
Cardinalidae	*Pheucticus melanocephalus*	Black-headed Grosbeak	Native
Cardinalidae	*Piranga ludoviciana*	Western Tanager	Native
Cardinalidae	*Piranga rubra*	Summer Tanager	Native
Cardinalidae	*Spiza americana*	Dickcissel	Native
Cathartidae	*Cathartes aura*	Turkey Vulture	Native
Cathartidae	*Gymnogyps californianus*	California Condor	**Extirpated**
Certhidae	*Certhia americana*	Brown Creeper	Native
Charadriidae	*Charadrius alexandrinus nivosus*	Western Snowy Plover	Native
Charadriidae	*Charadrius montanus*	Mountain Plover	Native
Charadriidae	*Charadrius semipalmatus*	Semipalmated Plover	Native
Charadriidae	*Charadrius vociferus*	Killdeer	Native
Charadriidae	*Pluvialis dominica*	Lesser Golden Plover	Native
Charadriidae	*Pluvialis squatarola*	Black-bellied Plover	Native
Ciconiidae	*Mycteria americana*	Wood Stork	Vagrant
Columbidae	*Columba fasciata*	Band-tailed Pigeon	Native
Columbidae	***Columba livia***	**Rock Pigeon**	**Exotic**
Columbidae	*Columbina passerina*	Common Ground-Dove	Native

Columbidae	***Streptopelia chinensis***	**Spotted Dove**	**Exotic**
Columbidae	***Streptopelia decaocto***	**Eurasian Collared Dove**	**Exotic**
Columbidae	*Zenaida asiatica*	White-winged Dove	Native
Columbidae	*Zenaida macroura*	Mourning Dove	Native
Corvidae	*Aphelocoma californica*	Western Scrub-Jay	Native
Corvidae	*Calocitta colliei*	Black-throated Magpie-Jay	Native
Corvidae	*Corvus brachyrhynchus*	American Crow	Native
Corvidae	*Corvus corax*	Common Raven	Native
Corvidae	*Cyanocitta stelleri*	Steller's Jay	Native
Cuculidae	*Coccyzus americanus*	Yellow-billed Cuckoo, western DPS	Native
Cuculidae	*Geococcyx californianus*	Greater Roadrunner	Native
Diomedeidae	*Phoebastria immutabilis*	Laysan Albatross	Native
Emberizidae	*Aimophila ruficeps canescens*	Southern California Rufous-crowned Sparrow	Native
Emberizidae	*Ammodramus savannarum*	Grasshopper Sparrow	Native
Emberizidae	*Amphispiza belli belli*	Bell's Sage Sparrow	Native
Emberizidae	*Calamospiza melanocorys*	Lark Bunting	Native
Emberizidae	*Chondestes grammacus*	Lark Sparrow	Native
Emberizidae	*Junco hyemalis*	Dark-eyed Junco	Native
Emberizidae	*Melospiza georgiana*	Swamp Sparrow	Native
Emberizidae	*Melospiza lincolnii*	Lincoln's Sparrow	Native
Emberizidae	*Melospiza melodia*	Song Sparrow	Native
Emberizidae	*Passerculus sandwichensis beldingi*	Belding's Savannah Sparrow	Native
Emberizidae	*Passerculus sandwichensis rostratus*	Large-billed Savannah Sparrow	Native
Emberizidae	*Passerella iliaca*	Fox Sparrow	Native
Emberizidae	*Pipilo chlorurus*	Green-tailed Towhee	Native
Emberizidae	*Pipilo crissalis*	California Towhee	Native

Emberizidae	*Pipilo fuscus*	Canyon Towhee	Native
Emberizidae	*Pipilo maculatus*	Spotted Towhee	Native
Emberizidae	*Pooecetes gramineus*	Vesper Sparrow	Native
Emberizidae	*Spizella atrogularis*	Black-chinned Sparrow	Native
Emberizidae	*Spizella breweri*	Brewer's Sparrow	Native
Emberizidae	*Spizella pallida*	Clay-colored Sparrow	Native
Emberizidae	*Spizella passerina*	Chipping Sparrow	Native
Emberizidae	*Zonotrichia albicollis*	White-throated Sparrow	Native
Emberizidae	*Zonotrichia atricapilla*	Golden-crowned Sparrow	Native
Emberizidae	*Zonotrichia leucophrys*	White-crowned Sparrow	Native
Falconidae	*Falco columbarius*	Merlin	Native
Falconidae	*Falco mexicanus*	Prairie Falcon	Native
Falconidae	*Falco peregrinus anatum*	American Peregrine Falcon	Native
Falconidae	*Falco sparverius*	American Kestrel	Native
Fregatidae	*Fregata magnificens*	Magnificent Frigatebird	Native
Fringillidae	*Carduelis lawrencei*	Lawrence's Goldfinch	Native
Fringillidae	*Carduelis pinus*	Pine Siskin	Native
Fringillidae	*Carduelis psaltria*	Lesser Goldfinch	Native
Fringillidae	*Carduelis tristis*	American Goldfinch	Native
Fringillidae	*Carpodacus mexicanus*	House Finch	Native
Fringillidae	*Carpodacus purpureus*	Purple Finch	Native
Fringillidae	*Loxia curvirostra*	Red Crossbill	Native
Gaviidae	*Gavia arctica*	Arctic Loon	Native
Gaviidae	*Gavia immer*	Common Loon	Native
Gaviidae	*Gavia pacifica*	Pacific Loon	Native
Gaviidae	*Gavia stellata*	Red-throated Loon	Native
Haematopodidae	*Haematopus bachmani*	Black Oystercatcher	Native
Hirundinidae	*Hirundo rustica*	Barn Swallow	Native
Hirundinidae	*Petrochelidon pyrrhonota*	Cliff Swallow	Native

Hirundinidae	*Progne subis*	Purple Martin	Native
Hirundinidae	*Riparia riparia*	Bank Swallow	Native
Hirundinidae	*Stelgidopteryx serripennis*	Northern Rough-winged Swallow	Native
Hirundinidae	*Tachycineta bicolor*	Tree Swallow	Native
Hirundinidae	*Tachycineta thalassina*	Violet-green Swallow	Native
Hydrobatidae	*Oceanodroma furcata*	Fork-tailed Storm-Petrel	Native
Hydrobatidae	*Oceanodroma homochroa*	Ashy Storm-Petrel	Native
Hydrobatidae	*Oceanodroma melania*	Black Storm-petrel	Native
Hydrobatidae	*Oceanodroma microsoma*	Least Storm-Petrel	Native
Icteridae	*Agelaius phoeniceus*	Red-winged Blackbird	Native
Icteridae	*Agelaius tricolor*	Tricolored Blackbird	Native
Icteridae	*Euphagus cyanocephalus*	Brewer's Blackbird	Native
Icteridae	*Icterus bullockii*	Bullock's Oriole	Native
Icteridae	*Icterus cucullatus*	Hooded Oriole	Native
Icteridae	*Icterus galbula*	Baltimore Oriole	Native
Icteridae	*Icterus parisorum*	Scott's Oriole	Native
Icteridae	*Icterus spurius*	Orchard Oriole	Native
Icteridae	***Molothrus ater***	**Brown-headed cowbird**	**Exotic**
Icteridae	*Quiscalus mexicanus*	Great-tailed Grackle	Native
Icteridae	*Sturnella neglecta*	Western Meadowlark	Native
Icteridae	*Xanthocephalus xanthocephalus*	Yellow-headed Blackbird	Native
Laniidae	*Lanius ludovicianus*	Loggerhead Shrike	Native
Laridae	*Chlidonias niger*	Black Tern	Native
Laridae	*Gelochelidon nilotica*	Gull-billed Tern	Native
Laridae	*Larus argentatus*	Herring Gull	Native
Laridae	*Larus californicus*	California Gull	Native
Laridae	*Larus canus*	Mew Gull	Native
Laridae	*Larus delawarensis*	Ring-billed Gull	Native
Laridae	*Larus glaucescens*	Glaucous-winged Gull	Native

Laridae	*Larus heermanni*	Heermann's Gull	Native
Laridae	*Larus hyperboreus*	Glaucous Gull	Native
Laridae	*Larus livens*	Yellow-footed Gull	Native
Laridae	*Larus minutus*	Little Gull	Native
Laridae	*Larus occidentalis*	Western Gull	Native
Laridae	*Larus philidelphia*	Bonaparte's Gull	Native
Laridae	*Larus thayeri*	Thayer's Gull	Native
Laridae	*Leucophaeus atricilla*	Laughing Gull	Native
Laridae	*Leucophaeus pipixcan*	Franklin's Gull	Native
Laridae	***Onychoprion anaethetus***	**Bridled Tern**	**Vagrant**
Laridae	***Onychoprion fuscatus***	**Sooty Tern**	**Vagrant**
Laridae	*Rissa tridactyla*	Black-legged Kittiwake	Native
Laridae	*Rynchops nigra*	Black skimmer	Native
Laridae	*Sterna caspia*	Caspian Tern	Native
Laridae	*Sterna forsteri*	Forster's Tern	Native
Laridae	*Sterna hirundo*	Common Tern	Native
Laridae	*Sterna maxima*	Royal Tern	Native
Laridae	*Sterna paradisaea*	Arctic Tern	Native
Laridae	*Sternula antillarum browni*	California Least Tern	Native
Laridae	*Thalasseus elegans*	Elegant Tern	Native
Mimidae	***Dumetella carolinensis***	**Gray Catbird**	**Vagrant**
Mimidae	*Mimus polyglottos*	Northern Mockingbird	Native
Mimidae	*Oreoscoptes montanus*	Sage Thrasher	Native
Mimidae	*Toxostoma redivivum*	California Thrasher	Native
Motacillidae	*Anthus rubescens*	American Pipit	Native
Pandionidae	*Pandion haliaetus*	Osprey	Native
Paridae	*Baeolophus inornatus*	Oak Titmouse	Native
Paridae	*Parus gambeli*	Mountain Chickadee	Native
Parulidae	*Dendroica coronata*	Yellow-rumped Warbler	Native

Parulidae	*Dendroica discolor*	Prairie Warbler	Native
Parulidae	*Dendroica nigrescens*	Black-throated Gray Warbler	Native
Parulidae	*Dendroica occidentalis*	Hermit Warbler	Native
Parulidae	*Dendroica palmarum*	Palm Warbler	Native
Parulidae	*Dendroica pensylvanica*	Chestnut-sided Warbler	Native
Parulidae	*Dendroica petechia*	Yellow Warbler	Native
Parulidae	*Dendroica striata*	Blackpoll Warbler	Native
Parulidae	*Dendroica townsendi*	Townsend's Warbler	Native
Parulidae	*Dendroica varia*	Black-and-White Warbler	Native
Parulidae	*Geothlypis trichas*	Common Yellowthroat	Native
Parulidae	*Icteria virens*	Yellow-breasted Chat	Native
Parulidae	*Oporornis tolmiei*	MacGillivray's Warbler	Native
Parulidae	*Seiurus noveboracensis*	Northern Waterthrush	Native
Parulidae	*Setophaga ruticilla*	American Redstart	Native
Parulidae	*Vermivora celata*	Orange-crowned Warbler	Native
Parulidae	*Vermivora luciae*	Lucy's Warbler	Native
Parulidae	*Vermivora perigrina*	Tennessee Warbler	Native
Parulidae	*Vermivora ruficapilla*	Nashville Warbler	Native
Parulidae	*Wilsonia citrina*	Hooded Warbler	Native
Parulidae	*Wilsonia pusilla*	Wilson's Warbler	Native
Passeridae	***Passer domesticus***	**House Sparrow**	**Exotic**
Pelicanidae	*Pelecanus erythrorhynchos*	American White Pelican	Native
Pelicanidae	*Pelecanus occidentalis californicus*	California Brown Pelican	Native
Phaethontidae	***Phaethon aethereus***	**Red-billed Tropicbird**	**Vagrant**
Phalacrocoracidae	*Phalacrocorax auritus*	Double-crested Cormorant	Native
Phalacrocoracidae	*Phalacrocorax pelagicus*	Pelagic Cormorant	Native
Phalacrocoracidae	*Phalacrocorax penicillatus*	Brant's Cormorant	Native
Phasianidae	*Callipepla californica*	California Quail	Native

Phasianidae	***Meleagris gallopavo***	**Wild Turkey**	**Exotic**
Phasianidae	*Oreortyx pictus*	Mountain Quail	Native
Picidae	*Colaptes auratus*	Northern Flicker	Native
Picidae	*Melanerpes formicivorus*	Acorn Woodpecker	Native
Picidae	*Melanerpes lewis*	Lewis' Woodpecker	Native
Picidae	*Picoides nuttallii*	Nuttall's Woodpecker	Native
Picidae	*Picoides pubescens*	Downy Woodpecker	Native
Picidae	*Picoides villosus*	Hairy Woodpecker	Native
Picidae	*Sphyrapicus nuchalis*	Red-naped Sapsucker	Native
Picidae	*Sphyrapicus ruber*	Red-breasted Sapsucker	Native
Ploceidae	***Euplectes franciscanus***	**Orange Bishop**	**Exotic**
Podicipedidae	*Aechmophorus clarkii*	Clark's Grebe	Native
Podicipedidae	*Aechmophorus occidentalis*	Western Grebe	Native
Podicipedidae	*Podiceps auritus*	Horned Grebe	Native
Podicipedidae	*Podiceps nigricollis*	Eared Grebe	Native
Podicipedidae	*Podilymbus podiceps*	Pied-billed Grebe	Native
Polioptilidae	*Polioptila caerulea*	Blue-gray Gnatcatcher	Native
Polioptilidae	*Polioptila californica californica*	Coastal California Gnatcatcher	Native
Polioptilidae	*Polioptila melanura*	Black-tailed Gnatcatcher	Native
Procellariidae	*Fulmaris glacialis*	Northern Fulmar	Native
Procellariidae	*Puffinus creatopus*	Pink-footed Shearwater	Native
Procellariidae	*Puffinus griseus*	Sooty Shearwater	Native
Procellariidae	*Puffinus opisthomelas*	Black-vented Shearwater	Native
Psittacidae	***Amazona viridigenalis***	**Red-crowned Parrot**	**Exotic**
Psittacidae	***Melopsittacus undulatus***	**Budgerigar**	**Exotic**
Ptilogonatidae	*Phainopepla nitens*	Phainopepla	Native
Rallidae	*Fulica americana*	American Coot	Native
Rallidae	*Gallinula chloropus*	Common Gallinule	Native
Rallidae	*Porzana carolina*	Sora Rail	Native

Rallidae	*Rallus limicola*	Virginia Rail	Native
Rallidae	*Rallus obsoletus levipes*	Light-footed Ridgway's Rail	Native
Recurvirostridae	*Himantopus mexicanus*	Black-necked Stilt	Native
Recurvirostridae	*Recurvirostra americana*	American Avocet	Native
Regulidae	*Regulus calendula*	Ruby-crowned Kinglet	Native
Regulidae	*Regulus satrapa*	Golden-crowned Kinglet	Native
Scolopacidae	*Actitis macularia*	Spotted Sandpiper	Native
Scolopacidae	*Aphriza virgata*	Surfbird	Native
Scolopacidae	*Arenaria interpres*	Ruddy Turnstone	Native
Scolopacidae	*Arenaria melanocephala*	Black Turnstone	Native
Scolopacidae	*Calidris alba*	Sanderling	Native
Scolopacidae	*Calidris alpine*	Dunlin	Native
Scolopacidae	*Calidris bairdii*	Baird's Sandpiper	Native
Scolopacidae	*Calidris canutus*	Red Knot	Native
Scolopacidae	***Calidris ferruginea***	**Curlew Sandpiper**	**Vagrant**
Scolopacidae	*Calidris himantopus*	Stilt Sandpiper	Native
Scolopacidae	*Calidris mauri*	Western Sandpiper	Native
Scolopacidae	*Calidris melanotos*	Pectoral Sandpiper	Native
Scolopacidae	*Calidris minutilla*	Least Sandpiper	Native
Scolopacidae	*Calidris pusilla*	Semipalmated Sandpiper	Native
Scolopacidae	*Catoptrophorus semipalmatus*	Willet	Native
Scolopacidae	*Gallinago delicata*	Wilson's Snipe	Native
Scolopacidae	*Gallinago gallinago*	Common Snipe	Native
Scolopacidae	*Heteroscelus incanus*	Wandering Tattler	Native
Scolopacidae	*Limnodromus griseus*	Short-billed Dowitcher	Native
Scolopacidae	*Limnodromus scolopaceus*	Long-billed Dowitcher	Native
Scolopacidae	*Limosa fedoa*	Marbled Godwit	Native
Scolopacidae	*Numenius americanus*	Long-billed Curlew	Native
Scolopacidae	*Numenius phaeopus*	Whimbrel	Native

Scolopacidae	*Phalaropus fulicaria*	Red Phalarope	Native
Scolopacidae	*Phalaropus lobatus*	Red-necked Phalarope	Native
Scolopacidae	*Phalaropus tricolor*	Wilson's Phalarope	Native
Scolopacidae	*Tringa erythropus*	Spotted Redshank	Native
Scolopacidae	*Tringa flavipes*	Lesser Yellowlegs	Native
Scolopacidae	*Tringa melanoleuca*	Greater Yellowlegs	Native
Scolopacidae	*Tringa solitaria*	Solitary Sandpiper	Native
Sittidae	*Sitta canadensis*	Red-breasted Nuthatch	Native
Sittidae	*Sitta carolinensis*	White-breasted Nuthatch	Native
Stercorariidae	*Stercorarius parasiticus*	Parasitic Jaeger	Native
Stercorariidae	*Stercorarius pomarinus*	Pomarine Jaeger	Native
Strigidae	*Asio flammeus*	Short-eared Owl	Native
Strigidae	*Asio otus*	Long-eared Owl	Native
Strigidae	*Athene cunicularia*	Burrowing Owl	Native
Strigidae	*Bubo virginianus*	Great Horned Owl	Native
Strigidae	*Otus flammeolus*	Flammulated Owl	Native
Strigidae	*Otus kennicottii*	Western Screech Owl	Native
Sturnidae	***Sturnus vulgaris***	**European Starling**	**Exotic**
Sulidae	***Sula sula***	**Red-footed Booby**	**Vagrant**
Sylviidae	*Chamaea fasciata*	Wrentit	Native
Threskiornithidae	***Ajaia ajaja***	**Roseate Spoonbill**	**Vagrant**
Threskiornithidae	*Plegadis chihi*	White-faced Ibis	Native
Tityridae	*Pachyramphus aglaiae*	Rose-throated Becard	Native
Trochilidae	*Archilocus alexandri*	Black-chinned Hummingbird	Native
Trochilidae	*Calypte anna*	Anna's Hummingbird	Native
Trochilidae	*Calypte costae*	Costa's Hummingbird	Native
Trochilidae	*Cynanthus latirostris*	Broad-billed Hummingbird	Native
Trochilidae	*Selasphorus rufus*	Rufous Hummingbird	Native
Trochilidae	*Selasphorus sasin*	Allen's Hummingbird	Native

Trochilidae	*Stellula calliope*	Calliope Hummingbird	Native
Troglodytidae	*Campylorhynchus brunneicapillus sandiegensis*	Coastal Cactus Wren	Native
Troglodytidae	*Catherpes mexicanus*	Canyon Wren	Native
Troglodytidae	*Cistothorus palustris clarkae*	Clark's Marsh Wren	Native
Troglodytidae	*Salpinctes obsoletus*	Rock Wren	Native
Troglodytidae	*Thryomanes bewickii leucophrys*	San Clemente Bewick's Wren	Native
Troglodytidae	*Troglodytes aedon*	House Wren	Native
Troglodytidae	*Troglodytes troglodytes*	Winter Wren	Native
Turdidae	*Catharus guttatus*	Hermit Thrush	Native
Turdidae	*Catharus ustulatus*	Swainson's Thrush	Native
Turdidae	*Ixoreus naevius*	Varied Thrush	Native
Turdidae	*Sialia currucoides*	Mountain Bluebird	Native
Turdidae	*Sialia mexicana*	Western Bluebird	Native
Turdidae	*Turdus migratorius*	American Robin	Native
Tyrannidae	*Contopus cooperi*	Olive-sided Flycatcher	Native
Tyrannidae	*Contopus sordidulus*	Western Wood-Peewee	Native
Tyrannidae	*Empidonax difficilis*	Pacific-slope Flycatcher	Native
Tyrannidae	*Empidonax hammondii*	Hammond's Flycatcher	Native
Tyrannidae	*Empidonax oberholseri*	Dusky Flycatcher	Native
Tyrannidae	*Empidonax traillii extimus*	Southwestern Willow Flycatcher	Native
Tyrannidae	*Empidonax wrightii*	Gray Flycatcher	Native
Tyrannidae	*Myiarchus cinerascens*	Ash-throated Flycatcher	Native
Tyrannidae	*Pyrocephalus rubinus*	Vermillion Flycatcher	Native
Tyrannidae	*Sayornis nigricans*	Black Phoebe	Native
Tyrannidae	*Sayornis phoebe*	Eastern Phoebe	Native
Tyrannidae	*Sayornis saya*	Say's Phoebe	Native
Tyrannidae	*Tyrannus verticalis*	Western Kingbird	Native
Tyrannidae	*Tyrannus vociferans*	Cassin's Kingbird	Native

Tytonidae	*Tyto alba*	Barn Owl	Native
Vireonidae	*Vireo bellii pusillus*	Least Bell's Vireo	Native
Vireonidae	*Vireo cassinii*	Cassin's Vireo [= Solitary Vireo]	Native
Vireonidae	*Vireo flavifrons*	Yellow-throated Vireo	Native
Vireonidae	*Vireo gilvus*	Warbling Vireo	Native
Vireonidae	*Vireo griseus*	White-eyed Vireo	Native
Vireonidae	*Vireo huttoni unitti*	Catalina Hutton's Vireo	Native
Vireonidae	*Vireo plumbeus*	Plumbeous Vireo	Native
Vireonidae	*Vireo vicinior*	Gray Vireo	Native
Mammals			
Antrozoidae [=Vespertilionidae]	*Antrozous pallidus*	Pallid Bat	Native
Balaenoptiidae	*Balaenoptera borealis*	Sei Whale	Native
Balaenoptiidae	*Balaenoptera musculus*	Blue whale	Native
Balaenoptiidae	*Balaenoptera physalus*	Finback whale	Native
Balaenoptiidae	*Megaptera novaeangliae*	Northern Humpback whale	Native
Bovidae	***Bison bison bison***	**Plains Bison**	**Exotic**
Canidae	*Canis latrans*	Coyote	Native
Canidae	*Urocyon cinereoargenteus*	Gray Fox	Native
Castoridae	***Castor canadensis***	**Beaver**	**Exotic**
Cervidae	*Odocoileus hemionus fuliginatus*	Southern Mule Deer	Native
Cricetidae	*Microtus californicus*	California Vole	Native
Delphinidae	*Tursiops truncatus*	Bottle-nosed Dolphin	Native
Didelphiidae	***Didelphis virginiana***	**Opossum**	**Exotic**
Eschrichtiidae	*Eschrichtius robustus*	Gray Whale	Native
Felidae	***Felis catus***	**Feral Cat**	**Exotic**
Felidae	*Puma concolor*	Mountain Lion	Native
Felidae	*Lynx rufus*	Bobcat	Native
Geomyidae	*Thomomys bottae*	Botta's Pocket Gopher	Native

Heteromyidae	*Chaetodipus californicus femoralis*	Dulzura Pocket Mouse	Native
Heteromyidae	*Chaetodipus fallax fallax*	Northwestern San Diego Pocket Mouse	Native
Heteromyidae	*Dipodomys simulans*	Dulzura Kangaroo Rat	Native
Heteromyidae	*Dipodomys stephensi*	Stephens' Kangaroo Rat	Native
Heteromyidae	*Perognathus longimembris pacificus*	Pacific Pocket Mouse	Native
Leporidae	*Lepus californicus bennetti*	San Diego Black-tailed Jackrabbit	Native
Leporidae	*Sylvilagus audubonii*	Desert Cottontail	Native
Leporidae	*Sylvilagus bachmani*	Brush Rabbit	Native
Mephitidae	*Mephitis mephitis*	Striped Skunk	Native
Mephitidae	*Spilogale gracilis*	Western Spotted Skunk	Native
Molossidae	*Eumops perotis californicus*	Western Mastiff Bat	Native
Molossidae	*Nyctinomops femorrosaccus*	Pocketed Free-tailed Bat	Native
Molossidae	*Tadarida brasiliensis*	Brazilian Free-tailed Bat	Native
Muridae	***Mus musculus***	**House Mouse**	**Exotic**
Muridae	*Neotoma bryanti* [=*Neotoma lepida intermedia*]	Bryant's Woodrat [= San Diego Woodrat]	Native
Muridae	*Neotoma lepida*	Desert Woodrat	Native
Muridae	*Peromyscus boylii*	Brush Mouse	Native
Muridae	*Peromyscus californicus*	California Mouse	Native
Muridae	*Peromyscus eremicus*	Cactus Mouse	Native
Muridae	*Peromyscus maniculatus*	Deer Mouse	Native
Muridae	***Rattus norvegicus***	**Norway Rat**	**Exotic**
Muridae	***Rattus rattus***	**Black Rat**	**Exotic**
Muridae	*Reithrodontomys megalotis*	Western Harvest Mouse	Native
Mustelidae	*Mustela frenata latirostra*	Long-tailed Weasel	Native
Mustelidae	*Taxidea taxus*	American Badger	Native
Otariidae	*Zalophus californianus*	California Sea Lion	Native

Phocidae	*Mirounga angustirostris*	Northern Elephant Seal	Native
Phyllostomidae	*Macrotus californicus*	California Leaf-nosed Bat	Native
Physeteridae	*Physeter macrocephalus*	Sperm whale	Native
Procyonidae	*Procyon lotor*	Raccoon	Native
Sciuridae	*Otospermophilus beecheyi*	California Ground Squirrel	Native
Soricidae	*Notiosorex crawfordi*	Desert Shrew	Native
Soricidae	*Sorex ornatus*	Ornate Shrew	Native
Talpidae	*Scapanus latimanus*	Broad-footed Mole	Native
Vespertilionidae	*Corynorhinus townsendii*	Townsend's Big-eared Bat	Native
Vespertilionidae	*Eptesicus fuscus*	Big Brown Bat	Native
Vespertilionidae	*Myotis yumanensis*	Yuma Myotis	Native
Vespertilionidae	*Pipistrellus hesperus*	Western Pipistrelle	Native
Vespertilionidae	*Eumops perotis*	Western Mastiff Bat	Native
Vespertilionidae	*Lasiurus blossevillii* [= Lasiurus *frantzii*]	Western Red Bat	Native
Vespertilionidae	*Lasiurus cinereus*	Hoary Bat	Native
Vespertilionidae	*Lasiurus xanthinus*	Western Yellow Bat	Native
Vespertilionidae	*Lasionnycteris noctivagans*	Silver-haired Bat	Native
Vespertilionidae	*Myotis californicus*	California Bat	Native
Vespertilionidae	*Myotis ciliolabrum*	Western Small-footed Bat	Native
Vespertilionidae	*Parastrellus hesperus*	Canyon Bat	Native

Appendix G

Estuarine and Beach Ecosystem Conservation Plan

Appendix G

ESTUARINE AND BEACH ECOSYSTEM CONSERVATION PLAN

During 1994 Camp Pendleton entered into formal consultation under Section 7 of the ESA for ongoing and planned training activities, infrastructure maintenance activities, several construction projects and a Riparian and Estuarine Ecosystem Conservation Plan. On 30 October 1995 the USFWS issued a BO (1-6-95-F-02) covering those actions. This appendix contains the Estuarine and Beach Ecosystem Conservation Plan portion of those actions. Terms and conditions of the BO covering this plan and the Riparian Ecosystem Plan are contained in Appendix M.

The primary purpose of the Estuarine and Beach Ecosystem Conservation Plan is to manage fish and wildlife resources in the estuarine and beach areas of Camp Pendleton. This plan is "programmatic" in the sense that it addresses long-term requirements of the estuarine and beach resources in a comprehensive, "programmatic" fashion. This conservation plan is programmatic in its strategy: habitat management actions will be planned and evaluated in the context of achieving and maintaining a "healthy ecosystem" for sensitive species. It is the intention to apply this programmatic approach to all ongoing and future actions at Camp Pendleton, as they potentially affect the integrity of estuarine and beach ecosystems.

The mission of MCB Camp Pendleton is to operate an amphibious training base, while protecting the environment and providing facilities, services, and support to prepare Marines and Sailors for combat. Camp Pendleton's 125,000 acres (approximately 200 square miles) of ocean front beach, coastal plains and terraces, hills, mountains and stream valleys, with the Base's associated restricted airspace, offer a unique combination of natural resources that assure well-prepared national security forces.

Camp Pendleton's military mission is combat training and support of Marine Corps units and other DoD forces. Training activities include, but are not limited to: amphibious landings, fixed and rotary-winged aircraft flights and landings, tracked/wheeled vehicle and personnel maneuvers, artillery and small arms firing, aerial weapons delivery, engineer unit operations, organization of supply, field combat service support, employment of communications, airlifting of troops and weapons, equipment maintenance, and field medical treatment.

Camp Pendleton's training and combat service support functions share the use of Base lands with several non-military functions. Such uses include: a Department of Justice border patrol checkpoint, a California State Parks and Recreation campground and beach, the SONGS, agriculture and grazing outleases, and public schools. These functions are important uses of Camp Pendleton's land, and they require additional land management attention to assure the Base meets its primary commitments to the military mission and conservation.

The Base manages access to sensitive wildlife habitat and acknowledges the importance of this practice as a necessary precaution to preserve wildlife corridors and vital habitat for listed species and to enable the Base's mission to co-exist with sensitive wildlife communities.

1. ECOSYSTEM CONSERVATION MANAGEMENT

1.1. Overview

DoD has embraced "ecosystem management" as its tool for conserving natural resources. In a memorandum of 8 August 1994, concerning implementation of ecosystem management in the DoD, the Deputy Under Secretary of Defense (Environmental Security) promulgated the following policy statements:

> Ecosystem Management is the basis for future management of DoD lands and waters. It will blend multiple-use needs and provide a consistent framework for managing DoD installations, ensuring the integrity of ecosystems.
>
> Ecosystem management is a goal-driven approach to environmental management at a scale compatible with natural processes, recognizes social and economic viability within functioning ecosystems, and is realized through effective partnerships among private and government agencies.
>
> Ecosystem management is a process that considers the environment as a complex system functioning as a whole, not as a collection of parts, and recognizes that people and their social and economic needs are an integral part of the whole.
>
> In applying the principles and guidelines for DoD ecosystem management, military installations will:
>
> - Develop a vision of ecosystem health. Existing natural resource, social, and economic conditions should be factored into the vision;
> - Develop coordinated approaches to work toward ecosystem health. Since ecosystems rarely coincide with ownership and political boundaries, cooperation across ownerships is an important component of ecosystem-based management;
> - Maintain and improve the sustainability and native biological diversity of ecosystems;
> - Support sustainable human activities. People and their social, economic, and security needs are an integral part of ecological systems, and management of ecosystems depends upon sensitivity to these issues;
> - Use benchmarks to monitor and evaluate outcomes and establish milestones to ensure accountability.

Camp Pendleton's conservation program starts with recognition of its military mission. In fact, the Estuarine and Beach Ecosystem Conservation Plan assumes that only through continuance of that mission will the objectives of the plans be accomplished.

The conservation program also proceeds with recognition of the following biological principles: 1) ecosystems are dynamic by nature; 2) the functioning of ecosystem components operate at

different rates; 3) all components are interrelated; 4) the ecosystem is a complex, dynamic system functioning as a whole, not as a collection of parts; and 5) ecosystem integrity may be disrupted by excessive "interference" of any single component.

The Base uses these guidelines in establishing programmatic instructions for military training, facility and range maintenance, recreation, and new project planning. This approach is used to develop prudent and reasonable alternatives, which seek to avoid and minimize impacts to species and their habitats and maintain ecosystem integrity.

The Base Estuarine and Beach Ecosystem Conservation Plan was developed to maintain and improve the sustainability and native biological diversity of the estuarine and beach ecosystems, while supporting Camp Pendleton's mission of training Marines. Camp Pendleton intends that this program provide a comprehensive framework for assuring the consistent management of the Camp Pendleton estuarine and beach ecosystems.

The thrust of the Estuarine and Beach Ecosystem Conservation Plan is to manage habitat on an ecosystem basis. Benchmarks have been established to monitor and evaluate the integrity and functioning of the ecosystems aboard Camp Pendleton. Specific habitat and species goals were established in consultation with the USFWS and aim at contributing to threatened and endangered species recovery. Based on periodic assessments, the program calls for management objectives and strategies to be modified to meet changing circumstances and requirements.

The program depends on the development of formal and informal partnerships among private and government agencies to achieve its goals. It is based on the assumption that without such partnering the integrity of the ecosystems cannot be maintained. The plan further assumes that successful partnering will not happen without each party respecting the legitimate needs of the other.

1.2. Integration with Regional Conservation Planning

The Camp Pendleton conservation program depends on its integration with regional conservation planning efforts. The Base acknowledges the USFWS's broader role in the regional planning process and expects the USFWS to be its advocate in this arena. Camp Pendleton assumes that the USFWS will view the Base's ecosystems in an ecoregion context, setting appropriate goals for the subareas thereof. This means that the responsibility for conservation of wildlife in the southern California coastal ecoregion does not fall solely on Camp Pendleton. Camp Pendleton expects that the USFWS, in its oversight and wildlife advocacy role in the region conservation planning process, will promote the distribution of information and consistent application of Section 7 and Section 10 procedures to foster species recovery throughout the ecoregion.

1.3. Management Activity Funding

The Estuarine and Beach Ecosystem Conservation Plan is premised on the understanding that funding and achievement of the plan's goals are interrelated with assuring and enhancing the ongoing maintenance and flexibility of the Base's military mission. Funding for management activities aimed at the conservation of the Base's ecosystems derive from 1) agricultural leases and resource utilization programs and 2) new projects. In the past, policy has resulted in single

project-related, on-site, in-kind mitigation measures. This focus did not promote an ecosystem approach to resource management. This plan promotes a policy that will tailor individual project mitigation to the needs of the ecosystem. In addition, this plan recognizes the USFWS's proposal to assume (see conservation recommendations in the BO) some of the costs associated with the conservation program by in-kind resources. This is intended to increase the flexibility of Camp Pendleton to devote more effort towards the ecosystems goals previously established, and in turn enhance its operational flexibility. However, this approach is tempered in light of the current legislative proscription, under the Anti-Deficiency Act, from obligation of funds prior to Congressional authorization. Should this proscription be changed or legislation enacted that addresses the challenge of long-term funding for recurring ecosystem maintenance and enhancement requirements, Camp Pendleton and the USFWS will reexamine the current funding and management strategies aimed at achieving the program goals.

1.4. Ecosystem Boundaries

Camp Pendleton recognizes that the ecosystem habitats observe no specific delineation, tending to merge together in a very fluid and continuous manner, and that whatever ecosystem boundaries it designates are artificial. However, to facilitate the consistent mapping, monitoring, assessment and other management activities for each ecosystem, the following artificial boundaries were established in consultation with the USFWS. The riparian ecosystem aboard Camp Pendleton is comprised of those lands lying within the 100-year flood plain of the drainages flowing through the Base to the estuary and beach systems at the stream/river mouths junction with the Pacific Ocean. The estuary and beach ecosystem consists of those coastal areas and associated salt/fresh water marshes between the head of tidal action and the low tide line at the beach, which support unique estuarine species. The beaches included in this ecosystem are the coastal beaches with associated dune systems that border estuary and riparian regions of the Base and along the coast. The uplands ecosystem consists of the remaining undeveloped areas of Camp Pendleton.

1.5. Programmatic Instructions

The Base has incorporated into this plan a system of "programmatic instructions" that will be used to avoid and minimize adverse impacts to the ecosystem. If adverse impacts cannot be avoided, appropriate compensation procedures will be implemented, per Section 2.4.3. Activities will be scheduled during the non-breeding season where possible. Military training units will follow guidance given in the Programmatic Instructions to avoid incidental take and adverse impacts. Construction sites will be selected to impact the least amount of estuarine/beach habitat possible.

1.6. General Goals

Camp Pendleton, in consultation with the USFWS, has developed habitat acreage goals and species population numbers. Additionally, Camp Pendleton established enhancement actions specified within the Estuarine and Beach Ecosystem Conservation Plan.

2. ESTUARINE/BEACH ECOSYSTEM CONSERVATION PLAN

2.1. Background

This estuarine/beach conservation program is designed to sustain and enhance Camp Pendleton's natural resources along its coastline emphasizing coastal lagoons and the Santa Margarita River Estuary. This includes conservation of listed species and their associated habitat, maintaining and enhancing the functionality and biodiversity of the Santa Margarita River Estuary, and the coastal lagoons located at Cocklebur, French, Aliso, Las Flores, San Onofre, and San Mateo Creeks. This will be done through continuation of the active management programs conducted by Camp Pendleton and through application of the Programmatic Instructions contained herein, for the 319 acres of habitat associated with this ecosystem. Further, acreage assigned to estuary and beach areas will be managed to avoid future, permanent project impacts (other than transient training traffic or exercises) from construction. Permanent impacts to this habitat will be consulted on separately with the USFWS.

Entirely compatible with this objective is the support of Camp Pendleton's foremost mission--the training of Marines to defend the sovereignty of the United States. The philosophic approach behind this Conservation Program is to sustain and enhance estuarine and beach ecosystem dynamics, such that estuarine and beach communities on Camp Pendleton are sufficiently resilient to withstand a continued array of disturbances and incursions occasioned by military training activities.

The dynamics of the estuarine and beach conservation plan are outlined in the context of the ecosystem goals, terms and conditions and conservation recommendations below. Within the land areas designated as management zones, programmatic instructions and minimization measures will be enforced to protect these areas from permanent intrusion or effects which will disrupt the balance which has been achieved between Marines pursuing training activities, and threatened and endangered species residing in these areas. Protective fencing; warning signs; predator management; exotic vegetation management; monitoring of estuary salinity and tidal conditions are central tenets of the conservation program. Funding for future enhancement activities listed under the conservation recommendations, terms and conditions and reasonable and prudent measures will be actively pursued to promote recovery of the appropriate species. These activities have fostered a growth in the California least tern population over the years and with further study should promote the same in the western snowy plover population.

2.2. Goals

The overall objective of the estuarine/beach ecosystem conservation plan is to manage and protect the natural resources along the Base's coastline emphasizing coastal lagoons and the Santa Margarita River Estuary. This includes protection of listed species and their essential habitat, maintaining the functionality and biodiversity of the following focused management areas to be designated as: the Santa Margarita River Estuary and the coastal lagoons located at Cocklebur Creek, French Creek, Aliso Creek, Las Flores Creek, San Onofre Creek, and San Mateo Creek.

The primary goals of the estuarine/beach ecosystem conservation plan are to:

2.2.1. With Regards to Base Management

1) Facilitate greater latitude in conduct of training activities;
2) Provide a framework for consistency in mitigation related to current and future estuarine/beach impacts resulting from Base activities;
3) Preclude the need for the designation of critical habitat for the western snowy plover and other listed species;
4) Promote partnership with the USFWS for estuarine/beach ecosystem conservation in the region.

2.2.2. With Regards to Ecosystem Management

Implementation of the following conservation strategies should maintain and improve the integrity of estuarine/beach ecosystems and support viable, expanding populations of sensitive species. This plan proposes to implement specific management practices for listed species, including the western snowy plover, in lieu of Federal designation of critical habitat.

1) Provide a framework for managing estuarine/beach habitats from an ecosystem perspective.
2) Maintain connectivity with riparian and upland ecosystems.
3) Promote natural hydrological processes to maintain estuarine water quality and quantity in conformance with approved basin plans.
4) Minimize reduction or loss of upland buffers surrounding coastal wetlands.
5) Restore the dune system in the vicinity of the Santa Margarita Estuary following the guidance developed by The Nature Conservancy, as funds become available.

2.2.3. With Regards to Habitat Management

It is Camp Pendleton's intent to manage estuarine/beach habitat to preclude long-term damage and degradation. Habitat management will continue toward meeting the following goals:

1) Maintain natural processes and areal extent of estuarine/lagoon and beach/dune areas by avoiding and minimizing the permanent loss of the habitat value of these areas.
2) Maintain integrity of listed species' habitat.
3) Eliminate/control exotic plants whenever practical.
4) Maintain suitable tidewater goby habitat in the complex of lagoons associated with the creeks listed above.

2.2.4. With Regards to Species Management

1) Promote the growth of current tern populations over the entire SMR estuary (not only the North Beach colony) and at both Aliso Creek and French Creek Lagoons.

2) Maintain the integrity of the least tern nesting colonies.

3) Promote growth of current population of snowy plovers in the vicinity of the tern nesting colony sites.

4) Maximize the probability of a metapopulation persistence within the lagoon complex for tidewater gobies. The dynamic fluctuations in numbers of individuals associated with habitat types prone to episodic catastrophic events, such as drought and flooding, prevent the specification of precise population objectives.

2.3. Estuarine Ecosystem Baseline

This plan intends to conduct enhancement activities and studies that benefit regional habitat conservation, as funds and personnel permit. Appropriate compensation credit will be afforded to Camp Pendleton for such actions.

2.4. Plan Implementation

Existing management efforts for listed species conservation will be continued at the following Management Zones:

1) SMR Management Zone: The beach area extending from southern edge White Beach (MG 594795) to the southern end of the SMR Estuary delineated by the dirt access running seaward at the southern edge of the Estuary (MG 621758). This Management Zone shall encompass Cocklebur Canyon outlet and the Santa Margarita River Estuary extending east to Stuart Mesa Bridge. Habitats within this zone include least tern foraging areas; inter-tidal beaches (between mean low water and mean high tide) for snowy plover foraging; all nesting locations for the western snowy plover, California least tern, and light-footed clapper rail; salt pan; dune systems in nesting areas; salt marsh; mud flats; and all wetlands.

2) Other Management Zones: Habitats for listed species within the coastal lagoon systems of French, Aliso, Las Flores, San Onofre, and San Mateo watersheds.

2.4.1. Avoidance and Minimization

Programmatic Instructions are provided below which outline activities that are authorized in the Management Zones.

1) In the event nesting by California least tern or western snowy plovers should occur outside the traditionally fenced nesting areas within the management zones, individual nests and any young produced shall be afforded protection by posting and fencing around the immediate vicinity of the nest(s).

2) Prior to each nesting season an evaluation of vegetative cover shall be made at all nesting sites and any necessary vegetation control may be implemented utilizing herbicides or mechanical techniques prior to the breeding season. Enhancement of nesting areas decreases the likelihood of birds nesting outside the management zones.

3) In addition to signs posted at wetlands and nesting sites, the Management Zone will be posted in strategic locations including the Del Mar recreation area, atop the bluffs at Cocklebur Beach, beach access from the agriculture field just north of the North Beach least tern colony, the dirt road running along the southern and eastern portions of the Santa Margarita River Estuary, and on the beach ½ mile south of the LCAC ramp.

4) Camp Pendleton has adopted and implemented the Programmatic Instructions described below, to regulate the operational, maintenance, and recreational programs in and adjacent to estuarine and beach habitats to help ensure that the impact of incidental take is avoided and minimized to the maximum extent practicable. Any activity not specifically addressed in these Programmatic Instructions or otherwise covered herein under the class system for future consultations, requires concurrence from the USFWS to determine if impacts are offset by the ecosystem conservation plans described in this Plan and its BO. If the proposed project is compatible with the objectives established in this ecosystem conservation plan, the USFWS shall approve the proposed action. Indirect effects for noise and dust are considered mitigated by this conservation plan.

5) Weather permitting, construction of fencing at California least tern nesting colonies shall be completed by 15 March. This conservation plan will be updated as recovery plans for listed species are published so that conservation efforts contribute to regional recovery goals.

6) All terms and conditions identified in the BO 1-6-92-F49 will be implemented.

7) Tidewater goby populations on Camp Pendleton will be monitored to determine if there are any impacts to gobies from relocation of effluent infiltration ponds. Populations shall be surveyed to determine their status at least once every three years or as funding permits.

8) Conservation measures currently in place as a result of the LCAC FEIS will continue until completed, including the restricted status of the Santa Margarita River Estuary (with the exception of small boat raid operations up the river) and management of the designated Cocklebur Sensitive Area.

9) Protection measures.

   - Signs will be posted at entrances (along access roads or beaches) to all wetlands, nesting sites, and the management zones, to deter unauthorized entry.
   - In addition to the permanent fence at the White Beach tern colony, a buffer shall be demarcated along the northern border of the colony during the breeding season with an additional barrier i.e., communication wire. This is especially necessary on the northern end of the colony where vehicular and troop movements occur.
   - A seasonal fence extension from the White Beach tern colony extending to the French Creek Lagoon shall be constructed.
   - The chick fencing which is employed at the North Beach colony to protect least terns from vehicular traffic shall be breached in several locations on the eastern boundary. This will allow movement of flightless snowy plover chicks that have hatched inside the least tern fencing to escape in order to reach foraging areas. Openings shall be placed according to nest distribution of snowy plovers within the fenced areas. Breaches shall be closed during monitoring or other activities in the

colony that could potentially scatter least tern chicks resulting in the separation of siblings on both sides of the fence. Monitoring will be scheduled to avoid, as much as possible, periods of activity on the beaches adjacent to the colonies in order to minimize risk of tern siblings becoming separated by the fence. Chick barriers at White Beach shall be maintained open ended at French Creek Lagoon.

10) Non-native animal predators/competitor species that threaten listed species will be controlled.

11) All lighting in estuaries will be fully minimized year-round. Indirect illumination from pyrotechnics may be used during the non-breeding season in accordance with the Fire Danger Rating System (FDRS).

12) Information will be published by Base notices to Base personnel regarding sensitive species and habitat areas along the coastal areas.

13) The breeding/nesting season for the western snowy plover and California least tern shall be designated as 15 March - 31 August. The non-breeding season shall be designated as 1 September - 14 March for all activities authorized to occur outside of the breeding season.

14) Introduction of exotic vegetation into estuarine and beach habitats shall be controlled to the extent possible and existing infestations will be targeted for suppression, with an ultimate goal of eradication. Priority will be placed on the control of Arundo, Tamarix, and iceplant. Primary emphasis will be on preventive measures for existing California least tern and western snowy plover nesting sites. Prevention of exotic plant invasion will be done by removing sprouting giant reed stalks which are deposited on the beach during winter storms whenever possible.

15) The dune restoration plan developed for Camp Pendleton by The Nature Conservancy will be implemented as funds become available.

2.4.2. Maintenance and Enhancement of Estuarine/Beach Ecosystem

These are management actions that should be implemented to maintain the ecosystem's ability to support listed species and may be implemented to enhance the estuaries and beaches of Camp Pendleton.

1) Manage estuarine zones to maintain wetland values of coastal lagoons.

2) Fence nesting areas.

3) Control predators.

4) Restore dunes within nesting areas.

5) Explore habitat enhancement techniques including: (a) deepening smaller estuarine lagoons, and (b) controlling and removing exotic plants and fish.

6) Continue annual fencing of least tern nesting colonies; construct seasonal fencing; post warning signs at colonies; publish Base notices; monitor breeding activities (in compliance with the LCAC EIS funded monitors); study long term population trends; and manage nest predators at colonies.

7) Complete multi-year (3-5 year) study of breeding biology and effect of tern management on western snowy plovers with banding.

8) Monitor snowy plover breeding activity.

9) Protect last known nesting location of light-footed clapper rails (SMR).

10) Additional conservation activities included in the mitigation measures set forth in the LCAC EIS, which are currently in progress and will continue until completed, include:

- Maintain restricted status to the Santa Margarita Estuary.
- Protection and management of Cocklebur Sensitive Area.
- Assure no loss of Belding's savannah sparrow habitat.
- Monitoring the breeding status of the least tern to determine effects of LCAC operation and facility construction.

11) Vehicle access to estuary is authorized for the following activities during the non-breeding season:

- Removal of exotic plant species from the large sand deposition which occurred along the south bank of the river at eastern end of salt flats, to promote establishment of a nesting area for snowy plovers.
- Transporting and distributing sand on the Salt Flats Island to enhance this nesting site, should funding become available.

12) Maintain occupied tidewater goby habitat as well as maintaining historic habitat locations for recolonization.

13) Natural regeneration of native vegetation shall be emphasized.

14) Use best management practices based on current site conditions to implement adaptive management.

15) Sites will be selected based on the following criteria:

- Previously disturbed areas.
- Beach areas outside Santa Margarita River Estuary and plover management zone.
- Beach areas within plover management zone.
- Santa Margarita River Estuary.

16) Specific instructions for enhancement techniques are contained in Enclosure 4 to the BO and Appendix J of the BA.

2.4.3. Mitigation

Activities that cause permanent destruction of wetlands and sensitive dune areas will require replacement in kind by enhancement of degraded components of the ecosystem in consultation with the USFWS.

2.4.4. Compensation

Programmatic Instructions will be used to avoid and minimize adverse impacts to the appropriate species and its associated habitat. When these instructions are inadequate, the Table 1

compensation procedures will be implemented to mitigate for habitat losses and other indirect adverse affects to the species. These compensation procedures will apply to new projects or changes to current activities that affect estuarine or beach habitats. Although there are no foreseen losses of estuarine or beach habitat on the Base, these compensation procedures are applicable as long as the estuarine conservation goals (habitat and species) for the sensitive species affected are being met.

Compensation for the appropriate habitat will be calculated by means of Equation 1:

Equation 1: Compensation Required (Acres) =
3 x (Nesting Habitat{Acres}) +
1.5 x (Foraging habitat {Acres})+
3 x (Dune Habitat {Acres})+
2 x (Indirect Effect {Acres})

Compensation enhancement activities that may be applied, both on and off Camp Pendleton, subject to the USFWS's recommendation as the ecoregion manager, will be prioritized in descending order to be credited on the basis of $25,000 per acre of compensation required in accordance with Table 1.

TABLE 1. COMPENSATION FOR ESTUARY/BEACH IMPACTS

Bird Habitat	Tidewater Goby Habitat
Creation of nesting islands/new breeding colonies	Dredging of lagoons/new channels
Exotic Plant Control	Exotic fish control
Dune Restoration	Sedimentation traps
Predator control	Water quality monitoring
Warning signs/fencing	Warning signs/marker buoys
Studies	Studies

2.4.5. Monitoring

1) Water quality within the Santa Margarita River Estuary will continue to be monitored until estuary enhancement actions under the LCAC EIS are completed.

2) Oversee the Navy responsibilities in monitoring, minimizing, and determining impacts of the Landing Craft Air Cushion (LCAC) Facility at Camp Pendleton as identified in the Final EIS are carried out:

   - Watersheds need to remain healthy.
   - Natural hydrological regime of lagoons needs to be maintained or improved.
   - Marsh habitat adjacent to lagoons needs to be improved.
   - Maintain/enhance buffers surrounding wetlands.
   - Water quality in lagoons should be maintained or if necessary improved.

3) Least terns and snowy plovers shall be monitored at least biannually to determine number of pairs, hatching success, and reproductive success in order to assess the effectiveness of the conservation plan.

4) Survey tidewater goby populations and monitor their status every 3 years, or as funding is available.

5) Continue to permit access for clapper rail surveys by statewide survey efforts.

6) Conservation plan shall be updated as recovery plans are published so conservation efforts are consistent with recovery goals. The Base should participate in review of recovery plans to ensure compatibility with the Base's mission requirements.

2.5. Programmatic Instructions

This plan proposes instructions, and which activities are required to comply with to avoid and minimize impacts to estuarine/beach ecosystems and listed species.

2.5.1. General

1) All actions which develop/remove or degrade estuarine/beach habitat shall be compensated for pursuant to the program activity classifications identified in Section 3.

2) Avoid and minimize impacts as much as possible.

3) All activities shall comply with NEPA. Alternatives shall be fully considered.

4) Conduct enhancement activities and studies that will benefit regional habitat conservation. Appropriate compensation credit will be given to the Base for these studies.

2.5.2. Instructions for Military Training Activities

Troops

1) All training units using estuarine and beach areas shall be familiar with and follow the Fire Danger Rating System (FDRS).

2) Military activities shall be kept to a minimum within the Santa Margarita Management Zone during the breeding season. During the breeding season, all activities involving smoke, pyrotechnics, loud noises, blowing sand, and large groupings of personnel (14 or more) must be kept at least 1000 feet (300 meters) away from fenced or posted nesting areas. All other activities must be kept at least 15 feet (5 meters) from these areas.

3) No vegetation shall be cut for military training purposes, except exotic plant species when approved by AC/S ES.

4) All training foot traffic within the management zones shall be prohibited within 15 ft. (5 meters) of posted nesting areas during the breeding season with the exception of Environmental Security, animal damage control, law enforcement, research, and life guard personnel.

5) Estuary wetlands and salt flats shall not be entered unless specifically authorized in another section of these programmatic instructions.

6) Military activities will be kept to a minimum within the Management Zone during the non-breeding season (September 1-March 14) in order to minimize disturbance to wintering snowy plovers.

7) Foot traffic in coastal lagoons and the Santa Margarita River Estuary shall be minimized.

8) Boat traffic is not authorized in the Santa Margarita River and White Beach estuary/lagoon at any time during the breeding season (15 March-31 August). Boat traffic in other lagoons will avoid foraging birds, and transit as far away as possible from nesting sites.

Vehicles

1) Motorized vehicles shall remain at least 15 feet from nesting areas during the breeding season, with the exception of amphibious tracked vehicles, vehicles using the White Beach access road, vehicles required for animal damage control, law enforcement, Environmental Security staff, and lifeguards. Vehicle traffic within the management zones during the breeding season shall be kept to a minimum. Vehicles will remain on hard packed sand unless parked, outside posted (signed) areas during the breeding season and as much as possible at other times, and will avoid the dune system at the base of the bluffs, as well as coastal wetlands. Travel speeds are not to exceed 25 mph.

2) Vehicles shall be excluded from the edges of bluffs between the White Beach/French Creek nesting areas during the breeding season.

3) Amphibious tracked vehicles shall traverse the management zones while maintaining both tracks in water at all times. Upon entering the beach from Camp Del Mar vehicles shall transit in a direct line along a marked corridor bordering the southern edge of the Santa Margarita Management Zone before heading up-coast. During returns, vehicles shall proceed along the same marked corridor. During the breeding season, amphibious tracked vehicles shall not traverse the Santa Margarita Management Zone (see Paragraph B.2.4) in excess of a monthly, average of 20 traverses per day (one traverse equals one round trip to and from Camp Del Mar).

4) The Landing Craft Air Cushion (LCAC) shall not traverse the beach/estuary areas of the management zones (see Paragraph B2.4) during the breeding season.

5) Vehicles and troops accessing the beach at White Beach during the breeding season shall follow a route along the base of the northerly bluff to maintain the maximum distance from the tern colony.

2.5.3. Aircraft

1) During the breeding season, aircraft shall not land within 300 meters of fenced nesting areas on Blue Beach or White Beach as identified on the CP Special Training Map.

2) Aircraft shall maintain an altitude of 300 feet AGL or more above nesting areas.

3) Helicopter landing in the Santa Margarita estuary, wetlands, and salt flats shall not be authorized, except on an in-flight emergency basis and at LZ21 (Camp Del Mar).

4) Aircraft landing is authorized in established Landing Zones (LZ), CAL Sites, and V/STOL pads.

2.5.4. Engineering

1) No digging of fighting positions or bivouacking shall be authorized in the vicinity of nesting areas within the management zones during the breeding season.

2) Engineering training operations outside of NEPA approved landing operation support shall be prohibited within the management zones. At beaches, earth moving activity is authorized only for areas of unvegetated sand as least 300 meters from posted nesting areas unless specifically approved or requested by AC/S ES.

2.5.5. Facilities Maintenance Activities

1) No tree or brush trimming shall occur within management zones during the breeding season.

2) Tree trimming shall avoid entire trees except exotics.

3) Exotic plant species shall not be used to landscape areas adjacent to estuary and coastal wetlands.

4) Tree trimming equipment shall operate from roads as much as possible.

5) With the exception of the access road immediately west of I-5, no vehicles shall enter estuarine areas without prior approval from the AC/S ES.

6) Trimming of landscape trees may occur all year in compliance with the Migratory Bird Treaty Act.

7) Trimming of vegetation shall not exceed 10 feet from communication or power lines.

8) Trimming for improved road safety shall be no more than 10 feet from the road shoulder.

9) No road/culvert repairs shall be conducted during breeding season except under emergency conditions.

10) Exotics shall be thoroughly dried and properly disposed.

11) Proper erosion control on slopes shall be implemented as funding becomes available.

12) Sediment runoff shall be contained on construction sites.

2.5.6. Recreation Activities

1) Recreational activities shall be kept to a minimum within the Santa Margarita Management Zone during the breeding season.

2) All foot traffic within the management zone shall be prohibited within 150 ft. (50 meters) of posted nesting areas during the breeding season.

3) Surf fisherman shall stay at least 300 ft. from posted nesting areas during the breeding season. No live bait fish or amphibians will be allowed for use in fishing.

4) Fishing shall be prohibited within coastal lagoons except the Santa Margarita Estuary, from under the Interstate 5 freeway bridge access point to the Santa Margarita River mouth.

5) Watercraft shall not be permitted within coastal wetlands (except up to four non-motorized boats may be allowed in the Santa Margarita Estuary three days per week during the waterfowl hunting season).

6) Illumination from the Del Mar ball field will be shielded (when replaced) to deflect lighting away from the Santa Margarita River Estuary. Lights shall be extinguished when field is not in use.

7) Beach raking will be limited to the Del Mar and San Onofre Recreational Beaches.

8) Recreational use of all terrain vehicles, motorcycles, and off-road vehicles is prohibited within the management zones.

9) Cutting of vegetation is prohibited, except along recreational beach at San Onofre and Del Mar.

10) Beach fires are prohibited within the management zones.

11) Dogs on the beach must be on a leash when within 1000 feet of nesting areas during the breeding season.

12) Camping at Cocklebur Canyon beach access will be limited to the non-breeding season (September 1 -14 March).

3. ACTIVITY CLASSIFICATION SYSTEM FOR FUTURE CONSULTATION

The Estuarine and Beach Ecosystem Conservation Plan established a system to manage the conduct of future consultations between the USFWS and Camp Pendleton. The purpose of this system is: (1) to reduce staffing requirements; (2) to provide a systematic approach to deal with future proposed projects, activities and operations; (3) to increase the Base's mission flexibility; (4) to satisfy Section 7(e)20 of the Act requirements for future programmatic consultations; (5) to define activities which require formal consultation with the USFWS.

This "activity class" system is not intended to negate the requirement for consultation in the future. On the contrary, it is intended to define activities whose consultation requirements are programmatically covered by this Opinion or those for which no further consultation is required. This system establishes an annual reporting procedure for newly initiated Base activities, the effects of which are relatively minor and easily covered under the conservation plans. Further, the system defines types of activities for which an expedited consultation process can be implemented.

This plan establishes that Camp Pendleton activities be sorted into the following four categories: Class IV, III, II and I.

3.1. Class IV

3.1.1. Definition

Class IV activities are defined as any activity that does not have the potential to affect listed or proposed species. No Section 7 consultation is required for such activities.

3.1.2. Examples

1) Foot traffic on existing roads during all seasons.
2) Light foot traffic (movement by individuals) off of existing roads during the non-breeding season outside of posted nesting areas.
3) Vehicle operations on existing paved and dirt roads, including established creek crossings, during all seasons.
4) Vehicle operations off of existing roads in habitat outside the Tern/Plover Management Zone in the estuarine/beach ecosystem during the non-breeding season.
5) Live firing on established ranges.
6) New construction within cantonment areas that do not result in additional habitat degradation.
7) Vegetation management during the non-breeding season:
   - Limb Trimming of all vegetation within 10 feet of roads or above ground transmission cables.
   - Exotic Plant Control in all areas.
8) Maintenance activities during the breeding season:
   - Use of existing facilities and ranges that do not result in take of occupied habitat.
   - Culvert clearing of all vegetation within 15 feet of culvert entry and exit points.
   - Road Maintenance of existing roads.
   - Night-time Lighting including lighting from existing facilities and indirect illumination from pyrotechnics to the extent the Fire Danger Rating System allows.
   - Exotic Plant Control in areas greater than 100 feet from occupied habitat during the breeding season.
   - Recreational Access pursuant to Marine Corps Order P5090, Base Order P5000 and programmatic instructions.
   - Vehicle traffic on existing roads.
   - Foot traffic during state authorized hunting seasons.
   - Maintenance activities that do not remove native vegetation within 100 feet of occupied habitat.
   - Hunting of game during authorized seasons, except posted or fenced areas.
   - Hiking, running, and bird watching along established trails.
   - Fishing within waterways, along designated beaches and within lakes or ponds.

3.2. Class III

3.2.1. Definition

Class III activities are those discrete projects that "may affect" listed or proposed species. Potential effects to the species and their habitat are limited and considered offset by the on-going implementation of the estuarine/beach conservation plan. An annual report of activities occurring under this class will be sent by Camp Pendleton to the USFWS at the end of each fiscal year.

Class III activities are those which may potentially result in adverse effects to species in the estuarine/beach ecosystem that:

1) Are temporary disturbances to Plover Management Zone that is eliminated when activity ends.
2) Are temporary degradation of nesting areas during non-breeding season that can be restored before nesting season begins.

3.2.2. Examples

1) Aircraft overflights below 300 feet AGL over occupied territories of listed species during the breeding season along established Terrain flight (TERF) routes.
2) Small boats in the Santa Margarita River during the non-breeding season (military training and hunting).
3) Off-road troop movement (large groups) during the non-breeding season.
4) Indirect lighting of habitat during breeding season.
5) Weed control activities:
    - That result in the use of power tools during the breeding season within 100 feet of occupied habitat.
    - That result in affecting native vegetation of occupied habitat.
    - That use Rodeo or equivalent cut-stump or aerial spraying in occupied habitat.
6) Controlled burns conducted for habitat enhancement and protection during the non-breeding season.
7) Temporary sustained noise levels above 80 dBA L_{eq} hourly as measured over a 7-day period during the breeding season.
8) Vehicle access for enhancement activities.

3.3. Class II

3.3.1. Definition

Activities that may affect listed species and for which impacts may or may not be offset by the conservation plan with associated compensation measures and that require concurrence from the USFWS via a separate project concurrence letter. Concurrence letter will specify the project description for the proposed action; avoidance and minimization measures effected;

programmatic instructions recommended for implementation; assessment of the impact to listed species and associated habitat for direct and indirect effects (with the exception of dust and noise); annual bank balance; compensation requirements; and mitigation compensation measures proposed.

- Permanent development of beach habitat in excess of 1 acre.
- Permanent development of more than 1 acre of pickleweed salt marsh or 2 acres of coastal dune habitat.

3.3.2. Examples

General

1) Aircraft overflights below 300 feet AGL over occupied territories of listed species during the breeding season.
2) Results in lighting of habitat during breeding season that directly affects listed species.
3) Weed control activities that occur during the peak of the breeding season (March through June).
4) Aerial spraying of pesticides between March through August.
5) Result in permanent sustained noise levels above 80 dBA l_{eq} hourly calculated over a 7 day period during the breeding season.
6) Aircraft overflights below 300 feet AGL over nesting sites of listed species during the breeding season.

Project Examples

1) New facilities, structures or habitat modification that affects significant quantities of habitat.
2) Construction of new nesting island in Santa Margarita estuary.

3.4. Class I

3.4.1. Definition

Activities whose impacts are not offset by the Conservation Plan and/or additional mitigation not agreed upon through informal consultation. These activities will trigger the requirement to enter into formal consultation and require preparation of a separate BA by the Base, and consequent issuance of a BO by the USFWS. Reference may be made to measures within this Plan as guidelines for avoidance or minimization measures. However, credit for conservation plan activities conducted under this plan will not accrue to this "new consultation" and for which significant, separate compensation will be required.

- Activities that require construction or degradation of Santa Margarita Estuary, plover management zone, Cocklebur Canyon, and Red Beach Estuary.
- Activities whose indirect effect has potential to significantly degrade water quality and quantity of the Santa Margarita Estuary.

Appendix H

Riparian Ecosystem Conservation Plan

Appendix H

RIPARIAN ECOSYSTEM CONSERVATION PLAN

During 1994 Camp Pendleton entered into formal consultation under Section 7 of the ESA for ongoing and planned training activities, infrastructural maintenance activities, several construction projects, and a Riparian and Estuarine Ecosystem Conservation Plan. On 30 October 1995 the USFWS issued a BO (1-6-95-F-02) covering those actions. This appendix contains the Riparian Ecosystem Conservation Plan portion of those actions. Terms and conditions of the BO covering this plan and the Estuarine and Beach Ecosystem Plan are in Appendix M.

The primary purpose of the Riparian Ecosystem Conservation Plan is to manage fish and wildlife resources in riparian areas. This plan is "programmatic" in the sense that it addresses long-term requirements of the riparian resources in a comprehensive, "programmatic" fashion. This conservation plan is programmatic in its strategy: habitat management actions will be planned and evaluated in the context of achieving and maintaining a "healthy ecosystem" for sensitive species. It is the intention to apply this programmatic approach to all ongoing and future actions at Camp Pendleton, as they potentially affect the integrity of riparian ecosystems.

The mission of MCB Camp Pendleton is to operate an amphibious training base, while protecting the environment and providing facilities, services, and support to prepare Marines and Sailors for combat. Camp Pendleton's 125,000 acres (approximately 200 square miles) of ocean front beach, coastal plains, terraces, hills, mountains and stream valleys, and the Base's associated restricted airspace, offer a unique combination of natural resources that assure well-prepared national security forces.

Camp Pendleton's military mission is combat training and support of Marine Corps units and other DoD forces. Training activities include, but are not limited to: amphibious landings, fixed and rotary-winged aircraft flights and landings, tracked/wheeled vehicle and personnel maneuvers, artillery and small arms firing, aerial weapons delivery, engineer unit operations, organization of supply, field combat service support, employment of communications, airlifting of troops and weapons, equipment maintenance, and field medical treatment.

Camp Pendleton's training and combat service support functions share the use of Base lands with several non-military functions. Such uses include: a Department of Justice border patrol check point, a California State Parks and Recreation campground and beach, the SONGS, agriculture and grazing outleases, and public schools. These functions are important uses of Camp Pendleton's land, and they require additional land management attention to assure the Base meets its primary commitments to the military mission and conservation.

The Base manages access to sensitive wildlife habitat, and acknowledges the importance of this practice as a necessary precaution to preserve wildlife corridors and vital habitat for listed species, and to enable the Base's mission to co-exist with sensitive wildlife communities.

1. ECOSYSTEM CONSERVATION MANAGEMENT

1.1. Overview

DoD has embraced "ecosystem management" as its tool for conserving natural resources. In a memorandum of 8 August 1994, concerning implementation of ecosystem management in the DoD, the Deputy Under Secretary of Defense (Environmental Security) promulgated the following policy statements:

> Ecosystem Management is the basis for future management of DoD lands and waters. It will blend multiple-use needs and provide a consistent framework for managing DoD installations, ensuring the integrity of ecosystems.
>
> Ecosystem management is a goal-driven approach to environmental management at a scale compatible with natural processes, recognizes social and economic viability within functioning ecosystems, and is realized through effective partnerships among private and government agencies.
>
> Ecosystem management is a process that considers the environment as a complex system functioning as a whole, not as a collection of parts, and recognizes that people and their social and economic needs are an integral part of the whole.
>
> In applying the principles and guidelines for DoD ecosystem management, military installations will:
>
> - Develop a vision of ecosystem health. Existing natural resource, social, and economic conditions should be factored into the vision.
> - Develop coordinated approaches to work toward ecosystem health. Since ecosystems rarely coincide with ownership and political boundaries, cooperation across ownerships is an important component of ecosystem- based management.
> - Maintain and improve the sustainability and native biological diversity of ecosystems.
> - Support sustainable human activities. People and their social, economic, and security needs are an integral part of ecological systems, and management of ecosystems depends upon sensitivity to these issues.
> - Use benchmarks to monitor and evaluate outcomes and establish milestones to ensure accountability.

The Camp Pendleton's conservation program starts with recognition of its military mission. In fact, the Riparian Ecosystem Conservation Plan assumes that only through continuance of that mission will the objectives of the plans be accomplished.

The conservation program also proceeds with recognition of the following biological principles: 1) ecosystems are dynamic by nature; 2) the functioning of ecosystem components operate at different rates; 3) all components are interrelated; 4) the ecosystem is a complex, dynamic

system functioning as a whole, not as a collection of parts; and 5) ecosystem integrity may be disrupted by excessive "interference" of any single component.

The Base uses these guidelines in establishing programmatic instructions for military training, facility and range maintenance, recreation, and new project planning. This approach is used to develop prudent and reasonable alternatives, which seek to avoid and minimize impacts to species and their habitats and maintain ecosystem integrity.

The Base Riparian Ecosystem Conservation Plan was developed to maintain and improve the sustainability and native biological diversity of the riparian ecosystem, while supporting Camp Pendleton's mission of training Marines. Camp Pendleton intends that this program provide a comprehensive framework for assuring the consistent management of the Camp Pendleton riparian ecosystem.

The thrust of the Riparian Ecosystem Conservation Plan is to manage habitat on an ecosystem basis. Benchmarks have been established to monitor and evaluate the integrity and functioning of the ecosystems aboard Camp Pendleton. Specific habitat and species goals were established in consultation with the USFWS and aim at contributing to threatened and endangered species recovery. Based on periodic assessments, the program calls for management objectives and strategies to be modified to meet changing circumstances and requirements.

The program depends on the development of formal and informal partnerships among private and government agencies to achieve its goals. It is based on the assumption that without such partnering the integrity of the ecosystems cannot be maintained. The plan further assumes that successful partnering will not happen without each party respecting the legitimate needs of the other.

1.2. Integration with Regional Conservation Planning

The Camp Pendleton conservation program depends on its integration with regional conservation planning efforts. The Base acknowledges the USFWS's broader role in the regional planning process and expects the USFWS to be its advocate in this arena. Camp Pendleton assumes that the USFWS will view the Base's ecosystems in an ecoregion context, setting appropriate goals for the subareas thereof. This means that the responsibility for conservation of wildlife in the southern California coastal ecoregion does not fall solely on Camp Pendleton. Camp Pendleton expects that the USFWS, in its oversight and wildlife advocacy role in the region conservation planning process, will promote the distribution of information and consistent application of Section 7 and Section 10 procedures to foster species recovery throughout the ecoregion.

1.3. Management Activity Funding

The Riparian Ecosystem Conservation Plan is premised on the understanding that funding and achievement of the plan's goals are interrelated with assuring and enhancing the on-going maintenance and flexibility of the Base's military mission. Funding for management activities aimed at the conservation of the Base's ecosystems derive from 1) agricultural leases and resource utilization programs; and 2) new projects. In the past, policy has resulted in single project related, on-site, in-kind mitigation measures. This focus did not promote an ecosystem approach to resource management. This plan promotes a policy that will tailor individual project

mitigation to the needs of the ecosystem. In addition, this plan recognizes the USFWS' proposal to assume (see conservation recommendations in the BO) some of the costs associated with the conservation program by in-kind resources. This is intended to increase the flexibility of Camp Pendleton to devote more effort towards the ecosystems goals previously established, and in turn enhance its operational flexibility. However, this approach is tempered in light of the current legislative proscription, under the Anti-Deficiency Act, from obligation of funds prior to Congressional authorization. Should this proscription be changed or legislation enacted that addresses the challenge of long-term funding for recurring ecosystem maintenance and enhancement requirements, Camp Pendleton and the USFWS will reexamine the current funding and management strategies aimed at achieving the program goals.

1.4. Ecosystem Boundaries

Camp Pendleton recognizes that the ecosystem habitats observe no specific delineation, tending to merge together in a very fluid and continuous manner, and that whatever ecosystem boundaries it designates are artificial. However, to facilitate the consistent mapping, monitoring, assessment and other management activities for each ecosystem, the following artificial boundaries were established in consultation with the USFWS. The riparian ecosystem aboard Camp Pendleton is comprised of those lands lying within the 100-year flood plain of the drainages flowing through the Base to the estuary and beach systems at the stream/river mouths junction with the Pacific Ocean. The estuary ecosystem consists of those coastal areas and associated salt/freshwater marshes between the head of tidal action and the low-tide-line at the beach, which support unique estuarine species. The beaches under this consultation are the coastal beaches with associated dune systems that border estuary and riparian regions of the Base and along the coast. The uplands ecosystem consists of the remaining undeveloped areas of Camp Pendleton.

1.5. Programmatic Instructions

The Base has incorporated into this plan a system of "Programmatic instructions" that will be used to avoid and minimize adverse impacts to the ecosystem. If adverse impacts cannot be avoided, appropriate compensation procedures will be implemented, per Section 2.5.2. Activities will be scheduled during the non-breeding season where possible. Military training units will follow guidance given in the Programmatic Instructions to avoid incidental take and adverse impacts. Construction sites will be selected to impact the least amount of riparian habitat possible.

1.6. General Goals

Camp Pendleton, in consultation with the USFWS has developed habitat acreage goals and species population numbers. Additionally, Camp Pendleton established enhancement actions specified within the Riparian Ecosystem Conservation Plan.

2. RIPARIAN ECOSYSTEM CONSERVATION PLAN

This Riparian Ecosystem Conservation Plan is designed to maintain and enhance the biological diversity of the riparian ecosystem on Camp Pendleton. The conceptual approach behind this conservation plan is to sustain and restore riparian ecosystem dynamics, so that natural plant and animal communities on the Base are sufficiently resilient to coexist with current and future military training activities.

The success of this plan will be primarily measured by the abundance and distribution of endangered species, and an increase in ecosystem health and value.

This plan identifies the major riparian habitats and quantifies a baseline (as present in 1994) acreage for each. This plan also assigns values to habitat types based on their suitability, for currently listed threatened and endangered species. These values were qualitatively developed based on information related to the distribution and abundance of sensitive species and what is currently known about their life history requirements.

The riparian ecosystem conservation plan demonstrates a commitment to promote an increase in the quantity of riparian woodland and riparian scrub habitat throughout all Camp Pendleton watersheds, beyond the baseline established through the Santa Margarita River Memorandum of Understanding (MOU). Further, it promotes the maintenance of the open water/gravel areas and marsh areas within the baseline. Conservation efforts will be focused on the eradication of exotics from various habitat categories and conversion of this acreage to riparian woodland, riparian scrub or open gravel areas in pursuit of the goal of promoting growth in sensitive species (primarily vireo, flycatcher, and arroyo toad) populations.

2.1. Background

Throughout the recent past, Camp Pendleton and the USFWS have collaborated in protecting riparian habitats from the impacts of many types of activities. Much of this collaboration was based on the Santa Margarita River MOU related to the least Bell's vireo. This MOU provided protection for this species through the Bases commitment to maintain 1200 acres of suitable habitat in the Santa Margarita River Basin for least Bell's vireo. This resulted in the *de facto* establishment of an endangered species management area on the Base that was largely off-limits to military training. This policy of avoidance, in conjunction with an aggressive monitoring and cowbird control program, led to a dramatic increase in the least Bell's vireo population on Base. The increasing vireo population in the Santa Margarita River basin (the focus of the MOU) has overflowed into other drainages on Camp Pendleton that were not addressed in the MOU.

2.2. Goals

The primary goals of the Riparian Ecosystem Conservation Plan are to:

2.2.1. With Regards to Base Management:

1) Facilitate greater latitude in conduct of training activities.
2) Provide a framework for consistency in mitigation related to current and future riparian impacts resulting from Base activities.
3) Preclude the need for designation of critical habitat and supersede the existing least Bell's vireo MOU.
4) Establish partnerships for ecosystem conservation. Conduct enhancement activities and studies off-Base that benefit regional habitat conservation. Studies (both on and off Base) will also be used to guide habitat enhancement. The USFWS will continue to be Camp Pendleton's advocate on a regional basis.

2.2.2. With Regards to Ecosystem Management:

1) Provide a framework for managing riparian habitats from an ecosystem perspective.
2) Supersede the single-drainage focus of the MOU by explicitly promoting the maintenance and enhancement of riparian habitats Basewide.
3) To eliminate Arundo (and other exotic riparian species) on Base in partnership with jurisdictions upstream.
4) Provide for viable riparian corridors.
5) Provide for largely unimpeded hydrologic and sedimentary floodplain dynamics, so that the physical template is available to support the maintenance and enhancement of biota throughout the Base.
6) Maintain natural flood plain processes and area extent by avoiding and minimizing the further permanent loss of floodplain habitats. As a federal entity, the Base is obligated to adhere to EOs 11988 and 11990 of 1977 concerning floodplain development and maintenance of ecosystem integrity.
7) Flood regimes on Base will be maintained to as close to natural a condition as possible. Artificial influences on flooding regimes shall be avoided and minimized to the maximum extent possible, necessary to protect life and property;
8) Stream and river flows needed to support riparian (and estuarine) habitats shall be maintained to the extent practicable. Riparian water quality and quantity shall be in conformance with approved Regional Water Quality Control Board basin plans. The USFWS will support the Base by monitoring upstream water withdrawals and discharges, to enable maintenance of a viable water balance within the watershed riparian ecosystems both on and off of the Base.
9) Groundwater levels shall be monitored and basin withdrawals managed to avoid loss and degradation of habitat quality, to the extent practicable. Where vegetation monitoring programs demonstrate effects on habitat, compensation will be implemented, based on the best available hydro-geochemical and biological modeling available. The Base will not be penalized for upstream development, use and their (upstream) over-withdrawals from the Basin.
10) Promote land conservation practices to effectively reduce unnatural sedimentation and siltation resulting from the activities on Base. The USFWS will promote the same practices for upstream users in the basins that flow through Camp Pendleton.

2.2.3. With Regards to Habitat Management:

It is Camp Pendleton's intent to manage riparian habitats to preclude long-term damage and degradation. Habitat management will continue toward exceeding the habitat goals established under this plan. Camp Pendleton seeks to:

1) Manage native vegetation to promote optimal community succession for ecosystem integrity with focus on sensitive species. Native riparian plant communities shall be maintained by natural processes and not be artificially manipulated, except as needed to

restore depleted natural resources, or where areas are isolated from natural dynamics of the ecosystem.

2) Promote connectivity of native riparian habitats through project avoidance of currently constrained areas and enhancement procedures.

3) Enhance the value of the ecosystem by targeting mitigation towards eradication of exotic plant communities (*Arundo* and *Tamarix* spp.) and promotion of successional stages of riparian scrub and riparian woodland habitat.

4) Eliminate/control exotic plants whenever practical, including after flood, fire, construction, or other disturbance. Control existing exotic vegetation by: aerial or ground herbicide application followed by cutting, or cutting followed by herbicide application. Additional herbicide application during the original treatment growing season plus herbicide treatment of regrowth, for an additional 2 growing seasons.

5) Prevent new weed introductions in riparian zones and to control/eliminate aggressive invasive exotic plants already established on Base. Camp Pendleton is willing to mitigate for projects on Base through removal of exotic vegetation off Base.

6) Restore areas to their original condition after disturbance through a combination of exotic vegetation control and vegetation management (including replanting if necessary) that will permit native species to regenerate. This method is to be implemented on areas that are temporarily disturbed during project construction or by other temporary impacts such as fire damage. The compensation program for temporary impacts, exclusive of those effects resulting from fires, includes exotic plant control measures such as weeding and monitoring of affected areas for 5 years, in addition to compensation per Section C.2.5.2. Whenever practical, the original topsoil will be restored to areas of native vegetation which have been disturbed by construction.

7) Minimize occurrence of unnatural fires in riparian zones caused by Base activities. Riparian zones subjected to unnatural fires shall be managed for improvement of native habitat values and prevention of soil erosion. This should mainly include the immediate control of invasive exotic species as appropriate. However, controlled burns, as part of Camp Pendleton's Fire Management Plan, are essential to preventing runaway destruction of significant quantities of riparian habitat.

8) Conserve habitat assigned to "Base" and "Bank" categories.

9) Distribute vireo quality habitat across all Basins, while maintaining the maximum amount of habitat per the spirit of the MOU.

10) Achieve the riparian ecosystem habitat goals of eliminating exotic vegetation and increasing riparian vegetation with at least 50% being riparian woodland/riparian scrub.

2.2.4. With Regards to Species Management:

1) Achieve greater biological diversity and distribution of sensitive species populations in the three other principal drainages (San Mateo, San Onofre, and Las Flores) on the Base.

2) Promote long-term increase in singing male vireos beyond the 300 singing males (718 singing males in 2006) stipulated in the MOU and flycatchers beyond the 22 singing

males detected during the 1994 Base survey within ecosystem through continuation of Base management efforts. The vireo population on Camp Pendleton has previously increased significantly because of the Base's commitment to reduce activities in riparian habitat during the breeding season and trap brown-headed cowbirds in the lower Santa Margarita River Basin. The Base will continue to minimize impacts to riparian habitats through use of programmatic instructions to guide activities and through control of brown-headed cowbirds on all drainages.

3) Establish self-sustaining populations of listed species that require little human intervention for maintenance. Animal Damage Control efforts will be focused toward management of "problem" species and minimization of the disruption of natural native animal population dynamics.

4) Minimize periods of excessive continuous noise levels (an average, hourly, continuous noise level above 60 DBA L_{eq} as measured over the entire daylight period) to which sensitive species are subjected.

5) Minimize effect of direct and indirect night time lighting in riparian areas (exclusive of ongoing night firing activities associated with existing range and training usage) year-round.

6) Promote increased arroyo toad populations in watersheds, where found, through perpetuation of natural ecosystem processes and programmatic instruction application for avoidance and minimization of impacts.

7) Evaluate habitat suitability for potential reintroduction of the red-legged frog.

8) Examine Base for habitat qualities necessary to support steelhead runs and determine feasibility of establishing such runs.

2.3. Riparian Ecosystem Baseline

2.3.1. Habitat Components

Riparian Woodland: characterized by dense, broad leafed, winter-deciduous riparian thickets, with greater than 70% constituted by several species of willow, including Gooding's (Black) willow (*Salix goodingii*), sandbar willow (*S. hindsiana*), and arroyo willow (*S. lasiolepis*). Other species that may be present are scattered individuals of Fremont's cottonwood (*Populus fremontii*), oaks (*Quercus* spp.), and California sycamore (*Platanus racemonsa*). This habitat was once extensive along major rivers of coastal southern California, but its extent has been greatly reduced by entities exclusive of Camp Pendleton, urban flood control, agriculture and development (Holland, 1986). This habitat is crucial for support of three federally endangered species, least Bell's vireo, the southwestern willow flycatcher and the arroyo toad. Under a habitat value ranking system, this habitat is assigned the numerical score of five (5) for comparison to other habitat types, in recognition of its principle use by currently listed species.

Riparian Scrub: characterized as being dominated by mulefat (*Bacharris glutinosa*), and often represents an early stage in the establishment of cottonwood- or sycamore-dominated riparian forests or woodlands (Holland, 1986). Other characteristic species include Mexican elderberry (*Sambucus mexicana*), sandbar willow, arroyo willow, and stinging nettle (*Urtica holosericea*). This habitat type is considered an early succession stage that will grow to riparian woodland,

eventually, given the right environmental conditions. The least Bell's vireo and southwestern willow flycatcher use this habitat for foraging and, in the more well-developed (mature) stands, for nesting. Under the habitat ranking system this habitat is assigned a score of three (3).

Open Water/Open Gravel: encompasses non-vegetated or very sparsely vegetated areas. Included here are sand and gravel washes, mud banks, and open water. This habitat type may be used by least Bell's vireos and southwestern willow flycatchers when it is within close proximity of riparian habitats supporting these species. This habitat may be used by arroyo toads when sandy or gravely substrates are present. Assigned a habitat ranking system value of four (4), due to its utility to the arroyo toad.

Freshwater Marsh: wetlands that are permanently flooded by standing freshwater lacking a significant current (Holland, 1986). Characteristic species include woolly sedge (*Carex lanuginosa*), yellow nutsedge (*Cyperus esculentus*), cattail (*Typhia* spp.), bulrush (*Scirpus* spp.), and southern mudwort (*Limiosella aquatica*). The light-footed clapper rail could potentially utilize coastal areas of this habitat type. Juvenile and adult California Least Terns may use this community type for feeding through the breeding season, when it is near their nesting areas. Least Bell's vireos and southwestern willow flycatchers will use this habitat type as foraging habitat when it is in close proximity to other riparian habitats. Assigned a habitat ranking system value of three (3).

Mixed Woodland: characterized by riparian woodlands containing less than 70% willows and low occurrence of exotic vegetation (arundo and tamarisk). Plant species included in this community are sycamores, oaks, willows, and Mexican elderberry. Least Bell's vireos and southwestern willow flycatchers are not commonly found using this habitat type aboard Camp Pendleton, but areas with little understory vegetation may support arroyo toads. Assigned a habitat ranking system value of two (2).

Sycamore Grassland: grasslands containing sycamore. Primarily associated with drier ephemeral washes and generally consists of a fairly open canopy. This habitat type is not expected to solely support any of the species of interest, but could be utilized to a limited extent when associated with other riparian habitats. Assigned a habitat ranking system value of two (2).

Grass-Forb Mix: includes such species as the exotic, mustard (*Brassica* spp.), and sweet fennel (*Foeniculum vulgare*); annual grasses (*Bromus* spp., *Vulpia* spp., etc.), goldenbush (*Isocoma menziesii*), and others. This habitat type may be used by least Bell's vireos and southwestern willow flycatchers when it is within close proximity to riparian habitats supporting these species. Assigned a habitat ranking system value of one (1).

Arundo: characterized as having greater than 70% giant reed. This exotic species has established itself in large stands along the watersheds of southern California and out competes native vegetation, thereby reducing habitat for several listed species. Assigned a habitat ranking system value of zero (0), as being unsuitable for listed species management efforts.

Tamarisk: characterized as having stands of greater than 70% tamarisk. This habitat type, like *Arundo*, is of no benefit to the targeted species and will be targeted for eradication as a high

priority under any management mitigation efforts. Assigned a habitat ranking system score of value (0), as being unsuitable for listed species management efforts.

Mixed Willow-Exotic: characterized as containing less than 70% willows with large percentages of exotic plants. Other plant species associated with this group include arundo, tamarisk, Mexican elderberry and mulefat. This habitat may support the least Bell's vireo, southwestern willow flycatcher, and arroyo toad, but at lower densities than could be expected for "pure" stands of riparian woodland or well developed mature riparian scrub. This habitat may be cleared of exotics under the riparian conservation plan mitigation compensation actions to upgrade it to a higher habitat quality. Assigned a habitat ranking system value of one (1), as it is of marginal utility to listed species.

Disturbed/Developed Lands: land on which the native vegetation has been significantly altered by agriculture, construction, or other land clearing activities is termed "neutral". Such habitat is typically found in vacant lots, roadsides, construction staging areas, and abandoned agricultural fields, and is dominated by non-native annual and perennial broadleaf plant species. This habitat generally includes few native plant species that support the species of interest. Assigned a habitat ranking system value of zero (0), as being of no use to listed species.

2.3.2. Habitat Baseline

This was based on a photographic (1:12,000) survey, digitized using the Camp Pendleton's Geographic Information System (GIS) and delineated by field surveys in 1994.

The riparian ecosystem was determined in 1994 to contain the mix of habitat types tabulated in Table 1. This is considered the benchmark for initiation of the Riparian Ecosystem Conservation Plan. An analysis of Camp Pendleton habitat acreages concerning the status of habitat and changes in the habitat mix will be accomplished using photographic analysis digitized to be compatible with the Camp Pendleton Geographic Information System every five years by the Base in partnership with the USFWS. The periodicity of such analysis may be modified, depending upon circumstances and when mutually agreed to.

2.3.3. Increasing Ecosystem Value

The plan is designed to achieve an increase in the relative value of the riparian ecosystem resulting from the gradual elimination of exotic plant species from the system. The assumption is that if exotics are removed, the riparian plant community will offer more suitable habitats for listed species. The plan proposes a formula (Equation 1) for qualitatively measuring progress toward achievement of this goal. The purpose of the formula is simply to provide a descriptive indicator. The numeric values assigned to each habitat type are not intended to denigrate the value of those assigned lesser value versus higher value. Habitat numeric value assessment is dependent upon the overall management objectives at a given point in time. At initiation of the ecosystem management plan these values were assessed based on the goal of enhancing Vireo, Flycatcher and Arroyo Toad populations within this ecosystem.

Equation 1: Ecosystem Value = 5 x (riparian woodland acres) +
4 x (open area/open water acres) +
3 x (riparian scrub acres) +

3 x (freshwater marsh acres) +
2 x (mixed woodland acres) +
2 x (sycamore grassland acres) +
1 x (grass-forb mix acres) +
1 x (mixed willow exotic acres)

TABLE 1. 1994 BENCHMARK SURVEY FOR RIPARIAN HABITAT

Habitat Type	1994 Benchmark (Acres)	Percent of Ecosystem (%)	Habitat Ranking System Value (Points/Acre)	Ecosystem Health Value (Points)
Riparian Woodland	1467	15	5	7335
Open Water/ Gravel	1160	11.80	4	4640
Riparian Scrub	2020	20.60	3	6060
Fresh Water Marsh	254	2.60	3	762
Mixed Woodland	651	6.60	2	1302
Sycamore Grassland	172	1.80	2	344
Grass/Forb Mix	1236	12.60	1	1236
Mixed Willow Exotic	982	10.00	1	982
Arundo	283	2.90	0.00	0
Tamarisk	13	0.10	0.00	0
Disturbed/ Developed	1565	16.00	0.00	0
TOTAL	9803	100.00		22661

2.4. Management Accounting

The least Bell's vireo (LBV) MOU goal of 1,200 acres of "suitable LBV habitat" was used as a "Base" (conservation category) for Camp Pendleton's regional participation in recovery plans for the LBV, and other listed species which share similar riparian habitat. This 1,200-acre "Base" consists of a mix of 600 acres of riparian woodlands habitat and 600 acres of riparian scrub habitat that the Base intends to maintain and distribute in all of its basins in order to create corridors of suitable riparian habitat and encourage species distribution beyond the Santa Margarita River basin. When this plan was established Camp Pendleton had an additional inventory of 2,287 acres of riparian woodlands and scrub habitat that was suitable for neotropical migratory birds such as the vireo and the willow flycatcher. Of these 2,287 acres, the Riparian Management Plan initially designated 1,000 acres (600 acres of riparian woodlands and 400 acres of riparian scrub) as an additional conservation bank ("bank"). The balance of habitat in this "bank" does not represent a habitat "line of credit", as compensation for actual or future destruction of the remainder of the habitat in the ecosystem. Rather, the "bank" balance serves as an entry argument in the calculation of mitigation ratios for compensation for unavoidable impacts resulting from current and future actions that may affect the remainder of the riparian ecosystem.

This "bank" was not created to be depleted, but rather to be used to determine/generate in-place mitigation compensation ratios and to provide an accounting mechanism, which will graphically

measure and depict the results and status of the Base's mitigation and management efforts within the riparian ecosystem. The "bank" is planned to be maintained or to grow, not to be reduced.

This plan has assigned the remaining 5,038 acres of riparian ecosystem to a conservation ledger account designated as a "flexibility" account. The purpose of the "flexibility" account is to provide habitat areas (of all types) that may be used for facilitating the Base's mission. When impacts to the riparian ecosystem, resulting from activities and projects associated with the Base's mission, are unavoidable, these activities and projects will be targeted in habitat areas on the Base in the following order: 1) exotic dominated; 2) "other" riparian; 3) riparian scrub; and 4) riparian woodland habitats. When this plan was established there were 1,278 acres of exotic dominated habitat, 3,473 acres of "other" habitat (habitat other than exotic, riparian woodland or scrub), 820 acres of riparian scrub, and 267 acres of riparian woodland habitat assigned to this "flexibility" account.

As projects or actions within the ecosystem are planned, Camp Pendleton intends to continue to emphasize avoidance and then minimization of impacts to the remaining habitat types within the ecosystem, primarily through the habitat management system above and through programmatic instructions. When impacts are unavoidable, mitigation compensation will be targeted, consistent with USFWS guidance, to eradicate exotic plants in the riparian ecosystem. The assumption of this plan is that as exotic habitat is cleared, that area will gradually be converted into other habitat types of the riparian ecosystem. Riverine dynamics and vegetative succession result in habitats ranging from open pool/gravel habitats to riparian scrub and woodland type habitats. As the amount of riparian woodland and scrub habitats increase in the "flexibility" account, habitat may be added to the "bank" balance in order to facilitate lower mitigation ratios for Camp Pendleton.

This base-bank-flexibility arrangement was established in consultation with the USFWS in light of Camp Pendleton's past accomplishments in enhancing the value of the ecosystem for endangered species. It has also been designed to provide management direction and incentives.[1] It is intended that this plan will provide Camp Pendleton planning personnel with a tool to evaluate impacts and associated costs of future actions. It should encourage the targeting proposed actions at lower value habitat and discourage actions or impacts to that of higher value to sensitive species. Finally, Camp Pendleton intends that it will provide consistent mitigation compensation ratios for programmatic application in future informal and formal consultations between the Base and the USFWS.

In other words, it is intended that the in-place mitigation "bank" will provide incentives for conservation and exert "self-discipline" on Camp Pendleton in its application, so that the overall habitat value of the ecosystem progresses in an increasing fashion. Should an occasion arise, though not envisioned, that will necessitate use of the habitat assigned to the "bank", the Base will re-initiate formal consultation with the USFWS. The Commanding Officer of MCB Camp

[1] Were this bank not in place, higher mitigation ratios would likely ensue (on the order of 5:1 for riparian woodland habitat, 3:1 for riparian scrub habitat, and 2:1 for other quality habitat).

Pendleton is designated as the approving official for use of the in-place mitigation bank and flexibility categories.[2]

Camp Pendleton will develop a ledger to account for habitat quantities and impacts thereon. This ledger will start with the 1994 habitat baseline (Table 1). An annual report, submitted by the Base to the USFWS, provides a year-to-date balance based on debits associated with project impacts and mitigation actions (credits). As previously mentioned the ledger balances will be realigned based on the periodic riparian ecosystem analysis.

2.5. Plan Implementation

2.5.1. Avoidance and Minimization

This plan places a premium on avoiding and minimizing destruction or disturbance of sensitive species and their habitat. A major component of this plan is the "programmatic instructions" that are followed during the planning and implementation of projects and activities. These instructions are aimed at assuring the avoidance and/or minimization of adverse effects to sensitive species and habitats within the riparian ecosystem. The programmatic instructions direct that projects must first try to avoid impacts and then focus on minimizing unavoidable impacts. Siting priorities for projects that must occur in riparian habitat are in descending order: 1) exotic infested habitat; 2) "other" habitat; 3) riparian scrub; and 4) riparian woodland (from the "flexibility" account).

2.5.2. Mitigation

With respect to mitigating for unavoidable impacts, this plan focuses, at least initially, on exotic plant control because eradication of exotic invasive plant communities is considered crucial to maintaining the health of the overall ecosystem. The actual implementation of eradication efforts will be based on individual (future) project impacts or on-going activity impacts, and conservation enhancement programs, funds permitting in the latter case. It is expected that eradication operations will occur annually in significant, cost-effective blocks, and will not be tied to the timing or location of individual projects (other than their aggregate contribution to the annual total of mitigation requirements).

Compensation for activities that do not fit within the Riparian Conservation Plan (e.g. Riparian Resources Floodplain Goals) or Programmatic Instructions shall be subject to informal or formal consultation with the USFWS.

To determine the amount of mitigation compensation acreage associated with any project, this plan incorporates a sliding mitigation scale to enable determination of mitigation ratios. These ratios are keyed to the size of the current "bank" balance. This will exert further discipline in the exercise of land use management planning within the riparian ecosystem, through imposition of penalties (increasing mitigation ratios) for maintenance of a relatively small bank and incentives (decreasing mitigation ratios) for increasing the bank balance. In essence, the lower the available bank balance, the higher the mitigation compensation that will be required. Conversely, the higher the bank balance, the lower the mitigation ratio that will be used.

[2] These actions will fall into the Class 1 category, as discussed in Section E.3.4.

2.5.3. Permanent Impact Compensation

The plan establishes a set of exponential functions that will be used to determine mitigation compensation ratios. These are indexed relative to the acreage retained within the bank. With a bank balance of zero (0), mitigation ratios would be on the order of 5:1 for high quality, 3:1 for medium quality, and 2:1 for low quality habitat. Given the Base's initial base and bank balance of 2200 acres of habitat, lower mitigation ratios on the order of 2.0:1 (two acres of arundo eradication for loss of 1 acre of habitat) for Riparian Woodland and Open/Gravel area habitat; 1.5:1 for Riparian Scrub, Freshwater Marsh, Mixed Woodlands, and Sycamore Grassland habitat; and 1.1:1 for all other habitat types (to include *Arundo* and *Tamarix*, were established by the plan. The function was developed to significantly increase compensation requirements should the bank balance decrease from its current level and to gradually decrease mitigation ratios as the bank balance increases.

Mitigation compensation ratios will be accomplished for projects sited in riparian habitat on the basis of the following equations:

Equation 2: (for riparian woodland and open water/open gravel area habitat type impacts)
$CRH2\ (bb) = 3.40\ e^{-bb/450} + 1.60$

Equation 3: (for riparian scrub, fresh water marsh, mixed woodland, and sycamore grassland habitat type impacts)
$CRM2\ (bb) = 1.7\ e^{-bb/450} + 1.3$

Equation 4: (for all other quality habitat type impacts [3])
$CRL2\ (bb) = 1.00e^{-bb/450} + 1.0$

where e = Inverse natural logarithm
where bb = In-place conservation bank balance

Appropriate mitigation compensation ratios are determined (based on the annual bank balance); mitigation compensation costs (in acreage) will be determined by the following equations:

Equation 5: (for riparian woodland and open water/open gravel habitat type impact)
$Cost_{RW} = (Impact_{RW})\ CRH2\ (BB)$

Equation 6: (for riparian scrub, freshwater marsh, mixed woodlands, and sycamore grassland habitat type impacts)
$Cost_{RS} = (Impact_{RS})\ CRM2\ (BB)$

Equation 7: (for other quality habitat impacts)
$Cost_{Other} = (Impact_{Other})\ CRL2\ (BB)$

[3] Although the USFWS does not generally consider habitat dominated by exotic invasive vegetation to be suitable for support of sensitive wildlife, compensation calculated using this function will also be applied to include *Arundo* and *Tamarix* categories of habitat, as compensation for loss of floodplain acreage.

The total compensation required (Equation 8) for permanent impact associated with a project would be the sum of the costs calculated through Equations 5, 6, and 7.

Equation 8: (for total costs)

$$Compensation = Cost_{RW} + Cost_{RS} + Cost_{Other}$$

2.5.4. Temporary Impact Compensation

Temporary impacts are impacts associated with a project that does not result in the permanent removal of habitat from the ecosystem (impacts other than fire), but are temporary (0-4 years) in nature. Compensation for temporary impacts is based on length of the effect of the impact relative to the time of the vireo breeding season (Table 2).

TABLE 2. TEMPORARY IMPACT COMPENSATION

Temporary Effect Period (Breeding Season [X] of Vireo)	Compensation Percentage of Permanent Effect Value (Of Equations 6, 7, & 8)
X < 1.0	0%
1.0 <= X < 2.0	25%
2.0 < = X < 3.0	50%
3.0 <= X < 4.0	75%
X => 4.0	100%

2.5.5. Alternative Mitigation Methods

This plan also incorporates some flexibility into its mitigation strategy by allowing up to 20% of future mitigation requirements to be fulfilled by conservation actions other than exotic plant control. These other actions will also promote the maintenance of riparian ecosystem integrity. This flexibility is not intended to reduce the scope of current conservation efforts on the Base.

In partnership with the USFWS or other entities, Camp Pendleton may elect to focus compensation actions elsewhere within the ecoregion that promote recovery efforts of endangered and threatened species or their habitat. Such off-Base compensation efforts could occur with the caveat that species population and habitat goals continue to be met on Camp Pendleton.

This plan proposed that the expenditure of $12,000[4] for other conservation measures be considered comparable to performing an acre of exotic plant eradication. Such other measures considered to benefit wildlife and habitat in general would include: 1) cowbird trapping; 2) predator management; 3) fencing; 4) biological studies (as approved by the USFWS to fill voids in knowledge concerning species); 5) signs for conservation areas; 6) biological monitoring; 7) erosion control; 8) surveys of candidate species; and 9) habitat mapping. The mix of compensation measures proposed for any particular mitigation requirements will be based on the goal of achieving and maintaining a healthy riparian ecosystem.

[4] In 1994 dollars or other mutually agreed upon index.

2.5.6. Balancing the Habitat Ledger

The final phase of mitigation calculations is the task of balancing the books based on the actual mitigation transactions that have occurred during the previous fiscal year. This plan proposes to accomplish this in the following manner:

1) Debit the project direct impacts from the appropriate habitat accounts.
2) Credit the appropriate accounts with whatever habitat enhancement was accomplished.[5]
3) Determine appropriate non-exotic control compensation measures required to complement conservation plan goals (to fulfill the remaining 20% of compensation required).

2.5.7. Habitat Goals through Time

Using the procedures in the preceding paragraphs, this plan assumes that over time the balance of habitat for the respective accounts will increase from the 1994 Baseline successively to the goal whereby exotic plant communities have been eradicated from the riparian ecosystem.

2.5.8. Monitoring

Sound management of species and their habitats requires accurate and current data regarding their status and trends. In order to acquire and maintain this data, this plan proposed to:

1) Finish a two year herpetological inventory; identify additional toad sites. Use data from above surveys to establish long-term arroyo toad population/habitat goals in consultation with the USFWS.
2) Share all applicable digital GIS data for biological resource mapping on Base (existing survey, topography, vegetative layers, etc.) in with the USFWS.
3) Inventory the Bases riparian, habitat within 3 years of issuance of the riparian BO (Oct 1995) using aerial photography. Thereafter, the habitat inventory will be updated as necessary, but not more frequently than once every 5 years. However, the periodicity of such analysis may be modified to a more or less frequent basis depending upon circumstances and when mutually agreed to.
4) Continue ongoing surveys of listed species, provided funding remains available.
5) Pursue funding to conduct surveys/studies of candidate and other sensitive species to determine their status on Base.

2.6. Programmatic Instructions

The following programmatic instructions have been developed in order that on-going and planned actions will avoid and minimize adverse effects on listed and other sensitive species to the maximum extent practical.

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[5] Target eradication toward 80% (the minimum allowable amount) of the mitigation compensation acreage required (Equation 8) in the exotics category and subtract this amount from the exotics ledger. Transfer a "credit" of this acreage total to the appropriate habitat type created in either the Bank or Flexibility categories as management determines.

2.6.1. General Instructions

1) All actions which "take (develop)" habitat or degrade riparian habitat shall be compensated for pursuant to the program activity classifications identified in Section C.3.
2) Avoid and minimize impacts as much as possible.
3) All activities shall comply with NEPA.
4) Conduct enhancement activities and studies that will benefit regional habitat conservation. Appropriate compensation credit will be given to the Base for these activities and studies.

2.6.2. Instructions for Military Training Activities

1) All units must follow Fire Danger Rating System (FDRS).
2) Vehicle movement in riparian areas shall remain on existing roads.
3) Helicopters shall operate at an altitude in excess of 200 feet AGL over riparian areas except when landing or taking off between 15 March and 31 August.
4) Helicopter use is to be minimized between 0600 and 1100 during the breeding season at the TALA.
5) Ground troop movements in riparian areas are authorized year-round only on existing roads, trails and crossings. Reduce or eliminate troop maneuvers and tank traffic in riparian areas during Least Bell's Vireo breeding season, 15 March to 15 August.
6) Foot traffic shall remain outside of all fenced or posted sensitive areas during the breeding season. Foot traffic in the beach and estuary areas is authorized year-round outside fenced or posted areas.
7) No bivouacking or trenching is allowed in riparian areas.
8) No vegetation may be cut except exotic plant species, in consultation with AC/S ES.
9) No engineering, grading, or filling activities in riparian areas without prior approval from AC/S ES.
10) Small boats are authorized in riparian/estuarine areas outside breeding season.
11) Foot traffic associated with small boats activities is authorized in the riverbed.

2.6.3. Instructions for Facilities Maintenance Activities

1) No tree trimming in natural areas during breeding season. Trimming of landscape trees may occur all year in compliance with MBTA.
2) Tree trimming shall avoid entire trees except exotics or landscape plantings.
3) Exotic species shall be removed.
4) Tree trimming equipment shall be operated from roads only.

5) No maintenance vehicles shall operate in riparian areas without approval from AC/S ES.

6) Trimming shall extend no more than 10 feet from communication/power lines.

7) Trimming for improved road safety shall extend no more than 10 feet from road edge.

8) No road/culvert repairs shall be scheduled during breeding season.

9) Water bars on roads and firebreaks are required to the extent practical.

10) Exotic vegetation shall be thoroughly dried and properly disposed.

11) Sediment runoff shall be contained on construction sites.

12) Proper erosion control on slopes shall be implemented.

2.6.4. Instructions for New Construction

1) NEPA planning and review process shall be followed.

2) New construction sites will be identified in following priority: 1) previously disturbed; 2) Exotic dominated habitat; 3) Other habitat; 4) Riparian Scrub, mixed woodlands, or sycamore grassland habitat; and 5) Riparian Woodland habitat. Impacts to Freshwater marsh and open water/gravel areas will be minimized to the extent practical.

3) New construction sites will avoid already severely constricted riparian habitat.

4) Funding for habitat compensation will be identified as part of construction cost during planning process. To the maximum extent possible, funds for habitat compensation will be secured before contracts are awarded.

5) The NEPA process will be used to assess biological impacts.

6) Conservation goals addressing habitat protection shall be met.

7) Compensation formulae shall be followed.

8) No construction shall occur in occupied riparian habitat during the breeding season to the maximum extent practical.

9) No habitat shall be cleared during breeding season. Cutting or mowing will be used in place of blading or uprooting vegetation whenever practical.

10) Temporarily affected habitat will be treated for a minimum of five years for weed control; compensation is required for impacts extending beyond one breeding season.

2.6.5. Instructions for Recreation Activities

1) No motor vehicles are authorized off-road or off-trail.

2) No off-road vehicles, all-terrain vehicles, motorcycles or other vehicles are authorized in riparian areas except on existing roads.

3) Foot and vehicular traffic is prohibited from posted or fenced areas during breeding season.

4) No littering.

5) No cutting of vegetation.

6) No fishing with live bait fish or amphibians.

7) No gasoline powered motorized watercraft except on Lake O'Neill.

3. ACTIVITY CLASSIFICATION SYSTEM FOR FUTURE CONSULTATION

This Conservation Plan established a system to manage the conduct of future consultations between the USFWS and the Base. The purpose of this system is: 1) to reduce staffing requirements; 2) to provide a systematic approach to deal with future proposed projects, activities and operations; 3) to increase the Base's mission flexibility; 4) to satisfy Section 7(e)20 of the ESA requirements for future programmatic consultations; 5) to define activities which require formal consultation with the USFWS.

This "activity class" system is not intended to negate the requirement for consultation in the future. On the contrary, it is intended to define activities whose consultation requirement is programmatically covered by the BO covering this management plan or those for which no further consultation is required. This system establishes an annual reporting procedure for newly initiated Base activities, the effects of which are relatively minor and easily covered under the conservation plan. Further, the system defines types of activities for which an expedited consultation process can be implemented.

This plan sorts Base activities into the following four categories: Class IV, III, II and I.

3.1. Class IV

3.1.1. Definition

Class IV activities are defined as any activity that does not have the potential to affect listed or proposed species. No Section 7 consultation is required for such activities.

3.1.2. Examples

1) Foot traffic on existing roads during all seasons.

2) Light foot traffic (movement by individuals) off of existing roads during the non-breeding season outside of posted nesting areas.

3) Vehicle operations on existing paved and dirt roads, including established creek crossings, during all seasons.

4) Vehicle operations off of existing roads in habitat assigned to the flexibility category in the riparian ecosystem and outside the Tern/Plover Management Zone in the estuarine/beach ecosystem during the non-breeding season.

5) Aircraft operations over riparian habitat during the breeding season above 300 feet AGL, to include take-offs and landings at designated LZ's, CAL sites and VSTOL pads.

6) Live firing on established ranges.

7) New construction within cantonment areas that do not result in additional habitat degradation.

8) Vegetation management during the non-breeding season:

- Limb Trimming of all vegetation within 10 feet of roads or aboveground transmission cables.
- Exotic Plant Control in all areas.

9) Maintenance activities during the breeding season:

- Use of existing facilities and ranges, that do not result in take of occupied habitat.
- Culvert clearing of all vegetation within 15 feet of culvert entry and exit points.
- Road Maintenance of existing roads.
- Desilting of inlet and outlet channels for Lake O'Neill and infiltration ponds.
- Night-time Lighting including lighting from existing facilities and indirect illumination from pyrotechnics to the extent the Fire Danger Rating System allows.
- Exotic Plant Control in areas greater than 100 feet from occupied habitat during the breeding season.
- Recreational Access pursuant to Marine Corps Order P5090, Base Order P5000 and programmatic instructions.
- Vehicle traffic on existing roads.
- Foot traffic during state authorized hunting seasons.
- Maintenance activities that do not remove native vegetation within 100 feet of occupied habitat.
- Hunting of game during authorized seasons, except posted or fenced areas.
- Hiking, running, and bird watching along established trails.
- Fishing within waterways, along designated beaches and within lakes or ponds.

3.2. Class III

3.2.1. Definition

Class III activities are those discrete projects that "may affect" listed or proposed species. Potential effects to the species and their habitat are limited and considered offset by the on-going implementation of this conservation plan. An annual report of activities occurring under this class is sent to the USFWS at the end of each fiscal year.

Class III activities are those which may potentially result in adverse effects to species in the riparian ecosystem that:

1) Are temporary ($\leq$12 months) disturbance regardless of species: individual activity: less than 150 acres of Arundo, Tamarix, or Grass Forb Mix habitat, less than 30 acres of Freshwater Marsh or Open/gravel habitat areas; less than 10 acres of Mixed Willow Exotic habitat; less than 10 acres of Riparian Scrub, Sycamore Grassland, Mixed Woodlands or Riparian Woodlands habitat.

2) Result in less than 10 acres of disturbance of arroyo toad habitat per year.

3) Cumulative temporary disturbance per year less than 200 acres.

4) Permanent disturbance regardless of species: less than 10 acres of Grass Forb Mix, Arundo, Tamarix; less than 3 acres of Freshwater Marsh, Mixed Willow Exotic, Sycamore Grassland, Mixed Woodlands, Open water/gravel habitat; less than 2 acre Riparian Scrub or Riparian Woodland habitat.

5) Cumulative permanent disturbance per year of less than 15 acres.

3.2.2. Examples

1) Aircraft overflights below 300 feet AGL over occupied territories of listed species during the breeding season along established Terrain flight (TERF) routes.

2) Small boats in the Santa Margarita River during the non-breeding season (military training and hunting).

3) Off-road troop movement (large groups) during the non-breeding season.

4) Indirect lighting of habitat during breeding season.

5) Weed control activities:

   - That result in the use of power tools during the breeding season within 100 feet of occupied habitat.
   - That result in affecting native vegetation of occupied habitat.
   - That use Rodeo or equivalent cut-stump or aerial spraying in occupied habitat.

6) Controlled burns conducted for habitat enhancement and protection during the non-breeding season.

7) Temporary sustained noise levels above 80 dBA L_{eq} hourly as measured over a 7 day period during the breeding season.

8) Vehicle access for enhancement activities.

3.3. Class II

3.3.1. Definition

Activities that may affect listed species and for which impacts may or may not be offset by the conservation plan with associated compensation measures and that require concurrence from the USFWS via a separate project concurrence letter. Concurrence letter will specify the project description for the proposed action; avoidance and minimization measures effected; programmatic instructions recommended for implementation; assessment of the impact to listed species and associated habitat for direct and indirect effects (with the exception of dust and noise); annual bank balance; compensation requirements using Equation 9; and mitigation compensation measures proposed.

- Temporary ($\leq$12 months) disturbance regardless of species individual activity: more than 150 acres of Arundo, Tamarix, or Grass Forb Mix, more than 30 acres of Freshwater Marsh or Open water/gravel habitat; more than 10 acres of Mixed Willow Exotic habitat; more than 10 acres of Riparian Scrub, Sycamore Grassland, Mixed Woodland or Riparian Woodland habitat.
- Cumulative temporary disturbance per year that exceeds 200 acres.

- Permanent disturbance regardless of species: more than 10 acres of Grass Forb Mix, Arundo, Tamarix; more than 3 acres of Freshwater Marsh, Mixed Willow Exotic, Sycamore Grassland, Mixed Woodland, Open water/gravel habitat; more than 2 acre Riparian Scrub, Riparian Woodland habitat.
- Cumulative permanent disturbance per year that exceeds 15 acres.

3.3.2. Examples

General

1) Aircraft overflights below 300 feet AGL over occupied territories of listed species during the breeding season.
2) Results in lighting of habitat during breeding season that directly affects listed species.
3) Weed control activities that occur during the peak of the breeding season (March through June).
4) Aerial spraying of pesticides between March through August.
5) Result in more than 10 acres of disturbance of arroyo toad habitat per year.
6) Result in permanent sustained noise levels above 80-dBA l_{eq} hourly calculated over a 7 day period during the breeding season.
7) Aircraft overflights below 300 feet AGL over nesting sites of listed species during the breeding season.

Project Examples

1) Levee modification from that of BA and repair of existing levee.
2) Desilting activities in the riverbed, in addition to those identified in the BA submitted for this plan.
3) Major utility installation exceeding Class III acreages.
4) New road construction exceeding Class III acreages.
5) New facilities, structures or habitat modification that affects significant quantities of habitat (exceeds Class III acreages).
6) Construction of new nesting island in Santa Margarita Estuary.
7) Design changes to Basilone Bridge (P-030), Compass Calibration Pad and Hot Fuel Pits for MCAS.

3.4. Class I

3.4.1. Definition

Activities whose impacts are not offset by this Conservation Plan and/or additional mitigation not agreed upon through informal consultation. These activities will trigger the requirement to enter into formal consultation and require preparation of a separate BA by the Base, and consequent issuance of a BO by the USFWS. Reference may be made to measures within this Plan and its BO as guidelines for avoidance or minimization measures. However, credit for

conservation plan activities conducted under this plan will not accrue to this "new consultation" and for which significant, separate compensation will be required (using guidelines of the opinion).

- Activities that result in the potential to lower groundwater greater than 5 feet from existing conditions (1995) for vegetation demonstrated to be groundwater dependent.
- Activities that result in permanent cutoff of riparian habitat from the effects of scour and aggregation caused by flood effects.
- New flood control levees.
- New roads in previously undisturbed riparian areas.

3.4.2. Examples

1) Major increases (beyond historical withdrawals) in groundwater extraction, and major changes in groundwater basin management plans.
2) Projects that significantly affect the floodplain dynamics, and destroy wetlands (beyond the criteria previously established).
3) Projects that will extirpate or will have a significant effect on a species in a single drainage.
4) Maneuver corridors through the San Mateo Basin.

Appendix I

Riparian and Estuarine/Beach Biological Opinion: Reasonable and Prudent Measures and Terms and Conditions

APPENDIX I

RIPARIAN AND ESTUARINE/BEACH BIOLOGICAL OPINION: REASONABLE AND PRUDENT MEASURES AND TERMS AND CONDITIONS

The following sections are excerpted from the USFWS Riparian and Estuarine/Beach Biological Opinion (1-6-95-F-02) from 1995; and the subsequent major reinitiation coined the "Red Beach Amendment" (FWS-MCBCP-96B0003-09F0058) from 2020. Page and section references referred to in the text correspond to pages and sections within that document unless otherwise noted.

I.1 USFWS RIPARIAN AND ESTUARINE/BEACH BIOLOGICAL OPINION (1-6-95-F-02)

REASONABLE AND PRUDENT MEASURES (PAGES 31-32)

The following reasonable and prudent measures are necessary and appropriate to minimize the impact of incidental take. The measures below are nondiscretionary and must be undertaken by the Marine Corps.

1. The Marine Corps will adopt and implement the Riparian Habitat Conservation Plan, as specified in Section 4.1 of the BA and in the Project Description (Appendix 1) of this Opinion, including the programmatic instructions to regulate all training and other mission-related operations, Base infrastructure maintenance, and recreational activities, in and adjacent to riparian habitats to help ensure that the population and habitat goals are achieved and the impact of incidental take is avoided and minimized to the maximum extent practicable.

2. The Marine Corps will adopt and implement the Estuarine/Beach Ecosystem Conservation Plan, as specified in Section 4.2 of the BA and in the Project Description (Appendix 1) of this Opinion, including the programmatic instructions to regulate all training and other mission-related operations, Base infrastructure maintenance, and recreational activities, in and adjacent to estuarine/beach habitats to help ensure that the population and habitat goals are achieved and the impact of incidental take is avoided and minimized to the maximum extent practicable.

3. The Marine Corps will institute a monitoring program to assess the effectiveness of the programmatic ecosystem conservation plans based on high resolution aerial photography, GIS maps/data, and ground-truthing techniques, and reliable population censusing methods. The elements of this monitoring program are specified in Appendix 4. This monitoring program should accommodate an adaptive management approach.

4. The Marine Corps will take measures to assess threats to the survival and recovery of the tidewater goby and arroyo toad on Base.

5. The Marine Corps will continue to examine the least environmentally damaging alternative in the further planning stages of the SMR Flood Control – Construction Flood Levee/Wall Project and all other activities and construction projects involving the permanent loss of riparian and estuarine/beach habitat.

6. The Marine Corps will develop and implement a monitoring program that tracks compliance with the levels of take, and the measures and terms and conditions of the Incidental Take Section of this Opinion.

TERMS AND CONDITIONS (PAGES 32-37)

To be exempt from the prohibitions of Section 9 of the Act, the following terms and conditions, which implement the reasonable and prudent measures described above, must be complied with in their entirety.

1. To assure the implementation of reasonable and prudent measure #1 above, the Marine Corps shall:

   (a) Adopt and implement the Riparian Ecosystem Conservation Plan, as specified in Section 4.1 and 4.3 of the BA and outlined in the Project Description (Appendix 1) of this BO, and as modified in Appendix 5, including the programmatic instructions to regulate all training & other mission-related operations, infrastructure maintenance, and recreational activities which affect riparian habitats on Base.
   (b) Obtain concurrence from the Service that impacts are adequately offset by the Riparian Ecosystem Conservation Plan for any activity not specifically addressed in the Programmatic Instructions or otherwise covered herein.
   (c) Develop and implement mitigation measures (e.g., habitat enhancement) for future proposed training and maintenance actions (i.e., those not addressed in this Opinion) that may affect listed species or riparian habitat. Funding for measures that minimize (mitigate) the potential adverse impacts on the riparian and estuarine/beach ecosystems shall be identified as part of these future proposed actions during the planning process and shall be secured prior to initiation of such actions.
   (d) Restore riparian and estuarine/beach areas temporarily disturbed due to non-routine maintenance and construction activities to original or better condition, including: A combination of exotic vegetation control and vegetation management (including replanting if necessary) that will permit native species to regenerate in a timely manner (approximately 3-8 years). This method is to be implemented on areas temporarily disturbed during project construction, or affected by non-routine maintenance, fire, or other activity. This restoration

shall include weeding and monitoring of affected areas for a minimum of 3 years. Rehabilitation of natural (non-weedy) areas disturbed by construction shall use the original topsoil to the maximum extent practical. Salvaging of native vegetation shall be implemented where feasible. In addition the Base shall mitigate for the disruption and temporary loss of habitat function by performing habitat enhancement per the compensation formula specified in the Base's Riparian Ecosystem Conservation Plan (Section 11.5.4 of Appendix 1).

(e) Once exotic vegetation has been removed from the floodplain as a mitigation measure, the Base shall assure that the enhanced area remains free of recolonization by exotic vegetation for a minimum period of 5 years. Thereafter the Base shall make a reasonable effort to maintain the enhanced status of the area consistent with the goals of the ecosystem conservation plans.

(f) Treat any future action which is not described in the Project Description and which may result in a permanent loss of riparian wetland, no matter its quality, as a Class II or Class I activity[1] requiring informal consultation with written concurrence from the Service or initiation of formal consultation with the Service pursuant to Section 7 of the Act.

2. To assure the implementation of reasonable and prudent measure #2 above, the Marine Corps shall:

(a) Adopt and implement the Estuarine/Beach Ecosystem Conservation Plan, as specified in Section 4.2 and 4.3 of the BA and outlined in the Project Description (Appendix 1) of this BO, and as modified in Appendix 5, including the programmatic instructions to regulate all training & other mission-related operations, Base infrastructure maintenance, and recreational activities that affect estuarine/beach habitats on Base.

(b) Obtain concurrence from the Service that impacts are adequately offset by the Estuarine/Beach Ecosystem Conservation Plan for any activity not specifically addressed in the Programmatic Instructions or otherwise covered herein.

3. To assure the implementation of reasonable and prudent measure #3 above, the Marine Corps shall:

(a) Institute a monitoring program to assess the progress toward the accomplishment of the ecosystem, habitat and species goals specified in the Base's riparian and estuarine/beach habitat conservation plans. The monitoring program shall be based on high resolution aerial photography, GIS maps/data, and ground-truthing techniques, and reliable population censusing methods. The minimum requisite elements of this monitoring program are specified in Appendix 4.

(b) Identify and notify by way of periodic correspondence proposed program and monitoring adjustments (adaptive management) needed to achieve the goals and meet management objectives. These adjustments shall be submitted to the

Service on at least an annual basis during the fourth quarter of each calendar year. A follow-up meeting shall occur between the Base and the Service within 60 days of receipt of the notification but no later than January 31.

(c) The Base shall informally consult with the Service in developing the monitoring program to track the effectiveness of the exotic vegetation control program. At a minimum, this program shall employ aerial photography and ground surveys. Transects and monitoring control plots shall be used where deemed necessary for specific projects.

4. To assure implementation of reasonable and prudent measure #4 above, the Marine Corps, with assistance of the Service, shall assess the severity of threats to tidewater goby and arroyo toad posed by green sunfish, bullfrog, and other likely predators/competitors. If mutually deemed a threat of sufficient magnitude that may preclude attainment of recovery objectives on Base for these listed species, the Base shall implement specific control programs for invasive non-native plants and predatory animals.

5. To assure implementation of reasonable and prudent measure #5 above, the Marine Corps shall:

(a) Continue to examine with the Service and other appropriate regulatory agencies the environmentally (biologically) least damaging alternative in the further planning stages of all proposed activities considered herein potentially resulting in the permanent loss of riparian and estuarine/beach habitats, including the SMR Flood Control - Construction Flood Levee/Wall Project.

(b) Assure that whichever alternative is selected is designed to reduce loss of endangered species habitat and wetlands/floodplains to the maximum extent feasible. The Service shall review and concur with the final SMR flood control structure design and construction footprint prior to initiation of construction in order to design management capability and assure the maintenance of endangered species habitat isolated behind the flood control structure.

(c) Assure that the extent of any clearing of riparian woodland/scrub outside the footprint of the flood control structure is minimized to the maximum extent feasible. The Service shall review and approve any clearing or other modification of riparian vegetation associated with the maintenance and operation of the flood control structure prior to any such disturbance.

(d) Restore the functional value of wetland habitat currently dominated by Arundo to offset the permanent loss of listed species habitat resulting from all activities covered in the proposed action at a 3:1 ratio; and adopt any additional habitat replacement requirements deemed necessary through applicable Federal wetlands policies and the U.S. Army Corps of Engineers 404 regulatory program. The area from which the Arundo is removed shall be revegetated to a point that it replaces the endangered species value of the permanently disturbed area. The restoration effort shall begin before or immediately upon approval of

the individual activity/project and avoid the breeding season of the vireo and flycatcher. Since habitat dominated by Arundo is considered "wetland," creation of wetland is not being required. Consequently a grading and irrigation plan will not be necessary. However, a planting, monitoring and maintenance plan shall be required. These plans shall be approved by the Service.
The latter revegetation effort may be substituted by additional Arundo control; in this case the acreage of Arundo removed shall be at a 10:1 ratio.

(e) Once exotic vegetation has been removed from the floodplain as a mitigation measure, the Base shall assure that the enhanced area remains free of recolonization by exotic vegetation for a minimum period of 5 years. Thereafter the Base shall make a reasonable effort to maintain the enhanced status of the area consistent with the goals of the ecosystem conservation plans.

6. To assure the implementation of reasonable and prudent measure #6 above, the Marine Corps shall develop and implement a monitoring program that includes the minimum requisite elements described in Appendix 4. The monitoring program shall track and document:

   (a) Compliance with the provisions of the Base's ecosystem programmatic instructions.
   (b) Compliance with the authorized take, measures and terms and conditions of the Incidental Take Section of this Opinion.

Unless otherwise specified herein, incidents of non-compliance shall be reported in writing to the Service within one working day.

MONITORING PROGRAM (APPENDIX 4)

The following guidelines shall be used to develop a monitoring program:

1. The monitoring program will be designed to determine:

   - Attainment of management objectives in the programmatic ecosystem conservation plans.
   - Compliance with the provisions of the Base's ecosystem programmatic instructions, and the Service's reasonable and prudent measures and incidental take statement.
   - Adjustments needed to achieve management objectives and compliance with terms and conditions of this Opinion.

2. The monitoring program will be based on high resolution aerial photography, GIS maps/data, and ground-truthing techniques, and reliable population census methods.

3. The monitoring program will:

- Track plant community distribution, habitat function and value, listed and candidate species' distribution and status.
- Provide Service with all applicable digital GIS data for biological resource mapping on Base [existing survey, topography, vegetative layers, etc.] for input onto the Service GIS system in 1995.
- Monitor habitat status by providing the Service color aerial photography at appropriate scale and quality of all drainages on Base, including coastal areas, every 2 years (or as mutually modified in the course of annual program review), starting in 1996. The Base will supply copy prints of the September 1994 photos used for the current vegetation mapping done on Base.
- The Base will continue its groundwater monitoring in all drainages where groundwater is extracted to determine and manage the potential effect on listed species habitat.
- The Base will monitor stream water quality, flood regimes, and storm event frequency.
- The Base will monitor the effects of sedimentation in SMR Estuary and coastal lagoons which are subject to upstream disturbance from programmatic and construction activities addressed in this Opinion.
- The Base will continue to monitor the SMR Estuary for water quality and tide level and document the periods when the other coastal lagoons are subject to tidal influence.
- The Base will provide annual surveys for the vireo and flycatcher. Annual population levels will be calculated and locations mapped. Vireos and flycatchers will be surveyed for by detecting singing males.
- The Base will provide an annual report of animal damage control, predator management, and cowbird control activities on Base. This report will note the species, both native and exotic, affected by these management activities. In addition, the location by drainage, the numbers trapped or dispatched or translocated will be noted. Exotics noted will include brown-headed cowbird, bullfrog, green sunfish, bluegill, mosquito fish, largemouth and smallmouth bass, and others as appropriate for purpose of adaptive management of riparian and estuarine/beach ecosystems.
- The Base will monitor the population status of the tidewater goby on Base at least every three years.
- The Base will provide breeding population estimates and reproductive success of tern and plover on the Base on an annual basis.
- Provide for submission to the Service annual reports involving each of the monitoring activities.

4. The monitoring program will:

- Track the occurrence of accidents and unauthorized activities in riparian and estuarine/beach ecosystems on Base. These events will be reported to the Service within 24 hours.
- Develop a tracking system that records the level of ongoing programmatic activities in order to document trends in the frequency, magnitude, and extent of these activities on an annual basis compliance with programmatic instructions and early consultation with the Service if appropriate.

TERMS AND CONDITIONS - DETAIL (APPENDIX 5)

The following terms and conditions have been developed in order to implement the reasonable and prudent measures set forth in the Incidental Take section of this Opinion. Several of these terms and conditions enhance or otherwise add to the basic elements of the Base's ecosystem conservation plans described in the BA and Appendix 1 of this Opinion, including the goals, programmatic instructions and mitigation protocol.

General

- The Base shall assure that project proponents consult with AC/S ES staff early in the planning process, and that priority is given to the siting of proposed projects in areas that are not in riparian or estuarine/beach habitats.
- Where there are discrepancies between the project description, including the ecosystem conservation plan, as specified in the BA and the project as described in the Project Description section and Appendix 1 of this Opinion, the description in the latter shall take precedence. The Project Description section and Appendix 1 of this Opinion were developed mutually between the Base and the Service and reflect in many instances a modification and refinement of the project as originally described in the BA.
- Excessive noise (above 60 dBA leq hourly) related to all Base activities in or adjacent to riparian areas shall be avoided and minimized year round, but particularly during the breeding season. Noisy activities shall be concentrated spatially and temporally, particularly during the breeding season, to the maximum extent practical.

On-going and Planned Training

- The Base shall comply with the programmatic instructions enumerated in Section 4.1.3.1 of the BA.
- Vehicle traffic occurring at night on roads in potential arroyo toad habitat during the period of 15 March through 1 July shall be minimized to the maximum extent possible.
- Vehicle traffic in undeveloped crossings in potential arroyo toad habitat during the period of 15 March through 30 August shall be minimized.

- Dust produced in or adjacent to riparian areas shall be minimized to the maximum extent practical.
- The Base shall assure that aircraft operations shall be conducted not lower than an altitude of 300 feet AGL over vireo and flycatcher occupied riparian areas, to the maximum extent practical. The following aircraft operations are exceptions:
  * When landing and take-off from designated CAL, LZ, VSTOL, TALA/HOLF and air station runways.
  * When operating under the control of the tower in an airport traffic area.
  * When complying with regulations related to operations, weapons delivery profiles, emergencies, special visual flight rule (VFR) conditions.
  * Low-level flight (100-200 feet AGL) operations required by the mission and when operating, training or exercising contour and map of the earth tactics (0-100 feet AGL) along designated TERF routes.
- The Base shall assure that helicopter use at TALA is minimized between 0600 and 1100 during the breeding season to the maximum extent practical.

Infrastructural Maintenance

- The Base shall comply with the programmatic instructions enumerated in Section 4.1.3.2 of the BA.
- The Base shall assure that no engineering, grading, or filling activities in riparian areas occur without prior approval from the AC/S ES.
- Secondary roads shall be maintained to the extent practical in order to avoid ponding of water on the road surface in and adjacent to potential arroyo toad habitat.

Proposed and New Construction

- The Base shall comply with the programmatic instructions specified in Section 4.1.3.3 of the BA.
- Sediment runoff shall be contained on construction sites through the use of siltation fences, hay bales, sand bags, silt ponds, or other methods as determined by AC/S ES.
- Dust produced in or adjacent to riparian areas shall be minimized. Measures (such as chemical treatment) used on the ground surface to minimize dust shall be biologically sound.
- All riparian and estuarine/beach areas temporarily disturbed by construction activities will be treated for a minimum of 3 years post-construction to control the establishment of exotic vegetation within the cleared or otherwise disturbed area.
- The Base shall assure the implementation of biological monitoring and reporting during construction activities occurring in or adjacent to riparian and estuarine/beach areas.
- The Base shall assure the placement of signs indicating the necessity for all

activities to be strictly confined to the project site.
- The Base shall assure that construction site boundaries are clearly delineated on the ground by flagging, survey lath or wooden stakes.
- The Base shall assure that all construction project personnel are briefed by the prime contractor(s) during all project phases regarding the potential presence of listed species, the requirements and boundaries of the project, the importance of complying with measures designed to avoid and minimize adverse effects to listed species potentially resulting from project activities, and problem reporting and rectification.

Recreational Activities

- The Base shall comply with the programmatic instructions specified in Section 4.1.3.4 of the BA.
- The Base shall assure that recreational activities are designed, organized, implemented, and regulated in such as way, so as to avoid and minimize impacts to listed species to the maximum extent possible. All proposals for new recreation (and modifications of existing program activities) shall be reviewed by AC/S ES personnel for compliance with this term and condition. Ongoing activities that may result in take of listed species shall be reviewed on an annual basis.

Ecosystem Conservation Program

Riparian Plan

- The breeding season for the vireo and the flycatcher shall be designated from 15 March to 31 August. The non-breeding season shall be defined as 1 September to 14 March.
- The breeding season for the arroyo toad shall be designated from 15 March to 15 June. Juvenile maturation shall be designated to extend an additional 8 weeks, that is, until 15 August. The non-breeding/non-maturation period shall be designated from 16 August to 14 March.
- The Base shall comply with the programmatic instructions specified in Section 4.1.3.5 of the BA and section 11.6 of Appendix 1 of this Opinion.

Monitoring

- The Base shall share data from the ongoing herpetological inventory with the Service as it becomes available.
- The Base shall monitor habitat status by providing the Service color aerial photography at Service approved scale and quality for vegetation mapping of all drainages on Base every 2 years (1996, 1998, etc.).
- The Base (or the Base in partnership with the Service) shall facilitate the annual monitoring of species population levels for vireo, flycatcher, and arroyo toad on

Base. Determinations of species population trends shall be an integral part of the overall monitoring program.

- The Base (or the Service in partnership with the Base) shall facilitate the monitoring of floodplain and habitat acreage within the major drainages on Base. Determinations of achievement of acreage goals shall be an integral part of this monitoring.
- The Base shall prepare and submit to the Service for review and comment an annual report. This report shall include:
- A general summary of all projects that have been initiated on Base within the one year reporting period and will include:
    * A list of projects which implemented the provisions of this biological opinion.
    * The total acreage of listed species habitat lost or disturbed.
    * A summary of the effectiveness of take minimization measures.
    * A discussion of any problems encountered.

- A specific summary of each project undertaken. This report will detail:
    * Project name.
    * Project description.
    * Project location (map).
    * Total acreage of the project.
    * Acreage of listed species habitat lost and its relative condition.
    * Measures taken to ensure that "take" has been minimized or eliminated.
    * Total number of listed species that were taken, through injury, mortality, or harassment.
    * Data on take, if it occurs.
    * Any problems encountered with respect to implementing the provisions of the management plan.

Estuarine/Beach Plan

- The Base shall develop additional programmatic instructions designed to minimize to the maximum extent practical the take of western snowy plover potentially resulting from activities in the French Creek and Aliso Creek Lagoon areas.
- The breeding season for the snowy plover and least tern shall be designated 1 March through 15 September. The non-breeding season shall be defined 16 September to 28 February.
- The management actions specified in section 12.4.2 of Appendix 1 shall be implemented within a reasonable time frame. The implementation status of these proposed actions shall be reviewed on an annual basis.
- The Base shall adjust the Estuarine/Beach Ecosystem Conservation Plan to reflect the findings resulting from the multi-year study of the effects of tern management on snowy plovers.
- The Base shall implement the following strategies to maintain the beach/estuary

ecosystem and support viable, expanding populations of sensitive species:

- New activities that could cause degradation to coastal wetlands, including reductions in water quality, and sensitive dune areas shall be considered a Class 2 activity.
    * Conservation measures currently in place as a result of the LCAC FEIS shall continue including the "off-limits" status of the Santa Margarita River Estuary (except as modified by this Opinion), and the protection and management of the Cockleburr sensitive area.
    * The conservation plan shall be updated as recovery plans for listed species are published so conservation efforts are consistent with recovery goals.
    * Information to Base personnel regarding sensitive species and restricted areas along the coastal areas shall be provided by publishing Base notices and establishing an interpretive kiosk for the Del Mar Beach recreational area.
    * Least terns and snowy plovers shall be monitored on an annual basis to determine number of pairs, hatching success, and reproductive success in order to assess the effectiveness of the conservation plan.

The Base shall assure that the following instructions shall be complied with to avoid and minimize impacts to estuarine ecosystems and listed species:

Military Training Activities

- During the tern and plover nesting season, the Base shall publish instructions which restrict aircraft from operating at an altitude below 300 feet AGL over the SMR plover management zone and the White Beach nesting area (see paragraph 12.4 of Appendix 1), except operations involving landing or taking off from LZ21, manuevering to avoid aircraft flying in FAA controlled airspace not subject to the restrictions of Airspace Restricted Areas R-2503A and B, and complying with regulations related to operations, emergencies, special visual flight rule (VFR) conditions (i.e., when weather conditions dictate a lower altitude must be flown for safe flight of the aircraft).
- Helicopter landings at Del Mar (LZ21) shall be minimized during the least tern/snowy plover breeding season to the maximum extent practical.
- Foot traffic in coastal lagoons and the Santa Margarita River Estuary shall be minimized to the maximum extent possible.
- Military and recreational activities will be kept to a minimum within the management zone during the non-breeding season in order to minimize disturbance to wintering snowy plovers.

New Construction Projects and Activities

- Future proposed construction projects that could result in the permanent loss of coastal wetland and major changes to current training activities that may affect listed species along the beach/estuary shall require informal or formal consultation

with the Service (as a Class II or Class I activity).

Recreation Activities

- The Base shall develop programmatic instructions and measures to assure that recreational foot traffic, including fishermen, remain outside the nesting and foraging areas of the SMR management zone during the breeding season.
- Recreational activities shall be kept to a minimum within the management zone during the non-breeding season.
- Litter shall be deposited in proper disposal bins.

I.2 USFWS RIPARIAN AND ESTUARINE/BEACH BIOLOGICAL OPINION (FWS-MCBCP-96B0003-09F0058)

REASONABLE AND PRUDENT MEASURES (PAGE 25)

The following reasonable and prudent measures are necessary and appropriate to minimize the impact of incidental take. The measures below are nondiscretionary and must be undertaken by the Marine Corps. These measures are in addition to the reasonable and prudent measures identified within Biological Opinion (1-6-95-F-02):

1. The Marine Corps will monitor and report on consistency with the exempted amount or extent of take for least terns and snowy plovers associated with military training along all MCBCP beaches.

2. The Marine Corps will monitor and report on consistency with the exempted amount or extent of take for least terns and snowy plovers associated with population management and monitoring activities along all MCBCP beaches.

TERMS AND CONDITIONS (PAGES 25-26)

To be exempt from the prohibitions of Section 9 of the Act, the following terms and conditions, which implement the reasonable and prudent measures described above, must be complied with in their entirety.

The Terms and Conditions, as modified through this reinitiation, are provided below. Language to be removed from Biological Opinion (1-6-95-F-02) is shown in strikeout, and new language is shown in italics.
Appendix 5 – Terms and Conditions, Estuarine/Beach Plan, page 6:
Least terns and snowy plovers shall be monitored on an annual basis to determine breeding and wintering population estimates, number of pairs, hatching success, and reproductive success in order to assess the effectiveness of the conservation plan.

In addition to the all of the terms and conditions in the original biological opinion and the modified term and condition above, to implement reasonable and prudent measure number 1, the Marine Corps will implement the following terms and conditions (TC):

1. The Marine Corps will monitor the number of least tern and snowy plover adults, fledglings, chicks, or nests with eggs on Red, Gold, and Green Beaches prior to and after scheduled large scale training events. Monitoring should occur within 3 days before and 3 days after the training events to the greatest extent practical. After 5 years of monitoring, the Marine Corps and the CFWO will coordinate to discuss and evaluate if large scale event monitoring should be continued or modified.
2. The Marine Corps will notify the CFWO within 10 business days and submit a written report (via email or mail) of any incident of death or injury of least tern and snowy plover adults, fledglings, chicks, or nests with eggs associated with training activities. The purpose of this notification is to ensure that the impacts to least terns and snowy plovers from military training activities do not exceed the exempted amount of take.
3. To implement reasonable and prudent measure number 2, the Marine Corps will implement the following terms and conditions: The Marine Corps will notify the CFWO within 10 business days and submit a written report (via email or mail) of any incident of death or injury of least tern and snowy plover adults, fledglings, chicks, or nests associated with population management and monitoring activities. The purpose of this notification is to ensure that the impacts to least terns and snowy plovers from population management and monitoring activities do not exceed the exempted amount of take.

Appendix J

Species Accounts and Management Information

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FIGURES

ACRONYMS AND ABBREVIATIONS

Abbreviation	Unabbreviated
°C	degrees Centigrade
°F	degrees Fahrenheit
AFA	Artillery Firing Area
AMEC	AMEC Earth and Environmental, Inc.
Base	MCB Camp Pendleton
BLM	Bureau of Land Management
BO	Biological Opinion
BPG	Biogeographic Population Group
CCA	Candidate Conservation Agreement
CDFG	California Department of Fish and Game (now CDFW)
CDFW	California Department of Fish and Wildlife
cm	centimeter(s)
CNDDB	California Natural Diversity Data Base
CPIF	California Partners in Flight
DDT	dichlorodiphenyltrichloroethane
DPS	distinct population segment
ECOS	Environmental Conservation Online System
EOM	Environmental Operations Map
ES	Environmental Security
ESA	Endangered Species Act
FDRS	Fire Danger Rating System
GIS	geographic information system
ha	hectare(s)
HCP	Habitat Conservation Plan
I-5	Interstate 5
INRMP	Integrated Natural Resources Management Plan
km	kilometer(s)
m	meter(s)
m^2	square meter(s)
MASS-3	Marine Air Support Squadron 3
MBTA	Migratory Bird Treaty Act
MCAS	Marine Corps Air Station
MCB	Marine Corps Base
Camp Pendleton	Marine Corps Base Camp Pendleton
MCIWEST	Marine Corps Installations-West
mm	millimeter(s)
mph	miles per hour
NCCP	Natural Community Conservation Plan
NEPA	National Environmental Policy Act
NMFS	National Marine Fisheries Service
OHV	off-highway vehicle

Abbreviation	Unabbreviated
PPM	Pacific pocket mouse
PBDE	polybrominated diphenyl ether
PCB	polychlorinated biphenyl
SDZWA	San Diego Zoo Wildlife Alliance
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey

Federally Listed Wildlife Species

J.1. QUINO CHECKERSPOT BUTTERFLY (*EUPHYDRYAS EDITHA QUINO*)

FIGURE 1. QUINO CHECKERSPOT BUTTERFLY

The Quino checkerspot butterfly is a subspecies of the widespread Edith's checkerspot butterfly (*Euphydryas editha*). It is a medium-sized butterfly with a wingspan of about 1.5 inches (4 centimeters [cm]). The top of the wings has a patchwork of brown, red, and cream colored spots in a checkered pattern, and this species tends to be darker and redder than similar subspecies. Adult Quino checkerspot butterflies live from 10 to 14 days and emerge, mate, and selectively lay eggs on annual host plants during a 4- to 6-week flight period beginning from late January to early March and continuing as late as early May, depending on weather conditions (USFWS 2003a).

The preferred host plant for Quino checkerspot butterfly is dwarf plantain (*Plantago erecta*), which occurs within scrub, chaparral, and grassland communities. About a week and a half after laying, the eggs hatch and the larvae begin feeding until the host plants die over the summer, at which point the larvae enter a period of diapause (physiological inactivity). In the late winter and early spring as the plants reappear, the larvae begin feeding again and enter a chrysalis phase before they emerge as adults during the next flight season completing the life cycle. Quino checkerspot butterfly populations often display a metapopulation structure and require conservation of temporarily unoccupied patches of habitat for population resilience (USFWS 2003a).

J.1.1. Status

The Quino checkerspot butterfly is federally listed as endangered and the U.S. Fish and Wildlife Service (USFWS) has approved a recovery plan for the species (USFWS 2003a). Designated critical habitat for Quino checkerspot butterfly was revised and finalized in 2009: no critical habitat was designated within the Base boundary. A full species profile is available at the USFWS Environmental Conservation Online System (ECOS) website (https://ecos.fws.gov/ecp/species/5900), which includes all Federal Register publications related to the listing history, recovery plan documents, critical habitat designations, and

applicable Habitat Conservation Plans (HCPs). No special status has been assigned to the Quino checkerspot butterfly in the state of California.

J.1.2. Distribution and Occurrence

The historic range of the Quino checkerspot butterfly included much of coastal California south of Ventura County and inland valleys south of the Tehachapi Mountains. More than 75 percent of this historic range has been lost and the Quino checkerspot butterfly is currently known to occur in western Riverside County, southern San Diego County, and northern Baja California, Mexico. There are no records of Quino checkerspot butterfly having occurred on-Base and a historical analysis revealed that no individuals of this subspecies have been collected from Marine Corps Base Camp Pendleton (Camp Pendleton or Base) and deposited into museums.

A 2-year general survey for Quino checkerspot butterfly was conducted on Camp Pendleton from November 1996 through June of 1998 (Redak et al. 1998). The general survey identified 17 potential sites on-Base that could reasonably be assumed to support this animal. All 17 sites supported stands of the Quino's preferred host plant, dwarf plantain, and adult nectaring plants. Similarly, in 2015 biologists surveyed for Quino checkerspot over 987 acres on Base. In addition to those Basewide surveys, specific sites proposed for development were also surveyed during 1998–1999. No Quino checkerspot butterfly larvae or adults were found during any of those surveys. Although Camp Pendleton supports suitable habitat, no Quino checkerspot butterflies have been detected on-Base.

J.1.3. Threats

The distribution and abundance of the Quino checkerspot butterfly have been dramatically reduced during the past century because of agricultural and urban development and other land use changes in southern California. The Quino populations appear to have decreased in number and size by more than 95 percent rangewide, primarily due to habitat loss and fragmentation, invasion of nonnative plant species, and disrupted fire regimes associated with development and changes in land use (USFWS 2003a). In addition, climate change has been identified as a potential threat to Quino checkerspot butterfly. With the southwestern region of San Diego County predicted to become hotter and drier, climate change may cause drier winter-spring cycles, reducing host plant density and altering the critical timing of host plant availability (USFWS 2003a).

J.1.4. Recovery Strategy Goals

The recovery plan for the Quino checkerspot butterfly indicates its survival and recovery depend on protection, restoration, and management of habitat within occupied areas, expansion of existing populations, and reintroduction or discovery of new populations in

areas not known to be currently occupied. Because this species is highly endangered, it is anticipated that ongoing management of all populations will be required into the foreseeable future. The plan identifies major units for managing recovery efforts; however, none of the units occur on or near Camp Pendleton.

The plan does not propose any delisting criteria due to insufficient data; therefore, adaptive management and monitoring will be key aspects of recovery. Additional research will be needed before appropriate delisting criteria are identified. In the meantime, the plan proposes the following interim goals: (1) protecting habitat supporting known current population distributions and landscape connectivity between them; (2) maintaining or creating resilient populations; and (3) conducting research necessary to refine recovery criteria.

J.1.5. Management and Monitoring

The Quino checkerspot butterfly has not been documented on-Base and is not known to occupy the surrounding area. However, the Base is in the USFWS Recommended Quino Survey Area and Camp Pendleton conducts site assessments for all Base projects in accordance with USFWS Quino Checkerspot Butterfly Survey Protocol (USFWS 2014). Any occurrences that are observed on-Base will be addressed on a case-by-case basis with avoidance and minimization measures implemented as necessary and in consultation with USFWS. In addition, Camp Pendleton anticipates conducting another limited survey for Quino in the best available habitat on Base. Camp Pendleton Environmental Security will schedule the survey as funding is available after 2023.

J.2. RIVERSIDE FAIRY SHRIMP (*STREPTOCEPHALUS WOOTTONI*)

The Riverside fairy shrimp is a small freshwater crustacean approximately 0.5 to 1.0 inch (1.27 to 2.54 cm) in length. Like all fairy shrimp, this species has stalked compound eyes and no hard outer shell (carapace). The shrimp are translucent, and as they mature to reproductive age, the females develop prominent ovisacs while the males' second antennae become modified for clasping the females during mating. Riverside fairy shrimp generally occur in seasonal (vernal) pools, ponds, swales, and occasionally in depressions (road ruts and ditches) that support suitable habitat. They hatch from dormant cysts once hydrated under specific environmental conditions. Large cyst banks of viable resting fairy shrimp eggs within the soils of vernal pools are well documented (USFWS 2005b).

J.2.1. Status

FIGURE 2. RIVERSIDE FAIRY SHRIMP

The Riverside fairy shrimp is federally listed as an endangered species. A recovery plan has been approved for the listed species of southern California vernal pools, which includes the Riverside fairy shrimp (USFWS 2005b). Designated critical habitat for Riverside fairy shrimp was revised and finalized in 2012. Camp Pendleton was exempted from critical habitat designation under Section 4(a)(3)(B) of the federal Endangered Species Act (ESA) because USFWS determined that conservation efforts identified in the Base Integrated Natural Resources Management Plan (INRMP) provide a benefit to the Riverside fairy shrimp and its habitat (USFWS 2005b). A full species profile is available at the USFWS ECOS website (https://ecos.fws.gov/ecp/species/8148), which includes all Federal Register publications related to the listing history, recovery plan documents, critical habitat designations, and applicable HCPs.

No special status has been assigned to the Riverside fairy shrimp in the state of California.

J.2.2. Distribution and Occurrence

Riverside fairy shrimp are currently presumed to occupy 60 or fewer pool complexes throughout southern California (USFWS 2005b). The species is restricted to a subset of vernal pools and vernal pool complexes in Ventura, Orange, Riverside, and San Diego Counties, and in northern Mexico (USFWS 2005b). Except for the Riverside County population, all populations are within approximately 15 miles (24 kilometers [km]) of the coast. Within southern California, Riverside fairy shrimp range in distance approximately 163 miles (262 km) from north to south and occupy pools that range in elevation from 46 to 2,076 feet (14 to 633 meters [m]). Camp Pendleton supports 18% of Riverside fairy shrimp occurrences.

Surveys for vernal pools on Base started in 1978 but initially focused on identifying vernal pool plants. Fairy shrimp surveys conducted during the 1997–1998 and 1998–1999 wet seasons identified many pools on Base occupied with listed fairy shrimp and the coastal mesas on Camp Pendleton as supporting one of the largest known populations of Riverside fairy shrimp including at least 83 pools occupied (RECON 2001). Inventory surveys conducted in five study areas from 2006 through 2009 detected 53 Riverside fairy shrimp

occupied pools in Cocklebur Mesa, a portion of Edson Range, MASS 3, Oscar Two, and Red Beach. Ongoing surveys continue to discover additional populations and identify pools lacking Riverside fairy shrimp that may be suitable for translocation to establish new populations.

J.2.3. Threats

The Riverside fairy shrimp has the most limited range of any endemic California fairy shrimp and is currently threatened by habitat loss and degradation due to military, urban, and agricultural development; off-road vehicle use; trash dumping; trampling; military maneuvers; competition and predation by nonnative species; drainage or watershed alterations; and drought (USFWS 2008a). Fragmentation and destruction of isolated vernal pool groups can have subtle, but significant, adverse effects. Zedler (1987) found that species diversity within vernal pools and genetic diversity within a single species are evenly distributed throughout a given group of pools and between groups of pools. Thus, preservation of fewer pools may reduce the overall genetic diversity of the species, conceivably affecting its long-term survivability.

In addition, climate change has been identified as a potential threat to Riverside fairy shrimp. With the southwestern region of San Diego County predicted to become hotter and drier, climate change may cause changes in vernal pool inundation patterns, and drought may decrease or terminate fairy shrimp reproduction if pools fail to flood or if pools dry up before reproduction is complete (USFWS 2005b). However, the information currently available on the effects of climate change and increasing temperatures does not adequately predict the location and magnitude of climate change effects to Riverside fairy shrimp.

J.2.4. Recovery Strategy Goals

The recovery strategy for the Riverside fairy shrimp is to conserve and enhance southern California vernal pool ecosystems, with specific emphasis on stabilizing and protecting existing populations of listed species including Riverside fairy shrimp, San Diego fairy shrimp (*Branchinecta sandiegonensis*), San Diego button-celery (*Eryngium aristulatum var. parishii*), San Diego mesa mint (*Pogogyne abramsii*), Otay mesa mint (*Pogogyne nudiuscula*), and California Orcutt grass (*Orcuttia californica*), so that these species may be reclassified from endangered to threatened status (USFWS 2005b).

Before reclassification of Riverside fairy shrimp from endangered to threatened can be considered, the species must first be stabilized by conducting surveys and research essential to the conservation of the species. Camp Pendleton vernal pool complexes and associated species have been identified as necessary to stabilize the Riverside fairy shrimp and several other listed vernal pool species. The vernal pool complexes that are identified as necessary

to stabilize these listed species are Cocklebur Mesa, San Mateo, Las Pulgas, Stuart Mesa, State Park Lease Area, and Wire Mountain.

Once the species is stabilized, reclassification of Riverside fairy shrimp to threatened status may be considered when the following criteria are met: (1) existing vernal pools and their associated watersheds are secured; (2) where necessary, reestablish vernal pool habitat to the historical structure; and (3) manage and monitor habitat and listed species (USFWS 2005b). The Basilone and O'Neill vernal pool complexes occurring on Camp Pendleton are identified as necessary to reclassify the Riverside fairy shrimp to threatened.

J.2.5. Management and Monitoring

The U.S. Marine Corps is currently in consultation with USFWS regarding programmatic basewide management of upland habitats including vernal pool habitat occupied by Riverside fairy shrimp. Until consultation is complete and a Biological Opinion (BO) is issued, the Riverside fairy shrimp benefits from current basewide management practices such as invasive, nonnative vegetation control; erosion control; resource conservation awareness and education programs; investigative research (e.g., to examine pool and group enhancement, pool creation, fairy shrimp dispersal/translocation, and impact of signing and/or fencing); and avoidance and minimization of impacts from projects and Base activities including training. In accordance with the Fairy Shrimp and Vernal Pool Conservation Plan (Tetra Tech and ECORP Consulting 2019), the Base is restoring vernal pool complexes including Cocklebur Mesa and Vernal Pool Group 68 to conserve listed fairy shrimp and vernal pool plants.

The Base has instituted measures for avoidance and minimization of impacts to vernal pool habitat and species. These measures are specified in the Base Environmental Operations Map (EOM), which prescribes regulations and general precautions for range and training area users that limit impacts to vernal pool species (including Riverside fairy shrimp) by restricting activities in and adjacent to vernal pool habitat. Restrictions specific to vernal pools are as follows:

- Foot traffic is authorized year-round. Digging, including construction of fighting positions, is prohibited in vernal pools.

- Vehicle/equipment operations near known vernal pool areas shall be kept on existing roads year-round. Contact Environmental Security (ES) prior to conducting activities involving soil excavation, filling, or grading.

- Bivouac/command and post/field support activities shall be kept at least 50 m (164 feet) from identified vernal pools.

J.3. SAN DIEGO FAIRY SHRIMP (*BRANCHINECTA SANDIEGONENSIS*)

FIGURE 3. SAN DIEGO FAIRY SHRIMP

The San Diego fairy shrimp is a small, delicate freshwater crustacean with large, stalked compound eyes, no hard outer shell (carapace), and 11 pairs of swimming legs. Mature San Diego fairy shrimp range in length from 0.4 to 0.6 inch (1.0 to 1.5 cm). This species can be distinguished from other fairy shrimp by the shape of the second antenna in males, or the shape and length of the brood sac and the presence of paired abdominal spines in females (USFWS 1998a). Fairy shrimp are presumed to feed on algae, bacteria, protozoa, rotifers, and detritus (USFWS 2003b).

The San Diego fairy shrimp is a habitat specialist found in smaller-shallow vernal pools and ephemeral (temporary) basins that range in depth from approximately two to 12 inches (5.1 to 30.5 cm), have water ranging from 50 to 68 degrees Fahrenheit (°F). However, the species occasionally occurs in ditches and road ruts that can support suitable conditions.

J.3.1. Status

The San Diego fairy shrimp is federally listed as an endangered species. A recovery plan has been approved for the listed species of southern California vernal pools, which includes the San Diego fairy shrimp (USFWS 1998a). Designated critical habitat for San Diego fairy shrimp was revised and finalized in 2007. Camp Pendleton was exempted from critical habitat designation under Section 4(a)(3)(B) of the ESA because USFWS determined that conservation efforts identified in the Base INRMP provide a benefit to the San Diego fairy shrimp and its habitat (USFWS 2003b). A full species profile is available at the USFWS ECOS website (https://ecos.fws.gov/ecp/species/6945), which includes all Federal Register publications related to the listing history, recovery plan documents, critical habitat designations, and applicable HCPs.

No special status has been assigned to the San Diego fairy shrimp by the State of California.

J.3.2. Distribution and Occurrence

San Diego fairy shrimp are restricted to vernal pools in coastal southern California south to extreme northwestern Baja California, Mexico, with San Diego County supporting the largest number of remaining occupied vernal pools (USFWS 1998a). USFWS estimated at the time of listing that fewer than 200 acres (81 ha) of occupied vernal pool habitat remained in San Diego County, of which approximately 70 percent is thought to occur on Department of Defense lands (USFWS 1998a).

The San Diego fairy shrimp is found in San Diego County from Camp Pendleton; inland to Ramona; and south through Del Mar Mesa, Kearney Mesa, Proctor Valley, and Otay Mesa, and into northwestern Baja California, Mexico. In Baja California, it has been recorded at two localities: Valle de las Palmas, south of Tecate; and Baja Mar, north of Ensenada. Small populations occur in Orange County, and a single isolated female was reported from a vernal pool in Isla Vista, Santa Barbara County, California (USFWS 1998a).

On Camp Pendleton, the San Diego fairy shrimp shares the same coastal strip distribution as the Riverside fairy shrimp. However, within this limited range, especially in the southwestern part of the Base, the San Diego fairy shrimp occurs more often than either Lindahl's fairy shrimp (*Branchinecta lindahli*) or Riverside fairy shrimp. On Base, the San Diego fairy shrimp appears to be locally abundant in natural vernal pools and in human-made pools that have not been disturbed in several seasons (Moeur 1998). Vernal pools of high natural quality will be occupied by San Diego fairy shrimp while more degraded pools have a greater likelihood of containing Lindahl's fairy shrimp. San Diego fairy shrimp occur primarily in the Victor, Oscar One, and Oscar Two Training Areas, as well as the Wire Mountain housing area. MCB Camp Pendleton supports 7% of San Diego fairy shrimp occurrences.

Surveys for vernal pools on Base started in 1978 but initially focused on identifying vernal pool plants. Fairy shrimp surveys conducted during the 1997–1998 and 1998–1999 wet seasons identified many pools on Base occupied with listed fairy shrimp. A total of 219 pools occupied by San Diego fairy shrimp are in the following 11 study areas: San Mateo, the State Park Lease Area, Las Pulgas, Tango Training Area, Las Flores, Edson Range, Cocklebur Mesa, Stuart Mesa, Wire Mountain, Basilone, and Lake O'Neill (RECON 2001). Inventory surveys conducted in five study areas between 2007 and 2009 detected 184 San Diego fairy shrimp occupied pools in Cocklebur Mesa, a portion of Edson Range, MASS 3, Oscar Two, and Red Beach. Ongoing surveys and restoration efforts continue to find unknown populations and pools that may be suitable for translocation to establish new populations. Efforts and experiments to limit Lindahl's fairy shrimp are ongoing to reduce their hybridizing within listed San Diego fairy shrimp.

According to the most recent summarized data, results of all previous surveys to date indicate that out of the mapped 2,275 vernal pools/artificial basins on Camp Pendleton, there are a

total of 1,335 known to be occupied by fairy shrimp species. Of that total, 196 are occupied by Riverside fairy shrimp (Tetra Tech and ECORP Consulting 2019).

J.3.3. Threats

Regionally, the most pressing threat to San Diego fairy shrimp is habitat loss and degradation from military, urban, and water development; off-road vehicle use; trash dumping; trampling; military maneuvers; competition and predation by nonnative species, drainage, or watershed alterations; and drought. In addition, climate change has been identified as a potential threat to San Diego fairy shrimp. With the southwestern region of the county predicted to become hotter and drier, climate change may cause changes in vernal pool inundation patterns, and drought may decrease or terminate fairy shrimp reproduction if pools fail to flood or if pools dry up before reproduction is complete (USFWS 1998a). However, the information currently available on the effects of climate change and increasing temperatures does not adequately predict the location and magnitude of climate change effects to San Diego fairy shrimp. Lindahl's fairy shrimp hybridizing with San Diego fairy shrimp threatens the listed shrimp.

J.3.4. Recovery Strategy Goals

The recovery strategy for the San Diego fairy shrimp is to conserve and enhance southern California vernal pool ecosystems, with specific emphasis on stabilizing and protecting existing populations of Riverside and San Diego fairy shrimp, San Diego button-celery, San Diego mesa mint, Otay mesa mint, and California Orcutt grass so that these species may be reclassified from endangered to threatened status (USFWS 1998a).

Before considering reclassification of San Diego fairy shrimp from endangered to threatened, the species must first be stabilized by conducting surveys and research essential to the conservation of the species. Camp Pendleton vernal pool complexes and associated species have been identified as necessary to stabilize the San Diego fairy shrimp and several other listed vernal pool species. The vernal pool complexes identified as necessary to stabilize these listed species are Cocklebur Mesa, San Mateo, Las Pulgas, Stuart Mesa, State Park Lease Area, and Wire Mountain.

Once the species is stabilized, reclassification of San Diego fairy shrimp to threatened status may be considered when the following criteria are met: (1) existing vernal pools and their associated watersheds are secured; (2) where necessary, reestablish vernal pool habitat to the historical structure; and (3) manage and monitor habitat and listed species (USFWS 1998a). The Basilone and O'Neill vernal pool complexes occurring on Camp Pendleton are identified as necessary to reclassify the San Diego fairy shrimp to threatened.

J.3.5. Management and Monitoring

The U.S. Marine Corps is currently in consultation with USFWS regarding programmatic basewide management of upland habitats, including vernal pool habitat occupied by San Diego fairy shrimp. Until consultation is complete and a BO is issued, the San Diego fairy shrimp benefits from current basewide management practices such as invasive, nonnative vegetation control; erosion control; resource conservation awareness and education programs; investigative research (e.g., to examine pool and group enhancement, pool creation, fairy shrimp dispersal/translocation, and impact of signing and/or fencing); and avoidance and minimization of impacts from projects and Base activities, including training.

The Base has instituted measures for avoidance and minimization of impacts to vernal pool habitat and species. These measures are specified in the Base EOM, which prescribes regulations and general precautions for range and training area users that limit impacts to vernal pool species (including San Diego fairy shrimp) by restricting activities in and adjacent to vernal pool habitat. Restrictions specific to vernal pools are as follows:

- Foot traffic is authorized year-round. Digging, including construction of fighting positions, is prohibited in vernal pools.
- Vehicle/equipment operations near known vernal pool areas shall be kept on existing roads year-round. Contact ES prior to conducting activities involving soil excavation, filling, or grading.
- Bivouac/command and post/field support activities shall be kept at least 50 m from identified vernal pools.

J.4. SOUTHERN CALIFORNIA STEELHEAD (*ONCORHYNCHUS MYKISS*)

The southern California steelhead is an anadromous sea-run trout with a speckled dark-olive back, silvery-white underside, and distinct, pink-striped sides. Adults average 20 to 30 inches (51 to 76 cm) in length and can reach up to 45 inches (120 cm). Mature steelhead weigh approximately 8 to 9 pounds (3.6 to 4.1 kg) on average and can reach up to 55 pounds (25 kg) and a maximum age of 11 years old. Steelhead migrate to the ocean after spending one to three years in

FIGURE 4. SOUTHERN CALIFORNIA STEELHEAD

freshwater. Adults spawn between December and June in southern California when seasonal streams have adequate flow volumes to enable them to migrate upstream to their natal sites. Steelhead are capable of spawning more than once, although rarely more than twice before dying (NMFS 2012).

J.4.1. Status

The southern California steelhead distinct population segment (DPS) is federally listed as an endangered species. A recovery plan for the species was finalized in 2012 (NMFS 2012) and designated critical habitat for steelhead in California was finalized in 2005. Camp Pendleton was exempted from critical habitat designation under Section 4(a)(3)(B) of the ESA because USFWS determined that conservation efforts identified in the Base INRMP provide a benefit to the steelhead and its habitat (NMFS 2005). A full species profile is available at the NOAA Fisheries website (https://www.fisheries.noaa.gov/species/steelhead-trout#resources), which includes all Federal Register publications related to the listing history, Special Rule publications, recovery documents, critical habitat designations, and applicable HCPs.

The southern California steelhead DPS is state listed as a Species of Special Concern, and under review to be listed as endangered under the California Endangered Species Act. A Steelhead Restoration Management Plan for California has been prepared and approved by the California Department of Fish and Wildlife (CDFW) (McEwan and Jackson 1996). Steelhead are included in California's Coastal Monitoring Plan (Fish Bulletin 180) designed in collaboration with NMFS to gather information on the population status of salmonids inhabiting California's coastal watersheds (Adams et al. 2011). In 2022, CDFW published a revised state monitoring and management plan (Fish Bulletin 182). Steelhead are not included in any regional habitat conservation or multiple species planning efforts in southern California.

J.4.2. Distribution and Occurrence

Southern steelhead were formerly found in streams and rivers of Los Angeles, Orange, and San Diego Counties (CDFG, 1996), and were reported from San Mateo, San Onofre and San Juan Creeks, and in the San Luis Rey and Tijuana Rivers in 1946 (CDFG, 1996). The southern California steelhead DPS distribution extends from the Santa Maria River in San Luis Obispo County to at least San Mateo Creek on Camp Pendleton (NMFS 1999).

The most recent confirmed observations of steelhead on-Base include three individuals in the Santa Margarita River in 2021. All three individuals found just below the diversion weir were confirmed to be steelhead smolts due to their physical appearance, coloration, and size. Prior to this occurrence, one individual was detected in San Mateo Creek in 2003 and three were captured in the upper Santa Margarita River off-Base in 2009. Freshwater fish surveys

conducted in San Mateo Creek in 1995, 1996, and 1997 failed to detect any steelhead. Likewise, surveys in the Santa Margarita watershed were conducted in 1997, 1998, and 1999 both on- and off-Base resulting in no detection of steelhead. The portions of San Mateo Creek and Santa Margarita River within Base boundaries serve primarily as a migration corridor (December through May) to spawning habitat off-Base, so the persistent presence of steelhead on-Base is not expected. However, migrations may take place annually that support off-Base reproduction and persistence.

J.4.3. Threats

Major threats to steelhead include freshwater and estuarine habitat loss and degradation resulting from water and land development and management practices contributing to inadequate stream flows, blocked access to historic spawning and rearing areas, and discharge of sediment and debris into watercourses (CDFG 1996). Additional threats include impacts from recreational activities (e.g., off-road vehicles), introduction of nonnative species, and inadequacy of existing planning or regulatory and enforcement (NMFS 2012). Climatic shifts over the last decade appear to have resulted in decreased ocean productivity, which may exacerbate degraded freshwater habitat conditions (NOAA 2009).

J.4.4. Recovery Strategy Goals

The goal of the Southern California Steelhead Recovery Plan (NMFS 2012) is to recover anadromous steelhead and ensure the long-term persistence of self-sustaining wild populations across the DPS by addressing factors limiting the species within a set of core watershed populations distributed across the recovery planning area. The recovery planning area is divided into five Biogeographic Population Groups (BPGs). Camp Pendleton is located within the Santa Catalina Gulf Coast BPG, which includes the following priority actions:

- develop and implement plans to modify or remove barriers to fish movement.
- develop and implement operating criteria to ensure water release from the O'Neill diversion dam provides essential habitat functions to support steelhead; and
- develop and implement management plans to restore suitable habitat and eliminate nonnative species.

J.4.5. Management and Monitoring

The southern California steelhead is not covered by the Estuarine and Beach Ecosystem Conservation Plan, Riparian Ecosystem Conservation Plan, or the Riparian BO; however, the Base implements a conservation measure provided in the Riparian BO to examine the

Base for habitat qualities necessary to support steelhead runs and determine feasibility of establishing such runs. In addition, the Base has instituted measures for avoidance and minimization of impacts to Endangered Species Management Zones, including San Mateo Creek and the Santa Margarita River. These measures are specified in the Base EOM, which prescribes regulations and general precautions for range and training area users that limit impacts to natural resources.

Since 2017, the Base has been involved in the Santa Margarita River Conjunctive Use Project (SMR CUP) to resolve water rights dispute between the Base and Fallbrook Public Utility District (FPUD). To meet steelhead requirements per the SMR CUP NMFS BO, a fish ladder was installed in the reconstructed diversion weir which must operate to maintain fish passage and a functioning migration corridor for adult and juvenile steelhead from the point of diversion to the Pacific Ocean. Additionally, the Adaptive Management Plan (AMP) supports steelhead monitoring and data requirements developed from the NMFS BO pertaining to habitat, migration corridor, and estuary. Hydrograph and biological monitoring include an annual fish passage assessment prior to migration season to validate or re-establish critical passage sites and minimum passage flow rates per the NMFS BO, and after five years an assessment of flow event required to alter the stream morphology (Stetson 2017).

The Santa Margarita River and San Mateo Creek are designated per the NMFS Steelhead Recovery Plan as high priority (Core 1) watersheds for steelhead recovery (NMFS 2012). In 2018 and 2021 the Base funded steelhead monitoring using environmental DNA analysis of water samples taken at strategic locations in the Santa Margarita River and San Mateo Creek to test for the presence/absence of steelhead. The Base continues to work on the most effective steelhead monitoring strategies for future monitoring as funding allows.

The Base is participating in a watershed-wide program to manage the southern steelhead in the San Mateo Creek system. The planning group consists of state, local, and federal agencies, as well as other watershed stakeholders including private citizens and conservation organizations. The Base continues to document steelhead occurrence and is in the process of developing a steelhead salvage/relocation plan to support steelhead survival on Base. The Base also continues aquatic exotics control measures in five of the seven larger stream systems on Camp Pendleton, including San Mateo Creek and Santa Margarita River. Since 2003, a fisheries biologist has been on staff to manage the complex steelhead, tidewater goby, and other fish management actions aboard Camp Pendleton. Base representatives regularly attend meetings to coordinate local efforts to address steelhead issues with federal and state agencies and other interested organizations.

J.5. SOUTHERN TIDEWATER GOBY (*EUCYCLOGOBIUS KRISTINAE*)

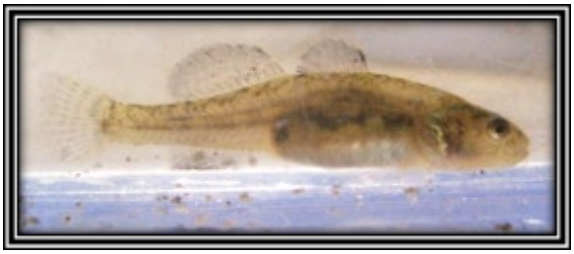

FIGURE 5. TIDEWATER GOBY

The southern tidewater goby is a small fish rarely exceeding two inches (50 millimeters [mm]) in length. It is characterized by an elongated body, large pectoral fins, ventral fins joined below the chest and belly, and two dorsal fins with slender spines set very close together. Males are nearly transparent with a mottled brownish upper surface. Females are darker and often have a black body and fins. Tidewater gobies primarily feed on small benthic invertebrates including aquatic insect larvae, snails, shrimp, and other crustaceans.

The tidewater goby lifespan is generally 1 year. Reproduction occurs at all times of the year with peak spawning periods during the spring and late summer. Males excavate breeding burrows in relatively unconsolidated, clean, coarse sand in April or May after lagoons naturally close to the ocean (USFWS 2007). Spawning normally takes place when water temperatures are between 48 to 77°F (9 to 25°C). Fluctuations in reproductive success are attributed to adult mortality that occurs during early summer and colder temperatures or hydrological disruptions in winter.

J.5.1. Status

The related tidewater goby (*Eucyclogobius newberryi*) is currently federally listed as endangered and USFWS has approved a recovery plan for this species (USFWS 2005). However, in March 2014, the USFWS published their finding on a petition to reclassify the tidewater goby as threatened, and that the reclassification is warranted (79 Federal Register 14340). As of December 2016, no final rule had been published. Designated critical habitat for the tidewater goby was revised and finalized in 2013. Camp Pendleton was exempted from critical habitat designation under Section 4(a)(3)(B) of the ESA because USFWS determined that conservation efforts identified in the Base INRMP provide a benefit to tidewater goby and its habitat (78 Federal Register 8745). A full species profile is available at the USFWS ECOS website (https://ecos.fws.gov/ecp/species/57), which includes all Federal Register publications related to the listing history, recovery plan documents, critical habitat designations, and applicable HCPs.

A study, published in July 2016 (Swift et al. 2016), reclassifies the southern populations of tidewater goby as a new species, the southern tidewater goby, as distinct from the northern tidewater goby. Southern tidewater goby has only been observed in nine intermittently occupied lagoonal systems in northern San Diego County. It routinely persists in three sites on Camp Pendleton, and is intermittently detected in the five other lagoons on Base. As of

July 2023, southern tidewater goby as a separate species has not yet been published by the USFWS. When USFWS recognizes the tidewater goby and southern tidewater goby as two separate species, listing and recovery actions pertaining to the southern species will be led by the Carlsbad USFWS field office.

The tidewater goby is state listed as a Species of Special Concern. It is not included in any regional habitat conservation or multiple species planning efforts in southern California.

J.5.2. Distribution and Occurrence

Tidewater gobies are endemic to California and historically ranged from Tillas Slough (mouth of the Smith River) in Del Norte County near the Oregon border south to Agua Hedionda Lagoon in northern San Diego County and are found today entirely within the original known range of the species. The known localities are discrete lagoons, estuaries, or stream mouths separated by mostly marine conditions. Tidewater gobies are absent from areas where the coastline is steep, and streams do not form lagoons or estuaries. Southern tidewater goby currently under review by USFWS is restricted to nine localities in northern San Diego County from San Mateo Creek near the Orange County line southward to the mouth of the San Luis Rey River (Swift et al. 2016). All but one population occur on Camp Pendleton.

On Camp Pendleton, the extirpation and recolonization of gobies annually fluctuates between lagoons (Swift & Holland 1998). At the time of listing in 1994, the species was thought to be present in only three of the eight drainages on Base; however, the number of estuaries with detectable tidewater goby populations changes in response to water levels, sedimentation, and other natural and anthropogenic events (USGS 2013). For example, tidewater gobies were not detected in French Creek estuary from 2002-2004, were detected from 2005-2006, absent in 2007, detected during years 2008-2013, 2016-2017, and absent in 2018 and 2021. Focused sampling efforts were not funded during 2014-2015, or 2019-2020 so presence/absence is unknown in lagoons where incidental capture did not occur during these years. As some of these years represent drought conditions when the estuary was not open to the ocean, it seems possible that gobies have found refuge in the estuary where detection is problematic.

San Mateo Creek estuary populations were steady until 2007, but since then, detections have fluctuated with an absence documented during sampling in 2007-2009, 2013, and 2016. The San Mateo Creek estuary is highly impacted by recreation, non-native species introduced upstream, and poor water quality (high coliform). However, there is an abundance of refugia, and goby may persist in San Mateo Creek as supported by their continued presence since 2017.

Southern tidewater gobies have not been observed in the Santa Margarita River since 2001. The mouth of the river was closed in 2004 and fall 2010 and opened in 2002, 2003, 2005–2009, 2018-2022 (USGS 2013). The lack of a persistent sand bar most likely precludes the long-term persistence of gobies at this location; however, it is also possible that they are present but remain undetected. In December 2021, eDNA analysis of a water sample from the SMRE showed a positive detection of southern tidewater goby. While this was one positive detection from 14 samples taken from December 2021 to May 2022, this data supports the presence of southern tidewater goby in a large water body that is particularly difficult to sample per protocol.

In 2010, an extirpation of tidewater gobies in Aliso Creek was associated with a high-density monoculture of mudsuckers (USGS 2013). Mudsuckers are a potential competitor and predator of southern tidewater goby and these two species often do not coexist. The absence of mudsuckers at this site in October 2011 may have allowed for recolonization of gobies in 2012. Southern tidewater goby were detected again in 2013, 2015-2017, but absent in 2018 and 2021. However, there was no detection of mudsuckers during this time either.

The Cockleburr, Hidden, San Onofre, and Las Flores Creek populations have been the most persistent populations of tidewater gobies remaining in the region, which potentially serve as important source populations for dispersal into suitable waterbodies in the area (e.g., Buena Vista Lagoon and Agua Hedionda Lagoon). Southern tidewater goby has been detected in San Onofre and Cocklebur every year monitoring has occurred since 2003. In Hidden Creek, the species was not detected in 2018 but was detected every other year sampling was performed from 2003-2021. In Las Flores, southern tidewater goby was not detected in 2016, but was present again from 2017-2021. It is possible that detection success for gobies is relatively low in the larger estuaries where they are present.

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

The Base implements programmatic instructions and habitat enhancement measures specified in the Estuarine and Beach Ecosystem Conservation Plan and the Riparian BO for protection and management of tidewater goby. The population goal for tidewater goby, as stated in the description of the proposed action consulted on in 1994, is to maintain three to four populations on Base. The conservation plan describes estuarine management zones for the specific protection of this species. The Base also conducts monitoring of southern tidewater goby in accordance with the conservation plan and BO. Although goby monitoring is only required once every three years, Camp Pendleton monitoring has occurred annually since 2002, except in 2014, 2015, 2019, and 2020. The Base funded a southern tidewater

goby translation feasibility study in 2023 in partnership with USFWS and USGS, to investigate the possibility of reestablishing the species in lagoons from which they are now extirpated. In addition, the Base EOM prescribes regulations and general precautions for range and training area users that limit impacts to this species by restricting activities in and adjacent to estuarine habitat.

J.5.3. Threats

The primary threats to southern tidewater goby are loss and modification of habitat, water diversions, habitat channelization, degraded water quality, and predatory and competitive introduced fish species (USFWS, 2005), including sunfish (*Centrarchidae*), largemouth bass (*Micropterus salmoides*), striped bass (*Morone saxatilis*), channel catfish (*Ictalurus punctatus*), mosquitofish (*Gambusia affinis*), and yellowfin gobies (*Acanthogobius flavimanus*) (Holland, 1992). Since southern tidewater gobies are known to migrate upstream into freshwater and often spawn in near-freshwater conditions, they are vulnerable to predation by both estuarine and riverine nonnative species.

From 2013 to 2016 drought reduced fish habitat in coastal estuaries and may have impacted goby populations by concentrating non-native predators and competitors where southern tidewater gobies breed and forage. In 2015 USFWS was petitioned by University of California, Los Angeles (UCLA) to salvage gobies on Base in order to protect against drought and potential El Niño flooding in winter months. Drought concerns were unrealized, but in February 2016 USFWS, Camp Pendleton, UCLA and Scripps and Santa Monica Pier Aquarium staff removed over 300 gobies from Hidden, Cocklebur and San Onofre Creek estuaries with the intent of holding them at the aquaria until El Niño rains passed. Precipitation was not destructive to the habitat, and gobies were released back to estuaries in May 2016. It is likely that southern tidewater gobies are genetically equipped to withstand El Niño rain events.

The southern tidewater goby is also threatened by modification and loss of habitat because of coastal development, habitat channelization, water flow diversions and alterations, and groundwater over-drafting. Other potential threats to the southern tidewater goby include discharge of agricultural and sewage effluents, increased sedimentation due to cattle grazing and feral pig activity, summer breaching of lagoons, upstream alteration of sediment flows into the lagoon areas, habitat damage, and watercourse contamination resulting from vehicular activity in the vicinity of lagoons.

J.5.4. Recovery Strategy Goals

The recovery strategy for the southern tidewater goby is to preserve suitable habitat throughout the range of the species, preserve the natural process of recolonization and

population exchange, and preserve genetic diversity (USFWS 2005). There is currently no recovery plan for southern tidewater goby. Base on the recovery plan for the northern tidewater goby species. the recovery of southern tidewater goby and its habitat may require implementation of four primary tasks: (1) monitor, protect, and enhance current habitat conditions for extant populations; (2) conduct research to acquire additional information needed for management; (3) restore degraded habitats to suitable conditions and reintroduce or introduce gobies to those habitats; and (4) develop and implement an information and education program.

J.5.5. Management and Monitoring

Guidelines for management and monitoring of southern tidewater goby and its habitat are provided in the Estuarine and Beach Ecosystem Conservation Plan and the Riparian BO. The Base implements the following programmatic instructions and habitat enhancement measures specified in the conservation plan and BO for the protection and management of the species and the estuarine/beach ecosystems:

- manage estuarine zones to maintain wetland values of coastal lagoons.
- restrict access to estuary wetlands and salt flats unless specifically authorized.
- post signs in strategic locations to deter unauthorized entry.
- conduct invasive, nonnative vegetation control.
- conduct annual nonnative aquatic species control; and
- maintain occupied tidewater goby habitat as well as historic locations for recolonization.

The Base has instituted measures for avoidance and minimization of impacts to Endangered Species Management Zones to protect tidewater goby and other species. These measures are specified in CAMP PENDLETON Base Order P3500.1 (Range and Training Standard Operating Procedures), which prescribes regulations and general precautions for range and training area users that limit impacts to natural resources. Restrictions specific to the Endangered Species Management Zones that apply to southern tidewater goby are as follows:

- Obtain authorization from ES before entering any lagoon or estuary, marsh, mud/salt flat, or posted nesting area. Bivouacking and digging of fighting positions are prohibited in the vicinity of the Estuarine/Beach Endangered Species Management Zones during the period of 1 March to 15 September.
- Unit hikes shall remain on the hard packed sand, as close to the ocean water edge as possible.

- Vehicle and equipment operations in the management zones shall be kept to a minimum between 1 March and 15 September. All vehicles shall travel on hard packed sand and shall not exceed 25 miles per hour. Tracked vehicles shall travel as close to the water (upper few inches of waves) as possible, year-round, in the Santa Margarita Management Zone.
- Engineering operations outside of approved landing exercise support shall be coordinated with ES prior to the initiation of activities.
- Boat operations are not authorized in lagoons and estuaries. Landing Craft Air Cushions (LCACs) shall not enter the management zones between 1 March and 15 September, except when entering or exiting seaward; and on return, shall exit the ocean heading directly up to the facility access ramp. Small boats may be permitted in the Santa Margarita estuary between 16 September and 1 March, with prior approval from ES.

The Base also conducts monitoring of tidewater goby in accordance with the conservation plan and BO. Although goby monitoring is only required once every 3 years, Camp Pendleton has been monitoring annually since 2002 to detect trends associated with occupation at specific sites. In 2004, Camp Pendleton expanded water quality monitoring from the Santa Margarita River estuary to all eight of the lagoons/estuaries on-Base that could provide habitat for the tidewater goby. In 2016, estuarine habitat monitoring parameters were revised to include more biotic variables, including benthic sampling. Data collected during water quality and goby presence/absence monitoring contribute to goby research efforts and is essential to understanding how water quality parameters correlate with tidewater goby life history parameters.

These management and monitoring measures have been implemented on-Base since the completion of the conservation plan in 1995 and were incorporated in and have been managed through this INRMP since 2001. The results of the monitoring efforts are used to develop adaptive management strategies for southern tidewater goby on-Base and are reported annually to USFWS.

J.6. GREEN SEA TURTLE (*CHELONIA MYDAS*)

Green sea turtle is an ocean dwelling species found worldwide primarily in subtropical and temperate regions of the Pacific, Atlantic and Indian Oceans and in the Mediterranean Sea. Green sea turtles and is the largest hard shelled sea turtle. Green sea turtles are mostly foraging herbivores, with seagrass and algae making up most of the diet. There are 11 designated distinct population segments (DPS) in the world; Green Sea turtles found in California belong to the East Pacific DPS and is listed as endangered throughout its range (NOAA 2015).

FIGURE 6. GREEN SEA TURTLE

The East Pacific green sea turtle is differentiated from other green sea turtles by its relatively small size, varying coloration, and carapace shape. The carapace of East Pacific green sea turtles is narrower, steeply vaulted, and the indentation near the rear flippers is more distinguished. Adults tend to grow to about three feet in length and weigh between 300 and 350 pounds. The carapace can be light to dark brown, or olive green, with dark molting and a white or light-yellow plastron. Female turtles demonstrate natal philopatry, returning to same beaches of their birth for nesting and to lay eggs every two to four years. Most nests are found in Michoacan, Mexico and Galapagos Islands, Ecuador. Hatchlings are darker in color, black or dark grey, with a lighter underside and juveniles tend to be more brightly colored (NMFS and USFWS 1998).

J.6.1. Status

Green sea turtles were first listed as endangered in 1978 under the Endangered Species Act (ESA). In 2016, a revision of the listing occurred, when 11 distinct population segments were identified. Three populations are listed as endangered including the Central South Pacific, Central West Pacific, and the Mediterranean DPS. Federally threatened populations include the Central North Pacific, East Pacific, North Atlantic, South Atlantic, East Indian-West Pacific, North Indian, Southwest Indian, and Southwest Pacific DPS (Fed. Reg. 2016). The population that is seen off the coast of southern California is the East Pacific population. NMFS published a recovery plan for East Pacific Green Sea Turtle in December of 1998, citing a population "stock" of 5,000 females nesting annually, over a period of six years, as criteria for de-listing.

J.6.2. Distribution and Occurrence

The East Pacific green sea turtle can be found as far north as the Oregon-Californian border and as south as central Chile. Green sea turtles are known to occur off the coast of southern California and are regularly seen in La Jolla Cove and San Diego Bay. Occasionally a green sea turtle becomes stranded on Camp Pendleton and are reported to NMFS and SeaWorld® San Diego for recovery. The East Pacific DPS has the smallest number of female nesters, with most of the nesters being found within Mexico. About 58% of East Pacific turtle nests were found on the beaches of Michoacan, Mexico, with about 11,588 nests. Ecuador is the second largest nesting area, with 4 main sites, holding about 3,600 nesters, and Costa Rica has 26 different nesting sites, with an estimate of 2,800 females nesting (NOAA 2015). There are no known nesting sites in the United States, or in any territory under U.S. jurisdiction.

J.6.3. Threats

Large sea turtle population declines occurred in the early to mid-1900s due to direct harvesting of green sea turtles and their eggs for food and other resources. Today, the most common threats within the United States to green sea turtles are vessel strikes, bycatch, and entanglement from fishing gear and debris. Harvesting eggs and turtles is a major threat and conservation hurdle in some countries but illegal within the United States. Climate change is causing nesting habitat to become degraded or completely lost from rising oceans, and elevated sand temperatures causing egg mortality or improper ratios of gender. According to NOAA (2023) if the temperature of the eggs incubates below 81.86 degrees Fahrenheit, males are born, but anything about 88.8 degrees Fahrenheit, females will be born. Coastal development destroys proper nesting habitat and causes light pollution, which can deter nesting and confuses hatchlings when first born. Debris and pollution cause many issues from ingestion of harmful chemicals or fragments that are mistaken for food, leading to injury or death. Two sea turtles stranded on Camp Pendleton in the 2010s were alive when transported to SeaWorld® but died shortly thereafter. When necropsied, both had plastic bags in their guts. Fibropapillomatosis can causes tumors that hinders the ability to swim or eat of green turtles but is not common in the East Pacific populations (NMFS and USFWS 1998).

J.6.4. Recovery Strategy Goals

The USFWS and NMFS published a Recovery Plan for U.S. Pacific Populations of the East Pacific Green Turtle (Chelonia mydas) in 1998. The recovery goals outlined in the plan is: (1) lower vessel strikes, (2) minimize accidental deaths from bycatch from commercial fishing, (3) support Mexico and Central American countries to protect, nesting turtles, eggs, and beaches, (4) survey U.S. population size and status, (5) identify home ranges with DNA

analysis, (6) identify, and protect the foraging areas within the U.S (NMFS and USFWS 1998).

Delisting criteria that must be met prior to de-listing the species include: (1) all stocks within U.S. waters are identified, (2) each stock needs to have about 5,000 nesting females annually over six years, (3) source beaches have stable or increasing nest populations over 25 years, (4) established foraging areas stay healthy, (5) foraging habitats are increasing in foraging populations within each region, (6) all priority 1 tasks are implemented (NMFS and USFWS 1998).

Aboard Camp Pendleton, providing healthy foraging habitat of seagrasses and algae is a key management goal. Additionally, large scale ship-to-shore military exercises are often required to have a "spotter" for sea turtle and marine mammal boat strike avoidance.

J.6.5. Management and Monitoring

The USFWS and NMFS have worked together since 1977 in sharing jurisdiction over the green sea turtle. NMFS is responsible for the marine environment and USFWS is responsible for the beaches and nesting areas. Every five years, the agencies collaborate to conduct a review of the species to determine what the status of the species is. Management strategies include the following:

- Protecting and restoring seagrasses, including eelgrass, and marine algae.
- Providing protection while turtles are resting on beaches and in the ocean.
- Improving fishing gear to reduce bycatch and entanglement.
- Conducting surveys to monitor populations, foraging habits and tracking individuals to collect data on growth and age to maturity.

Aboard Camp Pendleton, there are Standard Operating Procedures (SOP) for strandings of turtles on beaches. Stranded turtles are reported to NMFS, and, as necessary, to SeaWorld® San Diego for rehabilitation. Additionally, large scale ship-to-shore military exercises are often required to have a "spotter" for sea turtle and marine mammal boat strike avoidance; conservation measures for those exercises are determined by the U.S. Navy lead, in consultation with NFMS.

J.7. ARROYO TOAD (*ANAXYRUS CALIFORNICUS*)

The arroyo toad is a small 2- to 3-inch-long (5.6- to 8.4-cm-long) toad. Adult arroyo toads have a light-olive green or gray to tan back with dark spots and warty skin and are white or buff underneath. A light-colored, V-shaped stripe crosses the head and eyelids, and the oval parotoid glands behind the eyes are pale. Juvenile arroyo toads are white-gray-tan with small dark spots and gray reticulations on the back with a white underside. The enlarged parotoid glands of adult toads are not evident on young juveniles, but the V-shaped light mark that crosses the eyelids is prominently visible and diagnostic of this species.

FIGURE 7. ARROYO TOAD

The arroyo toad breeding season extends from 15 March to 15 August. They breed in the low-flow margins and side channels of open streams that lack emergent aquatic vegetation. Suitable spawning substrates are most often gravel and sand. Female arroyo toads produce a single clutch of four to five thousand eggs per breeding season. Arroyo toad tadpoles hatch in 4 to 5 days and require about 10 to 12 weeks to reach metamorphosis. Juveniles remain on stream banks for up to 16 weeks, or until they have grown large enough to burrow into sandy substrates. Maturity is reached in 1 year for males and 2 years for females. Adult arroyo toads generally occupy the channel floodplain and will move into adjacent upland habitats for overwintering or to travel between drainages. Arroyo toads feed on a variety of small insects but specialize on native ants.

J.7.1. Status

The arroyo toad is federally listed as endangered and USFWS has approved a recovery plan for the species (USFWS 1999). Designated critical habitat for the arroyo toad was revised and finalized in 2011. Camp Pendleton was exempted from critical habitat designation under Section 4(a)(3)(B) of the ESA because USFWS determined that conservation efforts identified in the Base INRMP provide a benefit to the arroyo toad. A full species profile is available at the USFWS ECOS website(https://ecos.fws.gov/ecp/species/3762), which includes all Federal Register publications related to the listing history, critical habitat designation, recovery plans, and applicable HCPs.

The arroyo toad is state listed as a Species of Special Concern.

J.7.2. Distribution and Occurrence

The arroyo toad is endemic to the coastal plains and mountains of central and southern California and northwestern Baja California and occurs principally along coastal drainages and also several locations on the desert slopes of the Transverse and Peninsular Mountain ranges south of the Santa Clara River, Los Angeles County (USFWS, 1999). In southern California, arroyo toads occur on the coastal plain and on a few desert slopes.

On Camp Pendleton, the arroyo toad occurs in Talega Creek, Cristianitos, San Mateo Creek, San Onofre Creek, De Luz Creek, and Roblar Creek and in the Santa Margarita River. Surface water availability is highly variable along these freshwater streams. From 2003-2021, the proportion of arroyo toad habitat containing surface water during the breeding season ranged from 23-95%, and similarly during this time the percent wet area occupied by arroyo toads ranged from 27-96%. Surface water availability and percent wet area occupied (PWAO) by arroyo toad is more variable in the ephemeral San Mateo and San Onofre subwatersheds (PWAO 0-100%). There was no evidence of breeding in the San Onofre subwatershed during 11 of the 19 years of monitoring and only limited breeding in 2008. In the San Mateo subwatershed, there was no evidence of breeding in 6 of 19 years and very limited breeding in 2009, 2012 2014, and 2016. By contrast, the Santa Margarita Watershed is predictably seasonal and more stable than the ephemeral creeks on Base (PWAO 25-99%). The Santa Margarita River has contained surface water during spring months and breeding activity has been observed for all years of monitoring 2003-2021. A negative population trend was observed during the drought period from 2012–2016 during which PWAO in the Santa Margarita River continuously declined hitting a record low at 25.3% in 2016. However, the breeding population rebounded the following year with above average rainfall and PWAO of 90.6% in 2017.

The lower portions of the San Mateo Creek, San Onofre Creek, and the Santa Margarita River on Camp Pendleton are the only remaining coastal drainages in southern California where the arroyo toad occurs within 6 miles (10 km) of the coastline down to the coastal marsh zone (USFWS 1999a). These populations have phenotypic characteristics that are now limited in representation within the overall range of the arroyo toad in California.

J.7.3. Threats

The arroyo toad's decline is largely attributed to extensive habitat loss, hydrological modifications, and the introduction of nonnative plants and predators. Channelization of drainages increases flow rates and modifies natural sediment distribution, which serves to significantly reduce the availability of suitable habitat within riparian ecosystems for the arroyo toad. Disturbances such as agriculture and road construction can increase

sedimentation in arroyo toad breeding pools, rendering them unusable. Arroyo toads can also be killed by vehicular traffic and road maintenance activities.

Nonnative, invasive plants, such as giant reed (*Arundo donax*), directly and indirectly affect the condition and formation of ideal breeding pools. Bullfrogs (*Lithobates catesbeiana*) are considered the most serious threat of all nonnative species to the arroyo toad. They are voracious predators that eat adult toads and are suspected of eating larvae and metamorphs, and since they are more tolerant to a variety of environmental conditions it allows them to colonize and dominate modified stream habitats more readily (e.g., percolation ponds within the lower Santa Margarita River).

Global climate change was recently identified as a new threat to the species. Current climate change predictions for terrestrial areas in the Northern Hemisphere indicate warmer air temperatures, more intense precipitation events, and increased summer continental drying. However, predictions of climatic conditions for smaller subregions such as California remain uncertain. It is unknown at this time if climate change in California will result in a warmer trend with localized drying, higher precipitation events, or other effects. It is recognized that climate change is an important issue with potential effects to listed species and their habitats; however, there is a lack of adequate information to make accurate predictions regarding its effects to arroyo toad at this time (USFWS 2009).

J.7.4. Recovery Strategy Goals

The strategy for recovery of the arroyo toad is focused on providing sufficient breeding and upland habitat to maintain self-sustaining populations of arroyo toads throughout the historic range of the species in California and minimizing or eliminating impacts and threats to arroyo toad populations (USFWS 1999). Self-sustaining populations are those documented as having successful recruitment (i.e., inclusion of newly matured individuals into the breeding population) equal to 20 percent or more of the average number of breeding adults in 7 of 10 years of average to above average rainfall amounts with normal rainfall patterns.

The arroyo toad will be considered for reclassification from endangered to threatened status in each recovery unit once management plans have been approved and implemented on federally managed lands. This will help secure the genetic and phenotypic variations of the arroyo toad in each recovery unit by conserving, maintaining, and restoring the riparian and upland habitats used by arroyo toads for breeding, foraging, and wintering habitat. The downlisting goal for the Southern Recovery Unit, which encompasses arroyo toad populations and habitat in the coastal drainages of Orange, San Bernardino, Riverside, and San Diego Counties, is 10 populations or metapopulations. A minimum of two of these 10 metapopulations are needed in the San Mateo and San Onofre Creeks, and the Santa Margarita River (USFWS 1999).

J.7.5. Management and Monitoring

Management and monitoring measures have been implemented on Base since the completion of the conservation plan in 1995 and were incorporated in and managed through this INRMP since 2001. USFWS has determined that efforts identified in the INRMP provide conservation benefit to the arroyo toad.

Guidelines for management and monitoring of arroyo toad and its habitat are provided in the Riparian Ecosystem Conservation Plan, and the Riparian BO. The Base implements the following programmatic instructions and habitat enhancement measures specified in the conservation plan and BO for the protection and management of this species and the riparian ecosystem:

- avoid riparian areas for project and training activities.
- restrict movement through riparian areas to existing roads, trails, and crossings.
- compensate for unavoidable impacts through invasive, nonnative vegetation control (e.g., giant reed removal); and
- conduct annual invasive, nonnative aquatic species control.

In addition, the Base has instituted measures for avoidance and minimization of impacts to arroyo toad. These measures are specified in the Base EOM, which prescribes regulations and general precautions for range and training area users that limit impacts to natural resources. Restrictions specific to arroyo toad are as follows:

- Extreme caution beyond that required by the Fire Danger Rating System (FDRS) is necessary when using pyrotechnics, and when conducting other activities likely to cause a fire.
- Foot traffic is authorized year-round on existing roads, trails, and creek crossings. Consult with ES prior to cutting/removing vegetation.
- Vehicles operating in the vicinity of creeks, rivers, or drainages shall use existing roads, trails, and established creek/river crossings. Vehicle traffic on roads in arroyo toad habitat between 15 March and 30 August shall be minimized to the maximum extent practical.
- Consult with ES prior to bivouacking, cutting/removing vegetation, trenching, grading, filling, or conducting engineering operations in or adjacent to creek/river bottom areas.
- Dust produced in or adjacent to creeks and rivers shall be minimized to the maximum extent practical.

The Base also conducts annual monitoring of arroyo toads in accordance with the conservation plan and BO. Arroyo toad surveys are conducted seasonally in the Santa Margarita River, San Mateo Creek, and San Onofre Creek watersheds. Since 2003, these surveys have used a Percent Area Occupied methodology, which tracks the presence of breeding populations by documenting the presence of eggs and larvae, in order to detect trends. Percent Wet Area Occupied (PWAO) normalizes the data for available surface water among monitoring years and provides a more stable metric that better demonstrates breeding dynamics within wetted and suitable habitat on Base.

In 2015, intensive monitoring of the lower Santa Margarita River began and was incorporated into annual monitoring efforts to meet requirements for the SMR Conjunctive Use (CUP) Project Biological Opinion following the replacement of the weir with a new water diversion and pumping schedule (USFWS 2016). This monitoring effort allows USGS to update Camp Pendleton on site conditions, tadpole development, and these data provide insight to whether the weir construction and water schedule changes have any effect on the lower Santa Margarita River arroyo toad population as well as any long-term drought effects. Monthly observational data and the final annual report are made available to CUP managers to consider conclusions and recommendations regarding water management activities (Stetson 2017). The collective results of these monitoring efforts are used to develop adaptive management strategies for arroyo toads on-Base and are reported annually to USFWS.

J.8. CALIFORNIA LEAST TERN (*STERNULA ANTILLARUM BROWNI*)

Least terns are the smallest members of North American terns, measuring approximately 9 inches (22.9 cm) long with a 20-inch (50.8-cm) wingspan. The least tern has a distinctive black cap and loral (space between the eyes and bill) stripe contrasting a white forehead. The remaining upperparts are gray with white underparts. In flight, a black wedge on the outer primary feathers is prominent, as well as the short, deeply forked tail. It has a yellow beak with a black tip, and orange-yellow legs. The sexes are similar except the loral stripe is wider in the male. The California least tern

FIGURE 8. CALIFORNIA LEAST TERN

breeding season extends from 1 March to 15 September.

J.8.1. Status

The California least tern is federally listed as endangered. A USFWS-approved recovery plan for the least tern has been revised several times (USFWS 1985a), but no critical habitat has been designated. The California least tern is protected by the Migratory Bird Treaty Act (MBTA). A full species profile is available at the USFWS ECOS website (https://ecos.fws.gov/ecp/species/8104), which includes all Federal Register publications related to the listing history, recovery plans, and applicable HCPs.

The California least tern is state listed as endangered and fully protected by CDFW.

J.8.2. Distribution and Occurrence

The California least tern is a migratory bird that historically nested in large beach colonies along the coastline from southern Baja, Mexico to coastal central California. Over time, California least tern nesting habitat has been drastically reduced as a result of regional urbanization. Nesting is currently limited to San Francisco Bay and areas along the coast from San Luis Obispo County to San Diego County. The largest concentrations of breeding pairs nest in Los Angeles, Orange and San Diego Counties, typically between 1 April and 15 15 July. Migration routes and wintering range for the California least tern are not well known; it is thought that this species winters along the Pacific Coast of Central America.

California least tern populations have declined since the early 1900s. At least 1,000 nesting pairs of least terns were reportedly observed along a 3-mile-long section of coastline in San Diego County from Pacific Beach to Mission Bay in the early 1900s (Foster 2002). By 1969, the statewide tern population was down to 182 pairs (CDFG 2002b). In cooperation with the Department of Interior, the Base set aside a portion of the beach near the mouth of the Santa Margarita River as a tern nesting area. Signs were posted designating the area as a refuge and to discourage vehicles and personnel from entering the area.

When the species was federally listed in 1973, the statewide tern population totaled 625 breeding pairs (Caffrey 1993). Since then, intensive management practices have resulted in an increase in the tern population; in 1992 the statewide tern population was up to 2,106 breeding pairs (Caffrey 1993) and in 2005 a statewide record-high of 7,100 pairs was reported, which represents more than twice the average annual breeding population size observed during the mid-1990s (USFWS 2006a). Breeding surveys in 2011 estimated approximately 4,826 to 6,108 breeding pairs at 40 nesting sites. The six most populous sites were Camp Pendleton, Naval Base Coronado, Batiquitos Lagoon, Huntington Beach, Point Mugu, and Alameda Point, which represented 79 percent of the breeding pairs.

The California least tern was first documented nesting on-Base in 1969, and it has been documented on-Base annually since. Typically, terns arrive in mid-April and depart by September. Camp Pendleton's special management period for this species occurs between 1 March and 15 September. On Camp Pendleton, California least tern nesting sites are located on the beaches and salt flats at the mouth of the Santa Margarita River (Blue Beach), and at the mouths of French and Aliso Creeks (White Beach). Since 2003, nesting sites have been intermittently observed at the mouth of Las Flores Creek (Red Beach). Between 2007 and 2014, the tern colony on Camp Pendleton represented a significant portion (approximately 18 percent) of the total tern population breeding in California (Boylan et al., 2015), with the peak occurring in 2010. Despite a recent decline from the 2010 peak (1,691 pairs), the breeding population on Camp Pendleton grew from 363 to 1,317 pairs between 1995 and 2014, which is growth of more than 360 percent (Boylan et al. 2015). In 2017, due to lack of predator management during the critical nesting season, adult terns abandoned Camp Pendleton sites early in the season. When terns returned in 2018, we only detected 323 pairs, down from 1056 pairs in 2017. The population of LETE at Camp Pendleton has been steadily increasing since the colony failure in 2017, and the estimated 538 pairs in 2021 was an increase of nearly 200 pairs from the 2020 monitoring season (Wooten et. al. 2021) Rates of nest success and fledgling productivity remain low and highly variable.

J.8.3. Threats

The decline in the California least tern population is largely attributable to loss of nesting and foraging habitat from coastal and marine development; modification of nest site habitat by invasive plant species; predation of eggs and chicks; disturbance to nesting colonies; reduction in food availability due to climate cycles (e.g., El Niño) and global climate change; flooding of nest sites due to sea level rise; oil spills; and increased predators due to urbanization (Boylan et al. 2015). Presently, nest sites are restricted to a few, defined locations, some of which are artificial and most of which persist only because of active management such as fencing, signage, education, and predator control (Boylan et al., 2015). However, in some cases, colony predators themselves may be sensitive species (e.g., gull-billed terns), which may impose a management conflict.

J.8.4. Recovery Strategy Goals

The Revised Recovery Plan for the California Least Tern (USFWS, 1985a) indicates that recovery for the annual breeding population in California must increase to at least 1,200 pairs distributed in at least 20 secure coastal management areas throughout their 1983 breeding range before delisting can be considered. Each of the 20 secure management areas must have a minimum of 20 breeding pairs with a 5-year mean reproductive rate of at least one young

fledged per breeding pair. Four of those colonies should be in San Francisco Bay, six in Mission Bay, and six in San Diego Bay.

The recovery plan requires the development and implementation of least tern management plans/programs for secure nesting habitat (secure land is defined as land under public ownership or control that is actively managed for its resource values emphasizing endangered species) at Aliso Creek and the Santa Margarita River mouth. Protection of important non-nesting, feeding, and roosting habitats from detrimental land or water use changes, including the Santa Margarita River and Lake O'Neill, is also required. Camp Pendleton's Estuarine and Beach Ecosystem Conservation Plan and this INRMP provide the required site-specific management and ensure implementation of those plans and actions. The status and results of the Base's management and actions in the estuarine and beach areas of the Base are reported annually to USFWS.

J.8.5. Management and Monitoring

Active management practices for protecting and enhancing least tern breeding habitat and minimizing disturbance to the species, when present on-Base, were established as early as 1984 when Camp Pendleton established protective fencing around the Santa Margarita River nesting colonies and posted warning signs to minimize human disturbance. Since then, a temporary fence has been installed along all known breeding locations to protect the colonies from military training on the beach during the breeding season. During the nonbreeding season, the fences between the ocean and nesting colonies are removed to allow access to the beach for wildlife and Base operations.

Current guidelines for management and monitoring of California least tern and its habitat are provided in the Estuarine and Beach Ecosystem Conservation Plan and the Riparian BO. The Base implements the following programmatic instructions and habitat enhancement measures specified in the conservation plan and BO for the protection and management of the species and the estuarine/beach ecosystems:

- keep military and recreational activities within the Santa Margarita Management Zone and other utilized nesting areas to a minimum during the breeding season;
- install and maintain permanent/temporary fencing around nesting areas;
- post signs in strategic locations to deter unauthorized entry;
- enhance nesting areas through vegetation removal/control and sand mobilization;
- conduct predator control;
- prohibit all activities in nesting colonies during the breeding season;
- prohibit all activities involving smoke, pyrotechnics, loud noises, blowing sand, and large groups of personnel (14 or more) within 300 m of nesting areas;

- prohibit all traffic within 15 feet of posted nesting areas during the breeding season;
- restrict aircraft from landing within 300 m of nesting areas; and
- restrict aircraft to 300 feet above ground level or more above nesting areas.

In addition, the Base has instituted measures for avoidance and minimization of impacts to Endangered Species Management Zones to protect California least terns and other species. These measures are specified in Base EOM, which prescribes regulations and general precautions for range and training area users that limit impacts to natural resources. Restrictions specific to the Endangered Species Management Zones that apply to terns are as follows:

- Obtain authorization from ES before entering any lagoon or estuary, marsh, mud/salt flat, or posted nesting area. Bivouacking and digging of fighting positions are prohibited in the vicinity of the Estuarine/Beach Endangered Species Management Zones during the period of 1 March to 15 September.
- Between 1 March and 15 September, all activities involving smoke, pyrotechnics, loud noises, blowing sand, and large groupings of personnel (14 or more) shall remain at least 300 m away from fenced or posted nesting areas. All other activities shall be kept at least 5 m from these areas.
- Foot traffic involving fewer than 14 personnel shall be kept as far away as possible and approach no closer than 5 m to posted nesting areas between 1 March and 15 September. Unit hikes shall remain on the hard packed sand, as close to the ocean water edge as possible. When passing nesting areas, minimize all noise.
- Vehicle and equipment operations in the management zones shall be kept to a minimum between 1 March and 15 September. All vehicles shall travel on hard packed sand and shall not exceed 25 mph (40.2 km/hour). Tracked vehicles shall travel as close to the water (upper few inches of waves) as possible, year-round, in the Santa Margarita Management Zone. Vehicle operations inside fenced areas on the edge of the bluff between Aliso and French Creeks (White Beach) are not authorized between 1 March and 15 September.
- Engineering operations outside of approved landing exercise support shall be coordinated with ES prior to the initiation of activities.
- Boat operations are not authorized in lagoons and estuaries. LCACs shall not enter the management zones between 1 March and 15 September, except when entering or exiting seaward; and on return, shall exit the ocean heading directly up to the facility

access ramp. Small boats may be permitted in the Santa Margarita estuary between 16 September and 1 March, with prior approval from ES.

The Base also conducts annual monitoring of California least tern in accordance with the conservation plan and BO. California least tern surveys are conducted seasonally in fenced nesting areas to characterize the temporal and spatial distribution of nests, pair numbers, and reproductive success of terns on-Base. The results of this monitoring are used to develop adaptive management strategies for California least terns on-Base and are reported annually to USFWS.

The majority of these management and monitoring measures were being implemented on-Base prior to the completion of the conservation plan in 1995 and all have been incorporated in and managed through this INRMP since 2001.

J.9. WESTERN SNOWY PLOVER (*CHARADRIUS NIVOSUS NIVOSUS*)

The western snowy plover is a small shorebird with pale brown to gray upperparts; gray to black legs and bill; and dark patches on the forehead, behind the eyes, and on either side of the upper breast. The Pacific coast population is a distinct population segment of the western snowy plover and is defined as those individuals nesting adjacent to tidal waters of the Pacific Ocean. Pacific coast western snowy plovers typically forage for small invertebrates in open areas consisting of wet or dry beach sand, tide-cast kelp and driftwood, low foredune vegetation, and near water seeps in saltpans.

FIGURE 9. MALE WESTERN SNOWY PLOVER

The breeding season for the western snowy plover extends from 1 March to 15 September. Clutches normally consist of three eggs laid in a shallow depression scarped in the sand by the male. Western snowy plovers tend to nest in relatively higher densities near freshwater or brackish wetlands such as river mouths, estuaries, and tidal marshes.

J.9.1. Status

The western snowy plover is federally listed as threatened, and USFWS has approved a recovery plan for the species (Recovery Plan for the Pacific Coast Population of the Western

Snowy Plover, 2007). Designated critical habitat for the western snowy plover was revised and finalized in 2012. Camp Pendleton was exempted from critical habitat designation under Section 4(a)(3)(B) of the ESA because USFWS determined that conservation efforts identified in the Base INRMP provide a benefit to western snowy plover and its habitat. The snowy plover is also listed as a Bird of Conservation Concern by USFWS and is protected by the MBTA. A full species profile is available at the USFWS ECOS website (https://ecos.fws.gov/ecp/species/8035), which includes all Federal Register publications related to the listing history, Special Rule publications, recovery plan documents, critical habitat designations, and applicable HCPs.

The western snowy plover is state listed as a Species of Special Concern.

J.9.2. Distribution and Occurrence

The western snowy plover breeds on the Pacific coast from southern Washington to southern Baja California, Mexico, and in interior areas of Oregon, California, Nevada, Utah, New Mexico, Colorado, Kansas, Oklahoma, and north-central Texas, as well as coastal areas of Texas, and possibly northeastern Mexico. The Pacific coast population of the species is genetically isolated from western snowy plovers that breed in the interior (Endangered and Threatened Wildlife and Plants, 1993). The Pacific coast breeding population extends from the State of Washington to Baja California, Mexico, with most breeding birds found in California (USFWS 2004a).

The coastal population of the western snowy plover consists of both resident and migratory birds. Some birds winter in the same areas used for breeding, while other birds migrate north or south to wintering areas. Plovers occasionally winter in southern coastal Washington (USFWS 2004a). Wintering plovers occur in widely scattered locations on both coasts of Baja California, and significant numbers have been observed on the mainland coast of Mexico at least as far south as San Blas, Nyarit (USFWS 1993).

Within San Diego County, most snowy plover nests are located on military bases and other federal properties (USFWS 2001). In 1998, 42 percent of all the snowy plovers in San Diego County were breeding on Camp Pendleton (Collier and Terp 2001). On Camp Pendleton, western snowy plover typically occurs in the Santa Margarita River estuary salt flats and along open beaches and dunes from Del Mar Recreation Beach to just north of Aliso Creek. The breeding population of plovers on Camp Pendleton increased steadily from a total of 36 breeding pairs in 1994 to a high of 94 pairs in 2012; however, nest pair estimation methods have varied over the years. In 2014, there were minimally 69 breeding pairs based on counting the maximum active nests at one time during the season. Pair estimations are currently estimated using the maximum number of active nests plus the number of observed broods. In 2021, we detected 123 plover nests and estimated 34 of breeding females, which

is equivalent to the maximum number of simultaneously active nests across all sites. Using the maximum number of simultaneously active nests and broods, we estimated a minimum of 51 breeding males (Wooten et. al. 2021). Camp Pendleton is also an important roosting stie for western snowy plover in the winter. During the 2021 winter window survey conducted on 20 January, 41 plover were detected; this represents the lowest number of wintering plover detected on Base since 2010. However, weekly winter roosting surveys detected an average of 69 individuals in February 2021. Recent banding resighting data demonstrates snowy plover move great distances, and birds banded on Camp Pendleton have been detected along the coast from Baja California to Oregon.

J.9.3. Threats

The decline in the western snowy plover population is attributed to human disturbance, predation, and loss of nesting habitat to encroachment of invasive, nonnative plant species and urban development (USFWS 1993). Beach cleaning activities that remove kelp and rake sand can harm plover foraging success (USFWS 2004). Both clutches and broods may be lost due to predators, tides, storms, and human recreational activities. Examples include both repeated flushings of nesting plovers and direct damage to nests or to young resulting from humans, dogs, horses, or vehicles that either approach plover nests too closely or overrun plovers and nests (USFWS 2004). On Camp Pendleton, the biggest threats are associated with military training activities and sea level rise. In recent years we have noticed more plover nests being washed out by high tides, however, this data needs to be formally analyzed.

J.9.4. Recovery Strategy Goals

The recovery strategy for the Pacific coast population of the western snowy plover is to increase the population across its range; eliminate threats to the species and its habitat; and monitor and refine management actions for the species (USFWS 2007). The recovery plan identifies six recovery units that cover the full range of the Pacific coast population; Camp Pendleton is in Recovery Unit 6 (Los Angeles to San Diego Counties). The recovery criteria for snowy plover include numeric subpopulation targets, reproductive productivity targets, and management actions for each recovery unit.

The first criterion is to maintain the snowy plover Pacific coast population at 3,000 birds, of which 500 breeding adults are to be in Recovery Unit 6. Criterion 2 requires a yearly average productivity of at least one fledged chick per male for a total of 5 years in each recovery unit. Once these are achieved, mechanisms must be developed to ensure the long-term protection and management of the species to maintain the subpopulation sizes and average productivity. (Appendix B of the draft recovery plan identifies three locations on Camp Pendleton: San Onofre Beach, Aliso/French Creek Mouth, and Santa Margarita River estuary).

Within Recovery Unit 6, Camp Pendleton manages identified breeding locations at Aliso/French Creek and Santa Margarita River estuary. The recovery plan identifies population targets for these locations of 40 and 160 breeding adults, respectively. Management measures identified for these locations are the following: (1) prohibit/restrict public access, boats, off-highway vehicles (OHVs), pets, horses, development, and military uses; (2) conduct population monitoring during breeding and/or wintering seasons; (3) conduct predator control; (4) conduct exotic plant control; (5) use exclusionary signs; (6) visually segregate or fence nesting areas; (7) provide public information and education; and (8) enforce protective rules and regulations. Camp Pendleton's management program as described in this INRMP accomplishes all management measures for both locations on-Base.

J.9.5. Management and Monitoring

Guidelines for management and monitoring of western snowy plover and its habitat are provided in the Estuarine and Beach Ecosystem Conservation Plan and the Riparian BO. The Base implements the following programmatic instructions and habitat enhancement measures specified in the conservation plan and BO for the protection and management of the species and the estuarine/beach ecosystems:

- keep military and recreational activities within the Santa Margarita Management Zone and other utilized nesting areas to a minimum during the breeding season;
- install and maintain permanent/temporary fencing around nesting areas;
- post signs in strategic locations to deter unauthorized entry;
- enhance nesting areas through vegetation removal/control, and sand mobilization;
- conduct predator control;
- prohibit all activities in nesting colonies during the breeding season;
- prohibit all activities involving smoke, pyrotechnics, loud noises, blowing sand, and large groups of personnel (14 or more) within 300 m of nesting areas;
- prohibit all traffic within 15 feet of posted nesting areas during the breeding season;
- restrict aircraft from landing within 300 m of nesting areas; and
- restrict aircraft to 300 feet above ground level or more above nesting areas.
- Record the fate of, but do not mark, nests occurring on Training Area Red Beach

The Base has instituted measures for avoidance and minimization of impacts to Endangered Species Management Zones to protect western snowy plover and other species. These measures are specified in Camp Pendleton Base Order P3500.1 (*Range and Training Regulations*), which prescribes regulations and general precautions for range and training

area users that limit impacts to natural resources. Restrictions specific to the Endangered Species Management Zones that apply to snowy plovers are as follows:

- Obtain authorization from ES before entering any lagoon or estuary, marsh, mud/salt flat, or posted nesting area. Bivouacking and digging of fighting positions are prohibited in the vicinity of the Estuarine/Beach Endangered Species Management Zones during the period of 1 March to 15 September.
- Between 1 March and 15 September, all activities involving smoke, pyrotechnics, loud noises, blowing sand, and large groupings of personnel (14 or more) shall remain at least 300 m away from fenced or posted nesting areas. All other activities shall be kept at least 5 m from these areas.
- Foot traffic involving fewer than 14 personnel shall be kept as far away as possible and approach no closer than 5 m to posted nesting areas between 1 March and 15 September. Unit hikes shall remain on the hard packed sand, as close to the ocean water edge as possible. When passing nesting areas, minimize all noise.
- Vehicle and equipment operations in the management zones shall be kept to a minimum between 1 March and 15 September. All vehicles shall travel on hard packed sand and shall not exceed 25 mph (40.2 km/hour). Tracked vehicles shall travel as close to the water (upper few inches of waves) as possible, year-round, in the Santa Margarita Management Zone. Vehicle operations inside fenced areas on the edge of the bluff between Aliso and French Creeks (White Beach) are not authorized between 1 March and 15 September.
- Engineering operations outside of approved landing exercise support shall be coordinated with ES prior to the initiation of activities.
- Boat operations are not authorized in lagoons and estuaries. LCACs shall not enter the management zones between 1 March and 15 September, except when entering or exiting seaward; and on return, shall exit the ocean heading directly up to the facility access ramp. Small boats may be permitted in the Santa Margarita estuary between 16 September and 1 March, with prior approval from ES.

The Base also conducts annual monitoring of western snowy plover in accordance with the conservation plan and BO. Western snowy plover surveys are conducted seasonally along occupied beaches to characterize the temporal and spatial distribution of nests, pair numbers, and reproductive success of plovers on-Base. Breeding activity is closely monitored during these surveys so that when plovers nest outside the traditionally fenced nesting areas, individual nests and any young produced shall be afforded the best possible protection by posting and fencing around the immediate vicinity of the nest(s).

Most of these management and monitoring measures were being implemented on-Base prior to the completion of the conservation plan in 1995 and all have been incorporated in and managed through this INRMP since 2001. In July 2020, The Base received an amended Biological Opinion from USFWS (ADD REF) to address addition impacts from training activities on Red Beach which allowed for training to occur unencumbered on that site. Modification in the BO amendment also included clarification of breeding season to 1 March – 31 August, and provided for more flexibility in monitoring and management activities.

Monitoring results are used to develop adaptive management strategies for western snowy plover on-Base and are reported annually to USFWS.

J.10. LIGHT-FOOTED RIDGWAY'S RAIL (*RALLUS OBSOLETUS LEVIPES*)

The light-footed Ridgway's rail is a hen-sized marsh bird that is long-legged, long-toed, and approximately 14 inches (36 cm) long. It has a slightly down-curved beak and a short, upturned tail. Males and females are identical in plumage with a cinnamon breast contrasting their streaked back plumage of grayish-brown, and barred flanks of gray and white. The chin, throat, and a line from the base of the bill to the top of the eye are very light-buff.

Light-footed Ridgway's rails are omnivorous and opportunistic feeders. Their diet is thought to consist of insects, snails, tadpoles, crayfish, crabs, and California killifish. Preferred marsh vegetation varies from salt marshes heavily dominated by pickleweed (*Salicornia virginica*) to freshwater marshes dominated by cattails (*Typha* spp.) and bulrushes (*Scirpus* spp.) with occasional intermixed willows (*Salix* spp.) (USFWS 1985b). In addition, scattered stands of spiny rush (*Juncus acutus* ssp. *leopoldii*) are critical for rail nest placement (Zembal & Hoffman 2000). The Ridgway's rail breeding season extends from 1 March to 15 September and nests are placed to avoid flooding by tides, yet in dense enough cover to be hidden from predators and to support the relatively large nest.

FIGURE 10. LIGHT-FOOTED RIDGWAY'S RAIL

J.10.1. Status

The light-footed Ridgway's rail is federally listed as endangered. A revised recovery plan for the Ridgway's rail has been approved by

USFWS (USFWS 1985b), but no critical habitat has been designated. This species is also protected by the MBTA. A full species profile is available at the USFWS ECOS website (https://ecos.fws.gov/ecp/species/4240), which includes all Federal Register publications related to the listing history, recovery plans, and applicable HCPs.

The light-footed Ridgway's rail is state listed as endangered and fully protected by CDFW.

J.10.2. Distribution and Occurrence

The light-footed Ridgway's rail is a nonmigratory bird found in coastal freshwater and saltwater marshes in southern California and northern Baja California, Mexico. The light-footed Ridgway's rail is found in only a fraction of the marshes it once occupied. The rail has been absent from Los Angeles County since 1983 and Santa Barbara County since 2004. The majority of light-footed Ridgway's rails, about 60 percent of California's breeding population, reside in the Upper Newport Bay Ecological Reserve in Orange County (USFWS 2009b).

In San Diego County, the light-footed Ridgway's rail numbers only about 100 pairs and is found in the following sites from north to south: Cocklebur Canyon mouth, Santa Margarita River estuary, San Luis Rey River mouth, Guajome Lake Marsh, Buena Vista Lagoon, Agua Hedionda Lagoon, Batiquitos Lagoon, San Elijo Lagoon, San Dieguito River Estuary, Los Peñasquitos Lagoon, Kendall-Frost Marsh (Mission Bay), San Diego River flood-control channel, Famosa Slough, Paradise Creek Marsh, Sweetwater River Estuary (including E Street and F Street marshes), J Street marsh, Otay River mouth, South Bay Marine Biology Study Area, Tijuana River Estuary, and the Dairy Mart ponds (Unitt 2004).

Light-footed Ridgway's rails have been recorded on Camp Pendleton since 1982 when two pairs were detected in the Santa Margarita River estuary, and one pair at the Cocklebur Estuary. Since then, they have been detected in the Santa Margarita River with one or two pair present from 1982 through 1988; and again from 2002 through 2007 (Zembal et al. 2007). In 2008, one pair and a single advertising male were detected within the Santa Margarita River estuary (RECON 2009), and two pairs of light-footed Ridgway's rails were detected on the north side of the Santa Margarita River in 2011. In addition, one adult Ridgway's rail and three chicks were detected in the Santa Margarita River estuary during 2009 predator control activities confirming nesting on-Base. In 2015, Ridgway's rails were detected at two locations on the north and south banks of the Santa Margarita River estuary. Because Ridgway's rails had been detected on the north shore in 2011 and on the south shore in 2013, it is likely that each of these rails nested within the area of detection in 2015 (Harris Environmental Group, Inc. 2015). Since then, one or two Ridgway rails have been detected in the Santa Margaritta River estuary every couple years during protocol surveys.

J.10.3. Threats

The decline of the light-footed Ridgway's rail is attributed to urban development, human disturbance, predation, and a general loss or degradation of feeding and nesting habitat in coastal salt marshes and estuaries (USFWS 2009b). It has also recently become apparent that there is potential for threats to Ridgway's rail habitat from ongoing accelerated climate changes, which was not considered at the time of listing. A risk assessment to evaluate the relative vulnerability or resilience of these birds or their habitat to impacts associated with climate change has not yet been developed. However, this taxon is generally restricted in coastal salt marshes and prefers to nest in the lower marsh areas, much of which is immediately surrounded by urban landscapes with little room to expand if water levels were to rise (USFWS 2009b).

J.10.4. Recovery Strategy Goals

The prime objective of the light-footed Ridgway's rail recovery plan is to increase the breeding population in California to at least 800 pairs by preserving, restoring, and/or creating approximately 10,000 acres (4,000 ha) of adequately protected, suitably managed wetland habitat consisting of at least 50 percent of marsh vegetation suitable for light-footed Ridgway's rail in at least 20 marsh complexes (USFWS 1985b). There are 36 individual areas identified in the recovery plan that are essential to light-footed Ridgway's rail recovery, five of which are identified on Camp Pendleton: San Mateo Creek mouth, Las Pulgas Creek mouth, Las Flores Marsh, Cocklebur Canyon marsh, and the Santa Margarita River lagoon.

The recovery plan identifies management actions for individual habitat areas that need to be initiated or improved to achieve recovery of the species. Management measures identified for Ridgway's rail at San Mateo Creek mouth, Las Pulgas Creek mouth, Las Flores Marsh, and Cocklebur Canyon marsh are to assess the potential to support a population of rails or additional rails, prior to allocating funds to manage and restore these areas. Management measures identified for the Ridgway's rail at the Santa Margarita River lagoon are the following: improve/restore tidal action; create/expand fringing freshwater marsh; create nesting hummocks; create additional salt marsh vegetation with an emphasis on low marsh; enhance pickleweed vigor; improve tidal channel network; control human disturbance; identify and control predators; and develop and implement a program to control or reduce sedimentation.

J.10.5. Management and Monitoring

Current guidelines for management and monitoring of light-footed Ridgway's rail and its habitat are provided in the Estuarine and Beach Ecosystem Conservation Plan and the Riparian BO. The Base implements the following programmatic instructions and habitat

enhancement measures specified in the conservation plan and BO for the protection and management of the species and the estuarine/beach ecosystems:

- keep military and recreational activities within the Santa Margarita Management Zone and other utilized nesting areas to a minimum during the breeding season;
- post signs in strategic locations to deter unauthorized entry;
- conduct invasive, nonnative vegetation control;
- conduct predator control; and
- protect last known nesting location of light-footed Ridgway's rails.

The Base has instituted measures for avoidance and minimization of impacts to Endangered Species Management Zones to protect light-footed Ridgway's rail and other species. These measures are specified in Camp Pendleton Base Order P3500.1 (*Range and Training Regulations*), which prescribes regulations and general precautions for range and training area users that limit impacts to natural resources. Restrictions specific to the Endangered Species Management Zones that apply to rails are as follows:

- Obtain authorization from ES before entering any lagoon or estuary, marsh, mud/salt flat, or posted nesting area. Bivouacking and digging of fighting positions are prohibited in the vicinity of the Estuarine/Beach Endangered Species Management Zones during the period of 1 March to 15 September.
- Between 1 March and 15 September, all activities involving smoke, pyrotechnics, loud noises, blowing sand, and large groupings of personnel (14 or more) shall remain at least 300 m away from fenced or posted nesting areas. All other activities shall be kept at least 5 m from these areas.
- Foot traffic involving fewer than 14 personnel shall be kept as far away as possible, and approach no closer than 5 m to posted nesting areas between 1 March and 15 September. Unit hikes shall remain on the hard packed sand, as close to the ocean water edge as possible. When passing nesting areas, minimize all noise.
- Vehicle and equipment operations in the management zones shall be kept to a minimum between 1 March and 15 September. All vehicles shall travel on hard packed sand and shall not exceed 25 mph. Tracked vehicles shall travel as close to the water (upper few inches of waves) as possible, year-round, in the Santa Margarita Management Zone. Vehicle operations inside fenced areas on the edge of the bluff between Aliso and French Creeks (White Beach) are not authorized between 1 March and 15 September.

- Engineering operations outside of approved landing exercise support shall be coordinated with ES prior to the initiation of activities.
- Boat operations are not authorized in lagoons and estuaries. LCACs shall not enter the management zones between 1 March and 15 September, except when entering or exiting seaward; and on return, shall exit the ocean heading directly up to the facility access ramp. Small boats may be permitted in the Santa Margarita estuary between 16 September and 1 March, with prior approval from ES.

In addition, Camp Pendleton conducts monitoring of light-footed Ridgway's rail every 3 years on-Base. Monitoring efforts include a habitat assessment and playback surveys focused in areas known or most likely to support vegetation communities used by Ridgway's rails to detect presence of this species. The most recent surveys were conducted in 2008 and 2011. Camp Pendleton also continues to grant access to surveyors for statewide Ridgway's rail surveys.

These management and monitoring measures have been implemented on-Base since before the completion of the conservation plan in 1995 and were incorporated in and have been managed through this INRMP since 2001. The results of the light-footed Ridgway's rail monitoring are used to develop adaptive management strategies for light-footed Ridgway's rail on-Base and are reported to USFWS.

J.11. LEAST BELL'S VIREO (*VIREO BELLII PUSILLUS*)

FIGURE 11. LEAST BELL'S VIREO

The least Bell's vireo is a small migratory songbird that is approximately 5 inches (12.7 cm) long with rounded wings, a short straight bill, and faint white eye-rings. Least Bell's vireos are mostly gray in color above and pale below. Least Bell's vireos primarily inhabit low, dense willow-dominated riparian habitats with lush understory vegetation. The least Bell's vireo builds an open-cup nest typically out of pieces of bark, fine grasses, plant down, and mammal hair. The least Bell's vireo breeding season extends from 15 March through 31 August with the peak egg-laying period from May into early June. Average vireo clutch size is three to four eggs, and the incubation period is typically 14 days. Both sexes care for young, which usually fledge 11 to 12 days after hatching (CDFG 1997).

J.11.1. Status

The least Bell's vireo is federally listed as endangered and USFWS has prepared a Draft Recovery Plan for the species (USFWS 1998b). Designated critical habitat for the vireo was revised and finalized in 1994. Camp Pendleton was excluded from this designation based on the finding that an existing Memorandum of Understanding between USFWS and the Marine Corps for vireo management is providing an adequate level of protection to the vireo and its habitat (Endangered and Threatened Wildlife and Plants, 1994). The least Bell's vireo is also a USFWS Bird of Conservation Concern and is protected by the MBTA. Additionally, it is listed as a sensitive species by the Bureau of Land Management (BLM). A full species profile is available at the USFWS ECOS website (https://ecos.fws.gov/ecp/species/5945), which includes all Federal Register publications related to the listing history, recovery plans, critical habitat designations, and applicable HCPs.

Recent genetic sequencing has identified two distinct clades that are separated in the arid southwestern United States, near the border of the Chihuahuan and Sonoran Deserts. A proposed taxonomic change has been made for populations occurring in San Diego County and including CAMP PENDLETON from least Bell's vireo (*Vireo bellii pusillus*) to California least vireo (*Vireo pusillus pusillus*) (Klicka et al. 2016). No formal change has been published in the Federal Register by the USFWS.

The least Bell's vireo is state listed as endangered.

J.11.2. Distribution and Occurrence

The least Bell's vireo has been extirpated from most of its historic range and its current range consists of the southwestern coastline of California below Santa Barbara, extending inland approximately to the edge of the Imperial Valley. The breeding range for this species encompasses greater Los Angeles and other metropolitan areas of southern California. The wintering habitat includes Baja California, Mexico, and the western coastline of northern and central Mexico. In San Diego County, the least Bell's vireo population is concentrated within riparian woodland and scrub habitat along coastal rivers, tributaries, and creeks. Major sites for the least Bell's vireo include the Santa Margarita River, San Luis Rey River, San Dieguito River, San Diego River, Sweetwater River, Windmill and Pilgrim Creeks, and several other smaller drainages throughout San Diego County (Unitt 2004).

On Camp Pendleton, the least Bell's vireo breeds along rivers; creeks; and tributaries of the Santa Margarita River, Cristianitos Creek, San Mateo Creek, San Onofre Creek, Piedra de Lumbre, Las Flores Creek, Aliso Creek, French Creek, De Luz Creek, Fallbrook Creek, Pueblitos Canyon, Windmill Canyon, and Pilgrim Creek. The least Bell's vireo arrives at Camp Pendleton from mid-March to early April and generally migrates to its wintering

ground in late September, although they may begin departing by late July (USFWS 1998b). Stragglers have been noted in October and November, and occasionally individuals overwinter in California (USFWS 1998b).

The Base recorded the largest number of vireo territories in 2009 (n=1013) and 2010 (n=1068) over 15-years of surveys starting in 1995 but decreased in 2011 (n=784) and again in 2012 (n=636). Vireo territories rebounded in 2013 (n=724) followed by another decrease in 2014 (n=634. -12%). The substantial population decrease in 2014 was inconsistent with regional trends in San Diego County that recorded only modest decreases in population, likely a response to wildfires in October 2013 and May 2014 that burned large sections of riparian habitat along the Santa Margarita River, Las Flores Creek, and San Mateo Creek. Vireos that were detected before the 2014 wildfire within its perimeter either perished or were displaced to other locations on Camp Pendleton or adjacent drainages, such as the San Luis Rey River (USGS 2014a). From 2015 through 2019 the number of vireo territories fluctuated from a 21 year low in 2015 to the fifth highest count recorded in 2018 (n=928). In 2020, Camp Pendleton and USGS implemented a reduced vireo survey protocol which included surveying core areas of breeding and a subset (Groups A-E) of all riparian habitat on Camp Pendleton to be completely surveyed on a five-year rotational basis (Lynn et al. 2020). There were 669 vireo territories detected in the core area and an additional 156 territories detected in non-core areas of group A. When extrapolated to the entire Base, the numbers of vireos detected in core areas in 2020 are likely the highest on record (Lynn et al. 2020).

J.11.3. Threats

Formerly common and widespread in California and northwestern Baja California, the least Bell's vireo was reduced to about 300 pairs in the mid-1980s. The rangewide decline was attributed to extensive breeding habitat loss and degradation, and brood parasitism by the brown-headed cowbird (*Molothrus ater*), which continue to be the most serious threats to vireos (USFWS 1998b). Permanent or long-term loss and degradation of breeding habitat and riparian woodlands is primarily due to nonnative invasive plants; watercourse development projects including flood control and water impoundments (dams); and changed hydrology from urban development (USGS 2014a).

The recent fluctuation in the vireo population on Camp Pendleton may be a combination of several threats including wildfire, drought, high floodwaters, and the inherent carrying capacity of the current habitat including breeding, migratory and wintering habitats (Lynn et al. 2021).

In addition, least Bell's vireo is susceptible to predation. A 2000 study (Peterson et al. 2004) of species-specific predators of the least Bell's vireo concluded that coyotes were the most

abundant mammal predators of vireos. Other common predators include other birds (e.g., scrub jays), opossums, snakes, and Argentine ants. Expansion of the Argentine ant population in association with ongoing urban development may constitute a previously unrecognized predation threat to the vireo, but further study is needed to determine their significance (USFWS 2006b).

J.11.4. Recovery Strategy Goals

The Draft Recovery Plan for the Least Bell's Vireo (USFWS 1998b) indicates that stable or increasing least Bell's vireo populations, each consisting of several hundred or more breeding pairs, must be protected and managed at several locations, including the Santa Margarita River, for a period of 5 years before being considered for downlisting. Additional goals for delisting include the reduction and elimination of threats so that the least Bell's vireo populations are capable of persisting without significant human intervention, or perpetual endowments are secured for cowbird trapping and exotic plant control in occupied riparian habitat.

The recovery strategy focuses on addressing the two major causes of least Bell's vireo decline: (1) habitat loss and degradation and (2) brown-headed cowbird nest parasitism. This requires habitat restoration, nonnative vegetation control, continuation of brown-headed cowbird removal, and annual monitoring programs. Management plans must also be developed and implemented for each population. Major threats to be addressed for the Camp Pendleton /Santa Margarita River population include fire and fire prevention, channelization, water management, development, military training activities, groundwater pumping and wastewater treatment, flood/sediment control projects, and exotic species.

J.11.5. Management and Monitoring

The Base has implemented focused and specific management practices for protecting the least Bell's vireo and enhancing its breeding habitat. Current guidelines for management and monitoring of least Bell's vireo and its habitat are provided in the Riparian Ecosystem Conservation Plan and the Riparian BO. Under the conservation plan, Camp Pendleton maintains a minimum baseline of 1,200 acres (486 ha) of riparian habitat and an additional 1,000 acres (405 ha) as a conservation bank. The Base implements the following programmatic instructions and habitat enhancement measures specified in the conservation plan and BO for the protection and management of the species and the riparian ecosystem:

- avoid riparian areas for project and training activities, especially during the breeding season;
- compensate for unavoidable impacts to riparian habitat through invasive, nonnative vegetation control (e.g., giant reed removal);

- restrict movement through riparian areas to existing roads, trails and crossings;
- minimize helicopter use between 0600 and 1100, and restrict helicopters to greater than 200 feet above ground level over riparian areas during the breeding season, except when landing and taking off;
- no bivouacking or trenching is allowed in riparian areas; and
- no engineering, grading or filling activities in riparian areas without prior approval.

The Base has also instituted measures for avoidance and minimization of impacts to least Bell's vireo. These measures are specified in Camp Pendleton Base Order P3500.1 (*Range and Training Regulations*), which prescribes regulations and general precautions for range and training area users that limit impacts to natural resources. Restrictions specific to the least Bell's vireo are as follows:

- Extreme caution beyond that required by the FDRS is necessary when using pyrotechnics; and when conducting other activities likely to cause a fire.
- Foot traffic is authorized year-round on existing roads, trails, and creek crossings. Consult with ES prior to cutting/removing vegetation.
- Vehicles operating in the vicinity of creeks, rivers, or drainages shall use existing roads, trails, and established creek/river crossings.
- Consult with ES prior to bivouacking, cutting/removing vegetation, trenching, grading, filling, or conducting engineering operations in or adjacent to creek/river bottom areas.
- Dust produced in or adjacent to creeks and rivers shall be minimized to the maximum extent practical.

In addition, the Base conducts annual cowbird trapping and removal. This program was first initiated in 1983 with five traps on the Santa Margarita River and has since expanded to a total of 40 traps on all major drainages. Since cowbird control began, the number of vireo locations at Camp Pendleton has increased from 62 to over 1,000 in 1998 (Griffith Wildlife Biology 2000). Additionally, the incidence of nest parasitism dropped from 47 percent in 1982 to no known parasitism observed in 1996. Since then, one documented occurrence of nest parasitism was made in 2016 (Lynn et al. 2016) and two in 2018 (Lynn, et al. 2018). Vireo surveys were conducted seasonally in all major drainages supporting riparian habitat to determine the population and distribution of vireos on-Base, characterize habitat used by vireos, estimate survivorship and movement, and assess the short-term effects of giant reed

removal on vireo fecundity, nest success, and productivity. In 2019 a reduced monitoring plan was implemented with annual surveys for flycatchers in "core" survey areas that consist of historical breeding areas. The other non-historically occupied riparian habitats were divided into 5 "non-core" groups that are surveyed on a rotational schedule every 5 years (Lynn et al. 2021).

In addition to the annual population and distribution monitoring, the Base has either hosted or funded the following U.S. Geological Survey (USGS) research efforts aboard the Base that directly or indirectly benefit the least Bell's vireo: (1) overwinter vireo survivorship using RMark, (2) post-fire response studies conducted from 2008 through 2011 documenting vegetation and vireo responses at Las Flores Creek and Horno fires and another study from 2014-2018 looking at responses to the De Luz and Basilone Complex fires of 2013 and 2014; and (3) artificial seep study as part of the Conjunctive Use Project which includes analysis of differences in vireo survivorship, movements, site fidelity, nest success and breeding productivity between seeps and reference sites along the Santa Margarita River. Differences in vegetation structure and plant composition were also analyzed.

The least Bell's vireo management and monitoring measures contained in the Riparian Ecosystem Conservation Plan have been implemented continuously since its completion in 1995 and were incorporated in and have been managed through this INRMP since 2001. The results of least Bell's vireo monitoring are used to develop adaptive management strategies for least Bell's vireo on-Base and are reported annually to USFWS.

J.12. SOUTHWESTERN WILLOW FLYCATCHER (*EMPIDONAX TRAILLII EXTIMUS*)

The southwestern willow flycatcher is a small, Neotropical migratory songbird that is approximately 5.75 inches (15 cm) long with a grayish green back and wings, whitish throat, light grey-olive breast, and pale yellowish belly. It has two parallel wingbars and a faint or absent eye-ring. The upper mandible is dark and the lower is light with a yellowish tone. The southwestern willow flycatcher breeds in relatively dense stands of riparian trees and other wetlands, including lakes (e.g., reservoirs).

FIGURE 12. SOUTHWESTERN WILLOW FLYCATCHER

The breeding season for the southwestern willow flycatcher extends from 15 March to 31 August. Southwestern willow flycatchers arrive in their breeding grounds typically during late April to early May and nesting occurs from May through July. Average clutch size is three to four eggs, which hatch in 12 days and fledge within 12 to 15 days. Adults usually depart from their breeding territory in mid-August/early September to their wintering grounds in central Mexico and northern South America.

J.12.1. Status

The southwestern willow flycatcher is federally listed as endangered and USFWS has approved a recovery plan for the species (USFWS, 2002). Designated critical habitat for the southwestern willow flycatcher was revised and finalized in 2013. Camp Pendleton was exempted from critical habitat designation under Section 4(a)(3)(B) of the ESA because USFWS determined that conservation efforts identified in the Base INRMP provide a benefit to the flycatcher and riparian habitat. The southwestern willow flycatcher is also protected by the MBTA. A full species profile is available at the USFWS ECOS website (https://ecos.fws.gov/ecp/species/6749), which includes all Federal Register publications related to the listing history, recovery plan documents, critical habitat designations, and applicable HCPs.

J.12.2. Distribution and Occurrence

The breeding range of the southwestern willow flycatcher includes southern California, Arizona, New Mexico, extreme southern portions of Nevada and Utah, far western Texas, perhaps southwestern Colorado, and extreme northwestern Mexico (USFWS, 2002). Between August and September, the southwestern willow flycatcher migrates to the wintering grounds in Mexico, Central America, and possibly northern South America. The flycatcher occurs from near sea level to over 8,500 feet (2,600 m) but is primarily found in lower elevation riparian habitats. Throughout its range, the flycatcher's distribution follows that of its riparian habitat; relatively small, isolated, widely dispersed locales in a vast arid region. Currently, most California southwestern willow flycatcher reside in three sites: Owens River valley in Inyo County, South Fork of the Kern River in Kern County, and the upper San Luis Rey River in San Diego County (Howell et al. 2020). In 2021, 78 territorial flycatchers along with one transient were observed at 4 survey locations in the upper San Luis Rey (Howell and Kus 2022). Other pairs or unmated individuals are scattered in small numbers throughout the county including Camp Pendleton.

Camp Pendleton was historically considered one of the two main colonies in San Diego County, however, the numbers have decreased significantly over the last 15 years. This decline was also documented on the lower San Luis Rey River, which has not had breeding since 2017 after occupancy from 2006-2016 (Allen and Kus 2019). On Base, willow

flycatchers have been found on the following rivers, creeks, and tributaries: Santa Margarita River, Newton Canyon, Hidden Canyon, Cristianitos Creek, San Mateo Creek, San Onofre Creek, Piedra de Lumbre, Las Flores Creek, Aliso Creek, French Creek, De Luz Creek, Fallbrook Creek, Roblar Creek, Windmill Canyon, and Pilgrim Creek. Willow flycatchers may be transient or territorial if detected from May 15th through June 24th. After June 24th any willow flycatcher detection is considered territorial and can be confirmed as a resident southwestern willow flycatcher as all transient willow flycatchers will have already passed through (Sogge et al. 2010). Some of the transient willow flycatchers may be southwestern willow flycatchers and therefore nonbreeding transitory habitat is considered for impacts during project planning.

The resident population of southwestern willow flycatchers on Camp Pendleton has declined 98 percent from 2004, when the population was at a record high of 42 individuals (Howell and Kus 2021). Since 2005 there were several stepwise declines of more than 25 percent until 2017 when no resident flycatchers were detected for the first time since monitoring began. Drought, habitat loss by fire, and changes in habitat composition were likely important factors that influenced the stepwise declines that occurred from 2007 to 2008, 2013 to 2014, 2014 to 2015, 2015 to 2016, and 2016 to 2017 (Howell et al. 2020). There was above average rainfall in 2017 and 2019, but 2018 contributed less than half the average rainfall, sustaining the drought conditions in the area. In 2018 and 2019 several flycatchers that had been detected previously on Camp Pendleton returned but numbers declined again in 2020 and 2021 with a single resident female detected during the 2021 breeding season (Howell and Kus 2021). In 2021, resident flycatchers were detected in the Santa Margarita River and transient flycatchers were detected at De Luz, Fallbrook, Pilgrim, and San Mateo Creeks (Howell and Kus 2021).

The multi-year decline on Camp Pendleton is consistent with a statewide decline of this species in California (Howell et al. 2020). The Base is investigating whether removal of settling ponds and/or implementation of water conveyance improvements that reduce seeps are contributing to decline via loss of access to perennial water through the breeding season.

J.12.3. Threats

Rangewide southwestern willow flycatcher population declines observed in recent years are attributed to human disturbance, nest parasitism by cowbirds, and permanent or long-term loss and degradation of nesting habitat and riparian woodlands (USFWS 2002). Habitat loss and degradation are due to urban, recreational, and agricultural developments, as well as diminished water quality, fires, water projects, livestock grazing, and changes in the riparian plant community caused by invasive, nonnative plant species. In addition, long-term climate trends associated with climate change are expected to have an overall negative effect on the available rangewide habitat for southwestern willow flycatcher.

Habitat loss from multiple fires, changes in habitat composition and extended drought conditions have been damaging to the long-term persistence of the flycatcher on Camp Pendleton (Howell et al. 2020).

J.12.4. Recovery Strategy Goals

The overall recovery objective for the flycatcher is to attain a population level, and the quantity and distribution of habitat sufficient to provide for long-term persistence of metapopulations, even in the face of local losses (e.g., extirpation) (USFWS 2002). Due to the broad geographic range and site variation of the southwestern willow flycatcher, recovery is being approached by dividing the flycatcher's range into six recovery units, which are further divided into management units. This provides a strategy to characterize flycatcher populations, structure recovery goals, and facilitate effective recovery actions that should closely parallel the physical, biological, and logistical realities on the ground. The Coastal California Recovery Unit is composed of four Management Units: Santa Ynez, Santa Clara, Santa Ana, and San Diego; Camp Pendleton is located in the San Diego Management Unit.

Per the recovery plan, the minimum number of southwestern willow flycatcher territories needed in the San Diego Management Unit to achieve downlisting is 125 territories from the 101 current territories. Within this management unit, the recovery plan identifies seven rivers and creeks on Camp Pendleton where efforts should be focused: (1) San Mateo Creek, from San Mateo Road crossing to the Pacific Ocean; (2) San Onofre Creek, from below Camp Horno to the Pacific Ocean; (3) Las Flores Creek, from Basilone Road to the Pacific Ocean; (4) Fallbrook Creek, from the Naval Weapons Station boundary to the Santa Margarita River; (5) Santa Margarita River, from confluence with De Luz Creek to the Pacific Ocean; (6) De Luz Creek, from De Luz Road to the Santa Margarita River; and (7) Pilgrim Creek, from Vandergrift Road to the confluence with the San Luis Rey River.

In addition, the following are recommended actions that have a high potential for increasing habitat suitability and availability that will contribute to recovery: (1) habitat restoration in historic breeding areas that burned, (2) habitat restoration in historically occupied habitats where exotic removal took place, and (3) creating and restoring water sources to historically occupied breeding areas using controlled releases to mimic seasonal flooding (Howell et al. 2020).

J.12.5. Management and Monitoring

Current guidelines for management and monitoring of the flycatcher and its habitat are provided in the Riparian Ecosystem Conservation Plan and the Riparian BO. Under the conservation plan, Camp Pendleton maintains a minimum baseline of 1,200 acres (486 ha) of riparian habitat and an additional 1,000 acres (405 ha) as a conservation bank. The Base

implements the following programmatic instructions and habitat enhancement measures specified in the conservation plan and BO for the protection and management of the species and the riparian ecosystem:

- avoid riparian areas for project and training activities, especially during the breeding season;
- compensate for unavoidable impacts to riparian habitat through invasive, nonnative vegetation control (e.g., giant reed removal);
- restrict movement through riparian areas to existing roads, trails and crossings;
- minimize helicopter use between 0600 and 1100, and restrict helicopters to 200 feet above ground or more above riparian areas during the breeding season;
- no bivouacking or trenching is allowed in riparian areas; and
- no engineering, grading or filling activities in riparian areas without prior approval.

The Base has also instituted measures for avoidance and minimization of impacts to southwestern willow flycatcher. These measures are specified in Camp Pendleton Base Order P3500.1 (*Range and Training Regulations*), which prescribes regulations and general precautions for range and training area users that limit impacts to natural resources. Restrictions specific to the southwestern willow flycatcher are as follows:

- Extreme caution beyond that required by the FDRS is necessary when using pyrotechnics; and when conducting other activities likely to cause a fire.
- Foot traffic is authorized year-round on existing roads, trails, and creek crossings. Consult with ES prior to cutting/removing vegetation.
- Vehicles operating in the vicinity of creeks, rivers, or drainages shall use existing roads, trails, and established creek/river crossings.
- Consult with ES prior to bivouacking, cutting/removing vegetation, trenching, grading, filling, or conducting engineering operations in or adjacent to creek/river bottom areas.
- Dust produced in or adjacent to creeks and rivers shall be minimized to the maximum extent practical.

Additionally, the Base conducts annual cowbird trapping and removal. This program was first initiated in 1983 with five traps on the Santa Margarita River and has since expanded to a total of 40 traps on all major drainages. Since cowbird control began, the incidence of nest parasitism dropped from 47 percent in 1982 to no known parasitism observed since 1996.

The Base also conducts annual monitoring of southwestern willow flycatcher in accordance with the conservation plan and BO. Flycatcher surveys are conducted seasonally from 2004 to 2018 in all major drainages supporting riparian habitat to determine the size and composition of the population on-Base, document survivorship and movement of resident flycatchers, document nesting activity, and characterize habitat used by flycatchers. In 2019 a reduced monitoring plan was implemented with annual surveys for flycatchers in "core" survey areas that consist of historical breeding areas. The other non-historically occupied riparian habitats were divided into 5 "non-core" groups that are surveyed on a rotational schedule every 5 years (Howell et al. 2020).

In addition to the annual monitoring, Camp Pendleton has either hosted or funded the following U.S. Geological Survey (USGS) research efforts aboard the Base that directly or indirectly benefit the southwestern willow flycatcher: (1) flycatcher demographic studies using banded flycatchers; (2) examination of vegetation characteristics at southwestern willow flycatcher nest sites; (3) riparian habitat use by birds with an emphasis on habitat dominated by exotic vegetation; (4) response of southwestern willow flycatcher to removal of exotic vegetation; (5) use of exotic riparian vegetation as nesting substrate; and (6) use of non-listed birds as indicators of suitable southwestern willow flycatcher habitat; (7) conspecific playback experimental study to test the tendency for individual flycatchers to settle near one another; (8) vegetation sampling of used and unused plots in 2001 and 2002 resampled in 2018 and 2019 to determine potential changes in vegetation structure and composition that may have reduced suitability of areas that were historically occupied; and (9) monitoring the seep enhancement project initiated by Environmental Security to augment surface water in historically occupied habitat.

The southwestern willow flycatcher management and monitoring measures contained in the Riparian Ecosystem Conservation Plan have been implemented continuously since its completion in 1995 and were incorporated in and have been managed through this INRMP since 2001. The results of southwestern willow flycatcher monitoring are used to develop adaptive management strategies for southwestern willow flycatcher on-Base and are reported annually to USFWS.

J.13. YELLOW-BILLED CUCKOO (*COCCYZUS AMERICANUS*)

The yellow-billed cuckoo is a medium-sized, slender migratory bird about 12 inches (31 cm) long with white underparts and rust-colored flight feathers. It has a long boldly patterned black and white tail, an elongated down-curved bill that is blue-black on top and yellow on the bottom, and short bluish-gray legs. Adults have a narrow, yellow eye ring. Juveniles resemble adults, except the tail patterning is less distinct, and the lower bill may have little or no yellow. Adults arrive at their breeding grounds in June and July. Nests are most often constructed on overhanging branches of willows or cottonwoods within a stratified canopy. Average clutches contain two to five eggs. The yellow-billed cuckoo has a short incubation and nestling period of 11 to 12 days with fledging occurring 5 to 8 days later. Adults leave their breeding grounds late July to mid-September.

FIGURE 13. YELLOW-BILLED CUCKOO

The yellow-billed cuckoo feeds primarily on large insects, but they will occasionally prey on small frogs and lizards. The cuckoo breeds almost exclusively in large blocks or contiguous areas of low to moderate elevation riparian woodlands, particularly cottonwood-riparian woodlands, within arid to semiarid landscapes (Hughes 1999). Yellow-billed cuckoos are elusive and most easily detected by their distinct "kowlp" call, which is a loud, nonmusical series of notes sounding like "ca-ca-ca-ca-ca-cow-cow-cow" (Halterman 2009). Additional emphasis on identifying and recording yellow-billed cuckoo occurrence in riparian areas was added to the least bell's vireo annual monitoring effort in 2015 following listing.

J.13.1. Status

The western distinct population segment (west of the U.S. Continental Divide) of the yellow-billed cuckoo is federally listed as threatened. The cuckoo is also listed as endangered under the California Endangered Species Act (CESA); listed as a sensitive species by both BLM and the U.S. Forest Service; and protected by the MBTA. A full species profile is available at the USFWS ECOS website (https://ecos.fws.gov/ecp/species/3911), which includes all Federal Register publications related to the listing history, critical habitat designations, and applicable HCPs.

J.13.2. Distribution and Occurrence

The yellow-billed cuckoo is a Neotropical migrant bird that winters in South America and breeds in North America. Cuckoos spend the winter east of the Andes, primarily south of the Amazon Basin in southern Brazil, Paraguay, Uruguay, eastern Bolivia, and northern Argentina (USGS 2008). The breeding range of the western population of cuckoos once extended from northern Mexico to the Canadian border; however, now they only breed in significant numbers in scattered locations where suitable habitat is available throughout California, Arizona, New Mexico, and Texas (Hughes 1999). They are also known or believed to occur in smaller numbers in Colorado, Idaho, Montana, Nevada, Oregon, Utah, Washington, and Wyoming.

In California, the breeding range of the yellow-billed cuckoo once extended through the entire Central Valley, along the southern coast and down to the Mexican border. Breeding cuckoos are now generally restricted to the lower Colorado River, the South Fork of the Kern River, and the Sacramento River, which is believed to be the major population center for the species (Laymon and Halterman 1987). Recent surveys from 2000 through 2012 have also detected cuckoos along the lower Eel River in Humboldt County, which may potentially represent a new breeding site in California. Cuckoos usually arrive in California in June and depart by late August to mid-September (Gaines and Laymon 1984).

In San Diego, the yellow-billed cuckoo is considered a rare and sporadic summer visitor. The only nesting dates reported from San Diego County are of a female with a brood patch collected at Escondido on 30 June 1915, and egg sets collected at Escondido on 3 July 1915 and 2 July 1932 (Unitt 2004). More recently, there have been a series of recorded sightings of one to two birds along the San Luis Rey River in 2011, 2012, 2013, 2015 and 2017 (eBird 2022).

On Camp Pendleton, the yellow-billed cuckoo has been encountered on four occasions since 1980: (1) along the Santa Margarita River at the upper end of Ysidora Basin on 4 and 5 July 1984 (Unitt 2004); (2) again along the Santa Margarita River at the upper end of Ysidora Basin on 7 through 11 July 2000 (Unitt 2004); (3) a carcass was recovered at the mouth of the Santa Margarita River on 25 June 2005 (Davenport, 2012); and (4) yellow-billed cuckoo calls were detected three times during gnatcatcher surveys along the Santa Margarita River at the De Luz Creek confluence on 18 July 2008 (Davenport 2012). Two yellow-billed cuckoo were detected on Camp Pendleton during least Bell's vireo surveys in 2023, however, the data has not yet been finalized and provide to the Base from USGS.

J.13.3. Threats

In California, yellow-billed cuckoos have declined by more than 99 percent from historical levels, and it appears this decline is continuing, especially along the Sacramento River and at isolated sites that previously supported small populations but are now unoccupied. Much of the substantial decline of the western yellow-billed cuckoo has been attributed to riparian habitat loss and degradation (Hughes 1999). Past riparian habitat losses are estimated to be 90 to 99 percent in California.

The main causes of this riparian habitat loss include land clearing for agriculture, flood control projects, surface water diversions and groundwater pumping, overgrazing by livestock, and increased incidence of wildfire. These types of disturbances also promote the establishment of invasive, nonnative plants, particularly giant reed and tamarisk, which reduces the size and quality of available breeding habitat (Rosenberg et al. 1991). The resulting fragmentation effects include the loss of suitable habitat patches large enough to sustain local populations, potentially leading to local extinctions, and the potential fragmentation or loss of migration routes, affecting the ability of the cuckoo to recolonize suitable areas.

Other threats include West Nile virus, which is spreading throughout portions of the western United States and poses a threat to bird species. The USGS National Wildlife Health Center has identified the yellow-billed cuckoo as a species that may be affected by West Nile virus. Predation is also a potential threat to the cuckoo. Falcons, hawks, jays, grackles, and various snake and mammal species have all been documented depredating adult cuckoos and/or their nests (including eggs and nestlings) (Hughes 1999).

J.13.4. Recovery Strategy Goals

Currently there is no federal recovery plan for the yellow billed cuckoo. The USFWS is required to develop and implement a recovery plan under subsection 4(f) of the ESA.

J.13.5. Management and Monitoring

Western yellow-billed cuckoo usually occurs in large, dense tracks of riparian habitat: therefore, management and monitoring should focus on maintaining, restoring, and enhancing large tracts of suitable habitat, including controlling invasive species, such as giant reed and tamarisk (California Partners in Flight 1998). Since the western yellow-billed cuckoo is considered a transient and infrequent visitor and is unlikely to nest on-Base, it is expected that the programmatic instructions and management measures outlined in the Riparian Ecosystem Conservation Plan for the management of riparian habitat are sufficient to protect and manage optimal habitat and provide conservation benefit to this species. The Riparian Ecosystem Conservation Plan will be revised to include coverage for the yellow-

billed cuckoo if, and when, the species is officially listed. Additionally, any occurrences of yellow-billed cuckoo on-Base will be addressed on a case-by-case basis with avoidance and minimization measures implemented as necessary under the Base's MBTA Program.

J.14. COASTAL CALIFORNIA GNATCATCHER (*POLIOPTILA CALIFORNICA CALIFORNICA*)

FIGURE 14. CALIFORNIA GNATCATCHER

The coastal California gnatcatcher is a small, long-tailed bird with dark, blue-gray plumage above and grayish white below. The tail is mostly black above and below. The male has a distinctive black cap, which is absent during the winter. Both sexes have a distinctive white eye-ring. As its common name implies, the gnatcatcher preys upon arthropods, including insects such as leafhoppers and planthoppers, and spiders (USFWS 2003d). The coastal California gnatcatcher is most numerous in low, dense coastal scrub habitat in arid washes, on mesas, and on slopes of coastal hills. California buckwheat, coastal sage, and patches of prickly pear are particularly favored for roosting, nesting, and foraging (CDFG 1997). The gnatcatcher breeding season extends from 15 February through 30 August, with peak nesting activities occurring from mid-March through mid-May.

J.14.1. Status

The California gnatcatcher is federally listed as threatened. There is no recovery plan for this species; however, USFWS has prepared a coastal California gnatcatcher Spotlight Species Action Plan. Designated critical habitat for the gnatcatcher was revised and finalized in 2007. Camp Pendleton was exempted from critical habitat designation under Section 4(a)(3)(B) of the ESA because USFWS determined that conservation efforts identified in the Base INRMP provide a benefit to the gnatcatcher and its habitat (USFWS 2007c). The gnatcatcher is also protected by the MBTA. A full species profile is available at the USFWS ECOS website (https://ecos.fws.gov/ecp/species/8178), which includes all Federal Register publications related to the listing history, Special Rule publications, critical habitat designations, and applicable HCPs.

The coastal California gnatcatcher is state listed as a Species of Special Concern.

J.14.2. Distribution and Occurrence

The coastal California gnatcatcher is a nonmigratory bird with a range restricted to coastal southern California and northwestern Baja California, Mexico. This subspecies is found from Ventura County south to San Diego County and east to San Bernardino County. The coastal California gnatcatcher occurs widely in San Diego County's coastal lowland. The core population areas capable of supporting 30 or more pairs of coastal California gnatcatcher range along the coast from Camp Pendleton south to the Tijuana River mouth, and inland from Rainbow/Pala to the Jamul Mountains (Unitt 2004). Elevation appears to be the main factor limiting gnatcatcher distribution in San Diego County, where over 90 percent of locations are below 1,000 feet (305 m) (Unitt 2004).

On Camp Pendleton, the coastal California gnatcatcher's distribution is primarily within coastal sage scrub habitat in the less steeply sloped areas of the Base with concentrations in the northern (State Park), coastal, and southern inland portions of the Base. Historically, the Base has been conducting coastal California gnatcatcher surveys every 3 to 4 years since 1989. The results of these survey efforts provide evidence that this population is subject to rather dramatic fluctuations in number of coastal California gnatcatcher locations, defined as territorial males, pairs, and family groups: 1989 (436 locations), 1998 (604), 2003 (311), 2006 (668), 2010 (268), 2014 (436), and 2019 (373)To understand these fluctuations and to address logistical difficulties with surveying the entire installation, the Base will adjust its efforts to annual surveys monitoring of core and rotating areas beginning in 2023.

A habitat assessment conducted in 2019 showed that approximately 19,734 acres (7,986 ha) of suitable gnatcatcher habitat occurs on-Base. In 2019, 373 occupied sites were identified, including 24 territorial males and 349 pairs (includes family groups). An additional 369 transient individuals were identified as well but were not recorded as occupied sites that would be considered during project analysis.

Since 2006, several wildfires have altered large expanses of high-quality coastal sage scrub habitat located in areas that typically supported large numbers of gnatcatchers, which may also be a contributing factor. Surveys in 2014 were interrupted mid-season due to large scale fires on-Base, which may also have disrupted nesting and renesting efforts. Despite the loss of suitable habitat, many areas of vacant unoccupied suitable habitat remain, and further investigation is needed to determine why these areas are not being utilized.

J.14.3. Threats

The coastal California gnatcatcher is closely tied to its habitat of coastal sage scrub in the northern portion of its range, and coastal succulent scrub in the southern portion. Although numerous factors were involved in the decline of the coastal California gnatcatcher, habitat

loss and fragmentation resulting in habitat type conversion is the principal reason for the subspecies' current threatened status. The most significant stressor leading to habitat type conversion is wildland fire. Wildland fire allows nonnative grasses to outcompete re-growing native shrubs. This leads to an increase in nonnative grasses, which makes the area more susceptible to wildland fire, and facilitates the process to repeat, but with successively fewer native shrubs with each new fire. The number of wildland fires has increased dramatically as urbanization has come into greater contact with wildland areas.

Implementation of regional Natural Community Conservation Plans (NCCPs)/HCPs has greatly reduced the magnitude of rapid destruction of coastal scrub vegetation by directing development toward certain areas, while preserving core and linkage habitat areas. However, recent wildland fires, including the firestorms of 2003 and 2007, have blackened tens of thousands of acres of gnatcatcher habitat including areas preserved under the regional NCCPs/HCPs. These areas are now at risk of being overrun by nonnative grasses and forbs. Thus, the threat of habitat type conversion has increased throughout San Diego County. Grazing, nest predation, and brood parasitism by brown-headed cowbirds have also adversely impacted the subspecies throughout its range.

J.14.4. Recovery Strategy Goals

Although no recovery plan has been established for the coastal California gnatcatcher, the USFWS Spotlight Species Action Plan provides a goal to increase the size of gnatcatcher populations by improving habitat quality at sites burned since 2003. Proposed actions include selecting sites for habitat restoration and initiating restoration work at these sites.

J.14.5. Management and Monitoring

The U.S. Marine Corps is currently in consultation with USFWS regarding programmatic basewide management of upland habitats including areas of the gnatcatcher's preferred habitat of coastal sage scrub. Until consultation is complete, and a BO is issued, the gnatcatcher benefits from basewide management practices such as invasive, nonnative vegetation control; cowbird trapping; and coastal sage scrub habitat restoration.

Since this species was listed, the Base has instituted measures for avoidance and minimization of impacts to the gnatcatcher and its preferred habitat. The USFWS Survey Guidelines for CAGN designate the breeding season as February 15 through August 30, with the peak nesting activity occurring from mid-March through mid-May. After a 14-day incubation period, fledglings are attended by parents for three to four weeks. The following conservation measures are observed on Base:

- Extreme caution beyond that required by the FDRS is necessary when using pyrotechnics and when conducting other activities likely to cause a fire.

- Foot traffic between 15 February and 30 August shall be kept to existing roads, trails, and established facilities to the maximum extent possible. Foot traffic may be authorized in California gnatcatcher habitat areas between 31 August and 14 February; however, care must be exercised to avoid crushing or otherwise destroying brush vegetation.

- Bivouac/command and post/field support activities shall be kept at least 50 m from gnatcatcher habitat areas, year-round.

In addition, the Base has been conducting coastal California gnatcatcher surveys since 1989, basewide approximately every 3 to 4 years and will in 2023 begin annual surveys of core and rotating areas. This survey effort provides necessary data for gnatcatcher and coastal sage scrub habitat management. The objectives of these surveys are to conduct habitat assessments to identify suitable areas of gnatcatcher occupation; conduct presence/absence surveys and record gnatcatcher locations and breeding status; and monitor 50 randomly selected pairs distributed across multiple survey sites to determine nest success and estimate annual productivity.

J.15. PACIFIC POCKET MOUSE (*PEROGNATHUS LONGIMEMBRIS PACIFICUS*)

The Pacific pocket mouse, a subspecies of the little pocket mouse, is a solitary nocturnal burrowing mouse approximately 5 inches (12.7 cm) long from nose to tip of the tail. It specializes in harvesting and caching seeds for food reserves. Their coat is silky (spineless and bristle-free), and is predominately brown, pinkish-buff above and light brown, pale tawny, buff, or whitish below. Their ears are tipped with a patch of light hairs, the tail is distinctly or indistinctly bicolored, and the soles of the hind feet are hairy.

The species can be found in hibernation ranging from September to April. Instead of utilizing a fat reserve for sustenance, during hibernation periods they display limited daily activity within their burrows feeding upon seed caches. Periods of dormancy have been found to not have a strictly daily or seasonal pattern, and they may be active during winter months outside of their burrows if seed production is high. The pocket mouse will become torpid if deprived of food for 24 to 36 hours and hibernate with a body temperature that fluctuates just above

ambient air temperature. They typically emerge from hibernation in spring (usually March) once seed availability is prevalent again (USFWS 1998c).

FIGURE 15. PACIFIC POCKET MOUSE

Breeding typically occurs from April through July (USFWS 1998c). Gestation typically lasts 23 days, and young are weaned after 30 days. Sexual maturity is reached within 41 days, and under favorable conditions breeding can occur within their natal year (USFWS 2010b). It is speculated that the pocket mouse has a lifespan of 3 to 6 years (USFWS 1998c).

J.15.1. Status

The Pacific pocket mouse is federally listed as an endangered species. A revised recovery plan for the Pacific pocket mouse has been approved by USFWS (USFWS 1998c), but no critical habitat has been designated. A full species profile is available at the USFWS ECOS website (https://ecos.fws.gov/ecp/species/8080), which includes all Federal Register publications related to the listing history, recovery plans, and applicable HCPs.

The Pacific pocket mouse is state listed as a Species of Special Concern.

J.15.2. Distribution and Occurrence

Recent taxonomic research of the little pocket mouse, using cranial geomorphometric shape parameters and dorsal color variables, identified 6 regional groups of populations restricted to southern California and adjacent to northern Baja California (Patton and Fisher 2023). Historically, the Pacific pocket mouse had a rare and patchy distribution along coastal southern California. Most records occurred within approximately 2.5 miles (4.0 km) of the coast from Marina Del Rey and El Segundo in Los Angeles County, south to the vicinity of the Mexican border in San Diego County. Currently, the only self-viable populations of this species occur in three locations: the Dana Point Headlands (Orange County), and two locations on Camp Pendleton. Patton and Fisher's research will reclassify the populations at these locations as *Pacificus longimembris cantwelli* along with an extirpated population on Camp Pendleton.

The Pacific pocket mouse has been detected on-Base in the following three areas: the Oscar One and Edson Range Training Areas (Santa Margarita population), east of the San Onofre housing area (South San Mateo population), and, historically, in the northwest corner of the Base between the Base boundary with the City of San Clemente and Cristianitos Road (North San Mateo population). Since 2012, the Base has enlisted USGS to implement the Pacific pocket mouse monitoring program across all three population sites within the Base to track trends in overall occupancy, breeding phenology, habitat utilization, and to identify results criteria for management action. The results show that the cover and diversity of forbs are the most highly correlated predictors of Pacific pocket mouse-occupied habitat across all population sites. In addition, increased forb cover was the most significant predictor of Pacific pocket mouse colonizing previously unoccupied plots from 2012 through 2013 (USGS 2014c). Sandy soils were found not to be a predictor of Pacific pocket mouse-occupied habitat; sandy soils are associated with forb-dominated vegetation communities and therefore are likely indirectly associated with Pacific pocket mouse occupancy (USGS 2014c). The study also showed a strong negative response of Pacific pocket mouse to high nonnative grass cover (USGS 2014c).

Pacific pocket mouse was regularly documented within open sandy areas of the North San Mateo area from 1995 through 2003. Although numerous and extensive surveys and monitoring efforts have been conducted after this time, Pacific pocket mouse has not been detected at this site since 2003. Therefore, it is assumed that the Pacific pocket mouse has been extirpated from the North San Mateo population area due to recreation, urban edge effects, vegetation succession, and invasion of Argentine ants.

J.15.3. Threats

All four known Pacific pocket mouse populations are threatened by habitat fragmentation and small size. Other primary threats to these isolated populations include habitat loss and degradation from development, military training activities, fire, and predation from a suite of potential predators. Since the listing of the species, climate change and Argentine ants have also been recognized as potential threats (USFWS 2010b).

Specifically, heavy use of the San Onofre State Beach area by the adjoining residential community, and unauthorized trail creation and habitat disturbances are degrading the habitat quality of the North San Mateo population. The Oscar One/Edson and South San Mateo populations are in active military training areas and ongoing military training activities impact habitat quality through increased foot and vehicle traffic, removal or reduction of vegetation, and soil compaction.

Light military training and movements (as well as biologists) are detrimental to Pacific pocket mouse (USGS 2014c). It is expected that this is much more of a problem for Pacific

pocket mouse occupying sandy soils rather than those in the harder clay soils as burrows could be easily crushed.

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

J.15.4. Recovery Strategy Goals

The immediate recovery goal for the Pacific pocket mouse is to avert the extinction of the Pacific pocket mouse by focusing on short-term strategies to improve the subspecies' prospects for survival (USFWS 1998c). The recovery strategy for the Pacific pocket mouse consists of two components. The first is to stabilize the existing populations by protecting currently occupied habitat as well as searching for additional populations and providing protection to any that are found. The second component is to establish additional populations through (1) natural colonization/recolonization into nearby and adjacent habitats, coupled with habitat management in these areas; and (2) translocation and/or the release of captive-bred individuals into known suitable habitat (USFWS 1998c).

USFWS may consider downlisting the Pacific pocket mouse to threatened when 10 populations are independently viable and suitable or increasing, and their habitats are secure and fully protected. Populations of the Pacific pocket mouse shall be considered viable if (1) the appropriate analysis of measured population parameters indicates that each population has a 95 percent or greater chance of surviving for 100 years; (2) occupied habitat consists of a minimum of 4,940 acres (2,000 ha) that are secure and fully protected; (3) all populations are managed through a program to maintain genetic diversity for future generations; and (4) all populations and essential habitat are managed, so that current and potential threats are eliminated or minimized to the extent that each population is not at risk of extirpation.

Second, delisting will be considered if and when (1) all actions necessary for reclassification to threatened have been implemented; (2) any necessary protection, restoration, and enhancement activities (on all sites that have been determined essential to the recovery of the subspecies) are successfully completed; and (3) populations of the Pacific pocket mouse are representative of the full (existing) genetic variability and historical geographical range of the subspecies and occur in habitats that collectively represent the full range of parameters

observed and described in the past or during prescribed, future research, and monitoring events.

Camp Pendleton implements many of the proposed recovery actions identified in the recovery plan including, but not limited to, the following: conduct surveys to locate unknown populations and identify prospective habitat; monitor population trends and identify potential threats and management needs; develop an adaptive management plan for Camp Pendleton; protect occupied habitat from fire and fire abatement measures; control exotic plants; and support efforts to establish new populations at locations on and off Base.

J.15.5. Management and Monitoring

The Pacific pocket mouse benefits from protections listed in *Informal Section 7 Consultation for Exotic Invasive Plant Species Control Program in Upland Habitats* (USFWS 2013b) and other current basewide management practices such as invasive, nonnative vegetation control; exotic animal/predator control (free roaming cats); use of native seed stock when conducting post-fire reseeding to enhance habitat; resource conservation awareness and education programs; and the terms and conditions of the consultation and BO for the construction, operation, and maintenance of the Crucible Challenge Course in the Oscar One and Edson Range areas of the Base that was issued on 14 August 1996 (USFWS 1996).

The BO for the Crucible Challenge Course required course elements to be located where the Pacific pocket mouse was determined to be absent or where current habitat conditions (extremely grassy or compacted areas) were likely to support few to no mice. All elements were constructed to ensure that movement of the species throughout the area is not restricted in any significant manner. Construction, operation, and maintenance are restricted to existing roads and personnel are to avoid parking vehicles on roadside berms in the vicinity of Pacific pocket mouse-occupied habitat. The Base implemented a monitoring and adaptive management program that assesses the net effect of the Crucible Challenge Course with the goal of long-term maintenance of the Pacific pocket mouse population in the Oscar One and Edson Range areas (USFWS 1996).

Since this species was listed, the Base has instituted measures for avoidance and minimization of impacts to the Pacific pocket mouse and its habitat. These measures are specified in the Base EOM, which prescribes regulations and general precautions for range and training area users that limit impacts to this species by restricting activities in and adjacent to pocket mouse-occupied habitat. Restrictions specific to the Pacific pocket mouse are as follows:

- Foot traffic is authorized year-round; however, digging, including construction of fighting positions, shall be avoided.

- Vehicle/equipment operations near known habitat shall be kept on existing roads year-round. Contact ES prior to conducting activities involving soil excavation, filling, or grading.
- Bivouac/command and post/field support activities shall be kept at least 50 m from Pacific pocket mouse habitat areas year-round.

In 2007, Camp Pendleton contracted with (USGS to develop a scientifically valid, effective, and cost-effective monitoring program for the Pacific pocket mouse that would document trends in the population status and identify adaptive management needs. USGS, Camp Pendleton, and a scientific review panel held a workshop in which many independent and agency scientists, consultants, and land managers provided input to help develop short-term studies and long-term goals. In preparation for developing a comprehensive long-term monitoring plan, several preliminary pilot studies were conducted from 2008 through 2010.

The 2008 study assessed the status of the north and south San Mateo populations, compared probabilities of capture and detection with live-trapping, and defined important habitat covariates associated with pocket mouse occurrence (Brehme and Fisher 2009). The 2009 study assessed and compared both active and passive sampling methodologies (e.g., live-traps, tracking tubes, canine scent detection) (Brehme et al. 2010). In 2010, all potential pocket mouse habitat on-Base was surveyed using canine scent detection to discover new populations and define sampling boundaries for the three Pacific pocket mouse populations.

In 2011, in collaboration with the scientific panel, a relatively simple, multi-scaled, habitat-based, adaptive monitoring program for Pacific pocket mouse was designed (Brehme et al. 2011). This program tracks trends in overall occupancy of Pacific pocket mouse on-Base, as well as within each of the three populations on-Base and includes a relative density index. Due to contract delays, the protocol for 2011 was reduced to tracking tube monitoring of core plots only. The primary purpose of the 2011 study was to generate phenological data for 2011 (time of torpor) and to identify and correct any issues with sampling prior to the implementation of the full program in 2012 (Brehme et al. 2011).

In addition, the terms and conditions of the consultation and BO for the construction, operation, and maintenance of the Crucible Challenge Course in the Oscar One and Edson Range areas of Camp Pendleton, issued on 14 August 1996, provide monitoring and adaptive management for the Pacific pocket mouse population. The Base is also partnering with Conservation and Research for Endangered Species and USFWS to sponsor a captive breeding program for the eventual establishment of another off-Base population. The Base is also currently conducting a PPM lighting study to better assess anthropogenic disturbances during the project review process. The Base completed a Pacific Pocket Mouse Management

Plan in 2015 and has since funded several projects aimed at increasing, improving, and restoring PPM habitat based on guidelines provided by USGS and their many years of annual monitoring data. Results of vegetation management have had positive results thus far.

In 2018, the Base conducted a Translocation Feasibility Study that identified 3 potential translocation sites for future PPM populations and in 2023 the Base will begin consultations with USFWS for the collaborative effort to translocate PPM to 2 locations within the Base property. The project is expected to begin in 2024 with SDZWA introducing a captive population of PPM to the Wire Mountain Site, which was identified in the 2018 Translocation Feasibility Study, and with USGS to reintroduce wild-caught PPM to North San Mateo.

J.16. STEPHENS' KANGAROO RAT (*DIPODOMYS STEPHENSI*)

The Stephens' kangaroo rat is a small, burrow-dwelling rodent. Like other kangaroo rats, it has a large head, external fur-lined cheek pouches used for transporting seeds to safe caches, elongated rear legs used for hopping, and relatively small front legs. The dexterous front paws are frequently used to hold seeds that the animal eats. There are five toes on each of the hind paws, and the crested tail is 1.45 times the length of the head and body. They prefer open habitat on gentle slopes for efficient movement and foraging. The average adult is 11 to 12 inches (27.9 to 30.5 cm) in length and weighs 2.3 ounces (67 grams) (Bleich 1977). This species is nocturnal, spending the day in underground burrows and foraging on the surface at night.

FIGURE 16. STEPHENS' KANGAROO RAT

Adults are solitary, strongly territorial (one adult per burrow) and characterized by a promiscuous mating system establishing no persistent pair bonds. Reproductive individuals have been observed year-round, although onset of estrus in females appears to be triggered by the onset of winter rains and ceases after plants disperse seeds. Average gestation period is 30 days, and the average number of young per litter is 2.5. The young are then weaned from the nest between 18 and 22 days after birth. In prosperous years, females born in the spring may reproduce their first year (USFWS 1997).

In 1996, Tetra Tech, Inc. estimated that there were approximately 684 acres (277 ha) of occupied Stephens' kangaroo rat habitat on-Base that were roughly grouped into three "core

population areas," which are referred to as the western, central, and eastern core population areas (USFWS 2011a).

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

Within the SKR Monitoring Area in Fall/Winter 2020/21, SKR occupied an estimated 192.8 ha which was slightly higher than what was reported for 2019/20. Long term results indicate the amount of habitat occupied by SKR steadily increased from a low estimate of only 60 ha in 2005/6 to 248 ha in 2016/17 and remains within historical average. SKR density estimates in occupied areas (4.1 SKR per 0.25 ha) were higher than 2019/20 (2.5), however, estimates continue to fall below in historic values (average 5.1 SKR per 0.25 ha) (USGS 2022).

J.16.1. Status

The Stephens' kangaroo rat is federally listed as a threatened species, downlisted from endangered in 2022. A Draft Recovery Plan for the Stephens' Kangaroo Rat was prepared by USFWS (USFWS 1997), but no critical habitat has been designated. A full species profile is available at the USFWS ECOS website (https://ecos.fws.gov/ecp/species/3495), which includes all Federal Register publications related to the listing history, recovery plan documents, and applicable HCPs.

The Stephens' kangaroo rat is state listed as a threatened species.

J.16.2. Distribution and Occurrence

The geographic distribution of the Stephens' kangaroo rat includes the San Jacinto Valley and adjacent areas of western Riverside, southwestern San Bernardino, and northwestern San Diego Counties (USFWS 1997). The species is distributed across a range of approximately 1,108 square miles (2,869.7 square km), in numerous small, fragmented populations, where suitable habitat remains (USFWS 1997). Stephens' kangaroo rat is frequently found in close association with dirt roads, previously and currently disturbed areas, and/or other sites with a high percentage of bare ground (USFWS 1997). Occupied habitats are usually sparse, slightly disturbed coastal sage scrub or annual grassland on level or low-rolling terrain.

Stephens' kangaroo rat is found from approximately 180 to 4,100 feet (55 to 1,250 m) above sea level with most populations occurring below 2,000 feet (610 m). It is not found on extremely hard or sandy soils; gravel is a common component of soils where the animal is found (USFWS 1997).

Stephens' kangaroo rat occurs at scattered localities on Camp Pendleton. Historically, this species has been found in the following areas: Juliet, Kilo 1, Kilo 2, Range 116, Range 407-1, Range 407-2, Range 408-1, and Range 409-1.

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

Per the numerous BOs for the management of the Stephens' kangaroo rat bank, the Base is to maintain the management area by prescribed burning. In reviewing the monitoring studies by Dr. Stephen Montgomery, going back to 1998, the habitat became overgrown and mostly consisted of thatch from native and nonnative grasses and weeds until the base started actively managing vegetation in 2007 (Petersen 2015). The Base had been out of compliance on the maintenance of the habitat since approximately 2000. There was a burn in 1998 that kept the habitat clear until the rains arrived in 1999.

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

The Base conducts Basewide annual monitoring for Stephens' kangaroo rat using a two-phase (habitat assessment and live-trapping) monitoring program. The monitoring protocol was revised in 2012 to remove low-quality habitat based on the previous year's results. In addition, the Base EOM prescribes regulations and general precautions that limit impacts to

this species by limiting activities in and adjacent to Stephens' kangaroo rat-occupied habitat. The Base is actively reviewing how it can minimize impacts to this species from its operations and training activities. The Base completed a Stephens' Kangaroo Rat Management Plan in 2015.

J.16.3. Threats

Agriculture and urban development have greatly reduced and fragmented the amount of habitat available for Stephens' kangaroo rat. As a result, the species is more susceptible to the effects of grazing, off-road vehicle activity, rodenticide use, decreased genetic diversity, domestic cat predation, and the potential impacts associated with climate change. Additional threats identified since listing include impacts from nonnative plant species and climate change (USFWS 2011b)

J.16.4. Recovery Strategy Goals

The recovery strategy for the Stephens' kangaroo rat focuses on the establishment of reserves to preserve and protect significant populations; protection of conserved populations and their habitat; elimination/minimization of unnatural mortality factors; and development and implementation of an outreach program (USFWS 1997). Plan requirements for the species have been divided between the Western Riverside County and the San Diego County conservation planning regions. The San Diego County Conservation Planning Region is subdivided into two conservation planning areas: the Western San Diego County Management Area and the Central San Diego Management Area. Camp Pendleton is in the Western San Diego County Management Area. The Camp Pendleton Stephens' kangaroo rat population is identified in the recovery plan as essential to the recovery of the species because it is large and not isolated from the surrounding biological community, and it represents the most southern distribution of the species. ES Uplands staff participated in the working group that developed the Rangewide SKR Management and Monitoring Plan (Spencer et al., 2021) and the updated Rangewide SKR Monitoring Plan (Spencer et al., 2022). Uplands staff continues to collaborate with the partners that have begun implementing that plan.

J.16.5. Management and Monitoring

The Stephens' kangaroo rat benefits from Informal Section 7 Consultation for Exotic Invasive Plant Species Control Program in Upland Habitats (USFWS 2013b) and other current basewide management practices such as invasive, nonnative vegetation control; exotic animal/predator control; use of native seed stock when conducting post-fire reseeding to enhance habitat; resource conservation awareness; and education programs.

The Base has instituted measures for avoidance and minimization of impacts to the Stephens' kangaroo rat and its habitat. These measures are specified in the Base EOM, which prescribes

regulations and general precautions for range and training area users that limit impacts to this species by restricting activities in and adjacent to occupied habitat. Restrictions specific to the Stephens' kangaroo rat are as follows:

- Foot traffic is authorized year-round; however, digging, including construction of fighting positions, shall be minimized.
- Vehicle/equipment operations near known habitat shall be kept on existing roads, year-round. Contact ES prior to conducting activities involving soil excavation, filling, or grading.
- Bivouac/command and post/field support activities shall be kept at least 50 m from Stephens' kangaroo rat habitat areas, year-round.

The Base also maintains a 34-acre Stephens' kangaroo rat management area, established in 1992 to mitigate for impacts to kangaroo rat habitat associated with development activities on-Base. The established management area is in the north-central portion of the Juliet Training Area adjacent to the boundary of Camp Pendleton and the Fallbrook Naval Weapons Station. This site was chosen based on its history of supporting Stephens' kangaroo rat; however, trapping studies indicate the population declined and may have extirpated by 2008. The management area is maintained through prescribed burns, mechanical and chemical vegetation management, and artificial burrow installations. In 2011, a population of Stephens' kangaroo rat was translocated from the 25 Area Combat Town construction site into the management area. The translocated populations are monitored several times a year.

Additionally, Camp Pendleton conducts annual monitoring for Stephens' kangaroo rat. In conjunction with USGS, Camp Pendleton developed a habitat-based, adaptive monitoring protocol in 2004 that is designed to track yearly trends in total area occupied by Stephens' kangaroo rat on-Base. A two-phased approach is utilized for sampling. The first phase involves a complete search for any potential kangaroo rat sign and measurement of habitat and environmental variables. If any potential sign is observed, 2 to 4 days of live-trapping is conducted for the second phase. Live-trapping is necessary to determine if plots are occupied by the Stephens' kangaroo rat and/or the Dulzura kangaroo rat (*D. simulans*) (USGS 2010). The first use of the protocol was in 2005 and the program was revised in 2011. The results of this monitoring are used to develop adaptive management strategies for Stephens' kangaroo rat on-Base and are reported annually to USFWS.

Federally Listed Plant Species

Species accounts for the five federally listed threatened or endangered plant species known to occur on the Base are provided below. For further species information, please refer to the USFWS' Environmental Conservation Online System available at https://ecos.fws.gov/ecp/. In the below discussion, populations for vernal pool endemic species (San Diego button-celery, spreading navarretia, and California Orcutt grass) are per occupied vernal pool, and populations for upland species (thread-leaved brodiaea and Encinitas baccharis) are per the 7-meter mapping rule. For example, all thread-leaved brodiaea plants that are within 7 meters of each other would be considered one population. This definition of population was developed by the Base and represents a method to define boundaries of groupings of individuals and is not necessarily a biological distinction. An occurrence are all plants of the same species that are within a quarter mile of each other. This definition of occurrence is the same as the California Natural Diversity Database's (CNDDB) definition of Element Occurrence.

J.17. SAN DIEGO BUTTON-CELERY (*ERYNGIUM ARISTULATUM* VAR. *PARISHII*)

San Diego button-celery is a perennial herb endemic to vernal pool habitats that has a persistent taproot and is a member of the Carrot family (Apiaceae). The plant has a spreading to erect habit, reaching a height of 40.6 cm or more. The stems and toothed leaves are gray green with spinose lobes, giving it a prickly appearance. Inflorescences develop from April through June on short peduncles (stalks) with few to many greenish flower-heads varying in length from 0.06 to 0.11 inch (1.7 to 2.8 mm) (ZipcodeZoo 2009).

FIGURE 17. SAN DIEGO BUTTON-CELERY

J.17.1. Status

San Diego button-celery was listed as state endangered in July 1979 (CDFW 2023), and federally endangered on 3 August 1993 (USFWS 1993). Critical habitat has not been proposed for this species, but San Diego button-celery is included in the approved recovery plan for the listed species of southern California vernal pools (USFWS 1998a). A full species profile is available at the USFWS ECOS website (https://ecos.fws.gov/ecp/species/5937), which includes all Federal Register publications related to the listing history, recovery plan documents, and applicable HCPs.

J.17.2. Distribution and Occurrence

San Diego button-celery ranges from as far north as Fairview Park in Orange County south to Lagunas Invernales in Baja California, Mexico. In the United States, San Diego button-celery has been detected in Los Angeles, Orange, Riverside, and San Diego counties. The Los Angeles County occurrence is believed to be extirpated. In San Diego County, San Diego button-celery has been detected in vernal pools on Del Mar Mesa, Mira Mesa, Kearny Mesa, MCAS Miramar, Camp Pendleton, and at sites within the Cities of Tierrasanta, San Marcos, Carlsbad, and Ramona; it was extirpated from a site in the City of La Jolla. The species is also found in the southern portion of San Diego County on Otay Mesa, near the Lower Otay Reservoir and in Proctor Valley. It also was found near the Tijuana Airport but is believed to be extirpated at this locale. There are no known herbarium collections of the species from the San Diego Mesa (e.g., Normal Heights and San Diego State University). Of the total point localities, 70 percent occur within the preserve planning area of the Multiple Species Conservation Program. In 1979, San Diego button-celery was known from 65 pool groups; by 1986, this species remained in 61 pool groups (USFWS 1993).

On Camp Pendleton, San Diego button-celery has been found in a total of 94 vernal pools within 6 occurrences with 1,398,713 individuals and occupying 1.8 acres. The known locations of San Diego button-celery on-Base are a compilation of multiple survey efforts over many years. San Diego button-celery occurs on the Base at 21 Area-Del Mar (10 occupied pools), November Training Area (four occupied pools), White Beach Training Area (two occupied pools), and Wire Mountain (80 occupied pools). The number of known occupied pools on the Base has increased over the years from one occupied pool detected in the 1980s, to an additional 54 pools in the 1990s, 11 additional pools in the 2000s, 18 additional pools in the 2010s, and 12 additional occupied pools in the 2020s.

J.17.3. Threats

San Diego button-celery, as with other vernal pool specific species, is threatened by the loss of habitat. In general, vernal pool habitat in San Diego County has declined approximately 97 percent (from ~23,859 ha to ~838 ha) since the early 1900s. Most of the remaining vernal pools, particularly in San Diego County, face the following increasing threats identified by USFWS: urban development, agricultural and roadway development, off-road vehicular activity, trampling by people and livestock, military activities, and watershed (drainage) alteration.

Per the USFWS 5-Year Review of San Diego button-celery (USFWS 2010a), loss and modification of vernal pool habitat continue to impact San Diego button-celery. Acquisition of land and conservation easements have preserved vernal pool habitat, but some loss of vernal pool habitat has continued to date. Threats associated with OHVs continue throughout

the range of the species, including on preserved and conserved lands. Threats related to mowing and trampling associated with humans and cattle have been reduced. Road construction in urbanized southern California will likely continue to pose some level of threat to vernal pool habitat. Watershed alterations near vernal pool habitat have caused changes in the hydrological structure and function of some vernal pool habitat. While still a threat throughout the range of the species, impacts of hydrological alterations have decreased in some areas due to development standards that control runoff and water use. Although military activities have continued to impact habitat occupied by San Diego button-celery, much vernal pool habitat has been restored through cooperation with MCAS Miramar and Camp Pendleton via provisions in their INRMPs.

Predation was not identified as a threat at listing, but insect herbivory of San Diego button-celery was later considered a disturbance concern in the recovery plan and remains a potential threat to the taxon. Insect herbivory can have considerable effects on plant population dynamics, including damage to roots, leaves, flowers, and developing seeds, which ultimately reduces living plant fitness and reproductive success in the presence of native and nonnative competitors.

According to USFWS, rangewide threats remain for the species and, absent the protections of the ESA, the existing regulatory mechanisms (i.e., California Endangered Species Act, Native Plant Protection Act, California Environmental Quality Act, California Porter-Cologne Act, Natural Community Conservation Planning, National Environmental Policy Act, and Clean Water Act) do not provide adequate regulatory protections to provide for the long-term persistence of San Diego button-celery.

Threats identified since listing include small population size, loss of pollinators, and climate change. Wildfires pose the largest single stochastic/single event risk to the remaining concentrations of San Diego button-celery in southern California.

J.17.4. Recovery Strategy Goals

The recovery strategy for the San Diego button-celery is to conserve and enhance southern California vernal pool ecosystems, with specific emphasis on stabilizing and protecting existing populations of Riverside fairy shrimp, San Diego fairy shrimp, San Diego button-celery, San Diego mesa mint, Otay mesa mint, and California Orcutt grass, so that these species may be reclassified from endangered to threatened status.

The Vernal Pools of Southern California Recovery Plan (USFWS 1998a) identifies eight locations on the Base that have vernal pool complexes and the plan includes these pools within the San Diego North Coastal Management Area. Six of these locations were identified in the plan as necessary to stabilize the species: Cocklebur, Las Pulgas, San Mateo, State

Park Lease, Stuart Mesa, and Wire Mountain. The remaining two locations, Basilone and O'Neill, were deemed necessary to reclassify the species to threatened status. As stated in the plan, San Diego button-celery has not been detected within all eight locations. This plan lists the following steps necessary for reclassification to threatened status: (1) remaining vernal pools and their associated watersheds must be secured in a configuration that maintains habitat function and species viability; (2) secured vernal pools are enhanced or restored such that population levels of existing species are stabilized or increased; (3) population trends must be shown to be stable or increasing for a minimum of 10 consecutive years prior to consideration for reclassification; and (4) monitoring should continue for a period of at least 10 years following reclassification to ensure population stability. Delisting of San Diego button-celery is conditional on the above four steps, plus an additional three steps: (5) the improvement at all currently known sites; (6) restoration, protection, and management of the minimum habitat area and configuration needed to ensure long-term viability; and (7) establishing locally extirpated populations when needed to ensure viability.

San Diego button-celery is included in the Camp Pendleton Rare Plant Management Plan (Camp Pendleton 2017). The goal for San Diego button-celery in the Rare Plant Management Plan is to manage San Diego button-celery populations to be self-sustaining with no net loss of occupied vernal pools because of anthropogenic causes.

J.17.5. Management and Monitoring

The Camp Pendleton Rare Plant Management Plan lists the following management actions for San Diego button-celery: (1) manage for no net loss of occupied vernal pools as a result of anthropogenic actions; (2) maintaining EOM restrictions; (3) Reduce the EOM buffer for federally listed plants from 164 feet (50 meters) to 16 feet (5 meters); (4) remove thatch and invasive plants that impair pool hydrology; (5) maintain fences and Carsonite signage around all occupied vernal pools and determine areas where additional physical barriers for occupied pools are needed; (6) continue to ensure that topography and soils are not disturbed to result in altered hydrology and repair anthropogenic damages to pool hydrology; (7) establish six new populations in existing unoccupied pools and supplement existing populations in two currently occupied pools; (8) NEPA actions will require a 2:1 ratio of adding plants to existing unoccupied pools; and (9) provide all information gained from monitoring and management activities to USFWS to be incorporated into their formal 5-year review for this species (Camp Pendleton 2017).

The following three monitoring objectives were identified in the Camp Pendleton Rare Plant Management Plan for spreading navarretia: (1) use a sampling strategy over the life of the Plan to demonstrate that populations are self-sustaining and stable; (2) determine if the Range Regulations are being adhered to for the federally listed plants and whether human activity causes a significant decline or extirpation of any population; and (3) monitor for success of

new populations. The Rare Plant Management Plan has been implemented and the first year of monitoring began in 2019.

Since this species was listed, the Base has instituted measures for avoidance and minimization of impacts to vernal pools and all vernal pool species, including San Diego button-celery. Current Basewide management practices that directly or indirectly benefit San Diego button-celery include invasive plant control, erosion control, resource conservation awareness and education programs, investigative research (e.g., to examine pool and group enhancement, pool creation, and impact of signing and/or fencing), and avoidance and minimization of impacts from projects and Base activities, including training.

The Base has instituted measures for avoidance and minimization of impacts to vernal pools and all vernal pool listed species, including San Diego button-celery. The Base EOM requires that military units and all personnel that access the Base ranges and training areas are in possession of the Base Environmental Operations Map. The Environmental Operations Map lists the following restrictions for vernal pools: (1) keeping bivouac/command post/field support activities at least 50 m from vernal pools year-round; (2) keeping vehicle/equipment on existing roads (foot traffic is authorized year-round); and (3) prohibiting digging (including construction of fighting positions).

J.18. SPREADING NAVARRETIA (*NAVARRETIA FOSSALIS*)

Spreading navarretia is a member of the Phlox family (Polemoniaceae) that is a low, spreading, or ascending, annual herb 4 to 6 inches (10.2 to 15.2 cm) tall, which flowers from April through June. The lower portions of the stems are mostly bare. The leaves are soft and finely divided, 0.4 to 2 inches (1.0 to 5.1 cm) long and are spine-tipped when dry. The flowers are white to lavender-white with linear petals that are arranged in flat-topped compact leafy-heads. The fruit is an ovoid, two-chambered capsule. This species has evolved mechanisms to self-pollinate (USFWS 2004b). Seeds of this plant are likely dispersed locally by the flow of water throughout the vernal pool or alkali wetlands in which this plant occurs; more distant dispersal is likely

FIGURE 18. SPREADING NAVARRETIA

primarily accomplished by the spiny flowerheads clinging to the fur of larger mammals, or via mud containing seeds stuck to birds that visit these wetlands (USFWS 2004b).

In San Diego County, spreading navarretia appears endemic in vernal pool complexes. In Riverside County, it occurs in relatively undisturbed and moderately disturbed vernal pools, and in alkali playa habitat near Hemet. The species also occurs in relatively undisturbed and moderately disturbed vernal pools and alkali playa habitats along the San Jacinto River in Riverside County and on Camp Pendleton (USFWS 2005c).

J.18.1. Status

Spreading navarretia was listed as federally threatened on 13 October 1998 (USFWS 1998e). In response to a court order, critical habitat for this species was proposed on 7 October 2004 (USFWS 2004b), with final designation of critical habitat published on 18 October 2005 (USFWS 2005c). USFWS found that the INRMP for Camp Pendleton provides a sufficient benefit for spreading navarretia, and all lands on Camp Pendleton are exempt from critical habitat pursuant to Section 4(a)(3) of the ESA (USFWS 2005). Spreading navarretia is included in the approved recovery plan for the listed species of southern California vernal pools (USFWS 1998a). A full species profile is available at the USFWS ECOS website (https://ecos.fws.gov/ecp/species/1334), which includes all Federal Register publications related to the listing history, recovery plan documents, critical habitat designations, and applicable HCPs.

J.18.2. Distribution and Occurrence

Spreading navarretia is known from widely disjunct and restricted populations extending from the near Creston in San Luis Obispo County, east to the western lowlands of Riverside County, south through coastal and foothill San Diego County, and even farther south to San Quintin, Baja California, Mexico. In the United States, spreading navarretia has been detected in San Luis Obispo, Los Angeles, Riverside, and San Diego counties. Spreading navarretia Spreading navarretia is found at elevations between sea level and 4,250 feet (1,295.4 m), on flat to gently sloping terrain in vernal pools, alkali grassland, alkali playa, and alkali sink habitats. Occasionally, the species also occurs in ditches and other artificial depressions in degraded vernal pool habitat (USFWS 2004b).

There are 82 occurrences of spreading navarretia in the 2023 California Natural Diversity Database. An occurrence is when all spreading navarretia plants that are within a quarter mile of each other. Of these 82 occurrences, 72 are presumed extant, five are possibly extirpated, and five are presumed extirpated according to the California Native Plant Society website (https://rareplants.cnps.org/Plants/Details/1161). Nearly 60 percent of these populations are concentrated in three locations in California: along the San Jacinto River in

Riverside County, near Hemet in western Riverside County, and on Otay Mesa in southern San Diego County (USFWS 2005c). USFWS estimates that less than 296.5 acres (120 ha) of habitat in the United States is occupied by the species (USFWS 1998e). In Mexico, BajaFlora.org has 60 records for spreading navarretia in Baja California with 55 of those records mapped. In Baja California, spreading navarretia has been mapped in the vicinity of the Tijuana Airport, Valle de las Palmas, Sierra Juarez, La Mision, Chichihuas, Rancho Mesa el Tigre, Colonet Mesa, Ejido Ruben Jaramillo, Rancho Ibarra, Ejido Papalote, and San Quintin.

On Camp Pendleton, spreading navarretia has been found in 61 vernal pools within 8 occurrences Basewide with 572,098 individuals and, comprising occupying 0.65 acre. The known locations of spreading navarretia on-Base are a compilation of multiple survey efforts (some Basewide, others site-specific) over many years. Spreading navarretia occurs on Base at 21 Area-Del Mar (11 occupied pools), Oscar One Training Area (seven occupied pools), San Onofre Management Area (five occupied pools), White Beach Training Area (three occupied pools), and Wire Mountain (35 occupied pools). The number of occupied pools on the Base has increased over the years from one occupied pool in the 1980s, to an additional nine pools in the 1990s, eight additional pools in the 2000s, 25 additional pools in the 2010s, and 18 additional occupied pools in the 2020s.

J.18.3. Threats

Spreading navarretia, as with other vernal pool species, is threatened by the loss of vernal pool habitat. In general, vernal pool habitat in San Diego County has declined 97 percent (from 58,957 to 2,070.7 acres [23,859 ha to 838 ha]) since the early 1900s. Spreading navarretia is threatened by habitat destruction and fragmentation from urban and agricultural development, grading, pipeline construction, alteration of hydrology and floodplain dynamics, excessive flooding, channelization, off-road vehicle activity, trampling by cattle and sheep, weed abatement, fire suppression practices (including discing and plowing to remove weeds, and creation of fire-breaks), and competition from exotic plant species (USFWS 1998e). Threats identified since listing include manure dumping, loss of pollinators, and climate change.

J.18.4. Recovery Strategy Goals

The recovery strategy for spreading navarretia is to ensure the long-term conservation of this species. The recovery plan states that removal of this species from protection under the ESA should only be considered when populations have secure habitat, populations are stabilized or increasing (and where necessary, new populations are established), and populations are shown to be self-sustaining. The recovery strategy for spreading navarretia is part of the USFWS Recovery Plan for conserving and enhancing southern California vernal pool

ecosystems, with specific emphasis on stabilizing and protecting existing populations of Riverside fairy shrimp, San Diego fairy shrimp, San Diego button-celery, San Diego mesa mint, Otay mesa mint, and California Orcutt grass, so that these species may be reclassified from endangered to threatened status (USFWS 2005c).

The Vernal Pools of Southern California Recovery Plan identifies eight distinct management areas in southern California, and Camp Pendleton is in the San Diego - North Coastal Management Area. Before delisting of spreading navarretia can be considered, the species must first be stabilized by conducting surveys and research essential to the conservation of the species. Camp Pendleton vernal pool complexes and their associated species have been identified as necessary to stabilize spreading navarretia and other listed vernal pool species. The vernal pool complexes identified are Cocklebur, San Mateo, Las Pulgas, Stuart Mesa, and Wire Mountain. Once the species is stabilized, delisting will be considered by USFWS when the following criteria are met: (1) existing vernal pools and their associated watersheds are secured; (2) where necessary reestablish vernal pool habitat to the historical structure; and (3) manage and monitor habitat and listed species.

Spreading navarretia is included in the Camp Pendleton Rare Plant Management Plan (Camp Pendleton 2017). The goal for spreading navarretia in the Rare Plant Management Plan is to manage spreading navarretia populations to be self-sustaining with no net loss of occupied vernal pools because of anthropogenic causes.

J.18.5. Management and Monitoring

The Camp Pendleton Rare Plant Management Plan lists the following management actions for spreading navarretia: (1) manage for no net loss of occupied vernal pools as a result of anthropogenic actions; (2) maintaining EOM restrictions; (3) Reduce the EOM buffer for federally listed plants from 164 feet (50 meters) to 16 feet (5 meters); (4) remove thatch and invasive plants that impair pool hydrology; (5) maintain fences and Carsonite signage around all occupied vernal pools and determine areas where additional physical barriers for occupied pools are needed; (6) continue to ensure that topography and soils are not disturbed to result in altered hydrology and repair anthropogenic damages to pool hydrology; (7) establish 13 new populations in existing unoccupied pools; (8) NEPA actions will require a 2:1 ratio of adding plants to existing unoccupied pools; and (9) provide all information gained from monitoring and management activities to USFWS to be incorporated into their formal 5-year review for this species (Camp Pendleton 2017).

The following three monitoring objectives were identified in the Camp Pendleton Rare Plant Management Plan for spreading navarretia: (1) use a sampling strategy over the life of the Plan to demonstrate that populations are self-sustaining and stable; (2) determine if the Range Regulations are being adhered to for the federally listed plants and whether human activity

causes a significant decline or extirpation of any population; and (3) monitor for success of new populations. The Rare Plant Management Plan has been implemented and the first year of monitoring began in 2019.

Current Basewide management practices that directly or indirectly benefit spreading navarretia include exotic vegetation control, erosion control, resource conservation awareness and education programs, investigative research (e.g., to examine pool and group enhancement, pool creation, and impact of signing and/or fencing), and avoidance and minimization of impacts from projects and Base activities including training.

The Base has instituted measures for avoidance and minimization of impacts to vernal pools and all vernal pool listed species, including spreading navarretia. The Base Environmental Operations Map lists the following restrictions for vernal pools: (1) keeping bivouac/command post/field support activities at least 50 m from vernal pools year-round; (2) keeping vehicle/equipment on existing roads (foot traffic is authorized year-round); and (3) prohibiting digging (including construction of fighting positions).

J.19. CALIFORNIA ORCUTT GRASS (*ORCUTTIA CALIFORNICA*)

California Orcutt grass is a member of the grass family (Poaceae). It is an annual grass that is about 2 to 8 inches tall and flowers from April through August. The flowers are wind pollinated and fungi play a role in stimulating germination (USFWS 2011d).

FIGURE 19. CALIFORNIA ORCUTT GRASS

J.19.1. Status

California Orcutt grass was listed as state endangered in September 1979 (CDFW 2023), and federally endangered on 3 August 1993 (USFWS 1993). Critical habitat has not been proposed for this species, but California Orcutt grass is included in the approved recovery plan for the listed species of southern California vernal pools (USFWS 1998a). A full species profile is available at the USFWS ECOS website (https://ecos.fws.gov/ecp/species/4923), which includes all Federal Register publications related to the listing history, recovery plan documents, and applicable HCPs.

J.19.2. Distribution and Occurrence

According to the Consortium of California Herbaria, California Orcutt grass occurs in the California Central Valley (Glenn, Sacramento, Yolo, Stanislaus, and Madera counties), and in Southern California in Ventura, Los Angeles, San Bernardino, Riverside, Orange, and San Diego counties. California Orcutt grass also occurs in Baja California, Mexico.

Currently, California Orcutt grass is only known from one vernal pool on the Base at the San Onofre Management Area, which is a vernal pool restoration site immediately north of the San Onofre Nuclear Generating Station. California Orcutt grass was discovered on the Base in June of 2020.

J.19.3. Threats

Threats to California Orcutt grass include loss and degradation of its vernal pool habitat caused urban and agricultural development, grazing, herbivory, altered hydrology, off-road vehicle use, trampling, invasive plants, and climate change and drought.

J.19.4. Recovery Strategy Goals

The recovery strategy for the California Orcutt grass is to conserve and enhance southern California vernal pool ecosystems, with specific emphasis on stabilizing and protecting existing populations of Riverside fairy shrimp, San Diego fairy shrimp, San Diego button-celery, San Diego mesa mint, Otay mesa mint, and California Orcutt grass, so that these species may be reclassified from endangered to threatened status.

California Orcutt grass will be added to the Rare Plant Management Plan. The goal for California Orcutt grass will be to manage populations to be self-sustaining with no net loss of occupied vernal pools because of anthropogenic causes.

J.19.5. Management and Monitoring

California Orcutt grass will be added to the Rare Plant Management Plan. The management actions and monitoring objectives will be like the actions mentioned above for San Diego button-celery and spreading navarretia.

The Base has instituted measures for avoidance and minimization of impacts to vernal pools and all vernal pool listed species, including California Orcutt grass. The Camp Pendleton Environmental Operations Map lists the following restrictions for vernal pools: (1) keeping bivouac/command post/field support activities at least 50 m from vernal pools year-round; (2) keeping vehicle/equipment on existing roads (foot traffic is authorized year-round); and (3) prohibiting digging (including construction of fighting positions).

J.20. THREAD-LEAVED BRODIAEA (*BRODIAEA FILIFOLIA*)

Thread-leaved brodiaea is a perennial herb that produces leaves and flower stalks from dark-brown, fibrous-coated underground corms (bulb-like storage stems that lack succulent leaves). Corms are dormant during the summer (dry season) and begin growing after the first significant fall rains saturate the soil. Leaves grow slowly throughout the winter and reach their full length in February or March. At the time of flowering, generally early summer (April through early June), the leaves are dead or nearly so, and next season's corms are mature. The flowering period lasts for 2 to 3 weeks starting in April to the early June, and development of capsules and seeds takes 4 to 8 weeks. Upon maturity, the three segments of the vertically oriented capsules split apart, revealing many small black seeds that are 0.08 to 0.1 inch (2 to 2.5 mm) long. The seeds are then dispersed as wind rattles the capsules and releases the seeds (USFWS 2009b). The rate of deposit and duration of seeds in the soil until germination is unknown. However, it is likely that most seeds produced in the capsules are dispersed nearby and, as a result, would be expected to be scattered among the standing plants at any given occurrence. All groupings of the species found on Camp Pendleton to date reside in areas with shrink-swell soils where surface cracks are common. Seeds deposited into cracks are incorporated into the soil matrix once the soils are rehydrated and the cracks swell shut in the fall. Specific conditions conducive to triggering natural germination are unknown (AMEC 2009).

FIGURE 20. THREAD-LEAVED BRODIAEA

Leaves are likely produced by the species every year; young plants may produce only leaves for a few seasons before having enough food stores to be capable of producing flower stalks. Even mature specimens may not flower every year, depending upon environmental conditions. The flower stalks (scapes) are 7.8 to 16.1 inches (20 to 41 cm) tall with several narrow leaves that are shorter than the scape. The tubular flowers, arranged in loose umbels, typically bloom from 1 April through 30 June, and are 0.35 to 0.5 inches (9 to 12 mm) long. The six perianth segments are violet, with their tips spreading. The staminodia (characteristic sterile stamens) are narrow and pointed. All species of the genus *Brodiaea* are self-incompatible, requiring cross-pollination with another genetically distinct plant to set seed, which is typically facilitated by pollinator species. The corm is the principal means by which plants of the genus *Brodiaea* perpetuate themselves (USFWS 2004c). Seedlings produce contractile roots (specialized root form designed to

shrink vertically under conditions of seasonal drying) for the first few years. These roots swell with moisture in the wet season creating a space in the malleable clay substrate and, as the season progresses, the succulent root dries and shrinks vertically, drawing the young corm down into the ground. This vertical migration is repeated for a few years until the corm reaches deep enough, that the soil moisture level is sufficient, to keep the succulent root continuously hydrated. The corms of mature plants lose their contractile roots once their vertical migration is complete, and often produce 2 to 15 new adjacent cormlets annually, which are drawn laterally away from their parent corm by contractile roots (USFWS 2004c).

J.20.1. Status

Thread-leaved brodiaea was listed as state endangered in January 1982 (CDFW 2023) and was listed by USFWS as a threatened species on 13 October 1998 (Endangered and Threatened Wildlife, 1998). USFWS found that designation of "critical habitat" for this species was not prudent at that time because such designation would provide no additional benefit over that provided by listing it on privately owned lands (USFWS 1998e). USFWS also found that the Camp Pendleton INRMP provides a sufficient benefit to the species and exempted all lands on Camp Pendleton from critical habitat pursuant to Section 4(a)(3) of the ESA (USFWS 1998e). A recovery plan for thread-leaved brodiaea has not yet been completed to date by USFWS (USFWS 2005). A full species profile is available at the USFWS ECOS website (https://ecos.fws.gov/ecp/species/6087), which includes all Federal Register publications related to the listing history, recovery documents, critical habitat designations, and applicable HCPs.

J.20.2. Distribution and Occurrence

The historical range of thread-leaved brodiaea extends from the foothills of the San Gabriel Mountains in Los Angeles County (Glendora and San Dimas), east to Arrowhead Hot Springs in the western foothills of the San Bernardino Mountains (San Bernardino County), and south through eastern Orange and western Riverside Counties to northern San Diego County (Highland Valley). A small, isolated population of thread-leaved brodiaea is also situated just west of Rancho Bernardo in central San Diego County (USFWS 2004c). This species is usually found at elevations of 98.4 to 2,509.8 feet (30 to 765 m) in herbaceous plant communities that occur in open areas on clay soils; soils with a clay subsurface; or clay lenses within loamy, silty loam, or alkaline soils, depending on soil characteristics.

Thread-leaved brodiaea was first located on-Base in 1993 during surveys in what are now Bravo One and Bravo Two Training Areas (Dudek & Associates 1994). On Camp Pendleton, thread-leaved brodiaea has been found in 567 populations in 52 occurrences with 20,174,812 individuals and occupy 101.41 acres. Populations of thread-leaved brodiaea on Camp Pendleton are of considerable importance not only because of the numbers of plants reported

Basewide, but also because they are found in more than one vegetation community and soil type, including grasslands and vernal pools. The groupings are distributed in a manner throughout the Base that likely facilitates pollen transfer among them, and with occurrences to the north and south of Camp Pendleton (USFWS 2005d).

Through 2023, 14,540 acres have been surveyed for thread-leaved brodiaea on the Base. Of the 14,540 acres surveyed, 8,554 were surveyed to protocol level and 5,986 were surveyed to non-protocol level. An additional 3,093 acres were excluded from surveys due to constraints (e.g., steep slopes, dense brush, unsuitable habitat).

J.20.3. Threats

At the time of ESA listing, USFWS identified several threats to thread-leaved brodiaea across its range, including habitat destruction, degradation, and fragmentation resulting from agriculture; urbanization; pipeline construction; alteration of wetland hydrology; clay mining; OHV activity; weed abatement; and invasive, nonnative plant species. By 1998, at least 25 percent of thread-leaved brodiaea populations or occurrences had been eliminated by urbanization and agricultural conversion (USFWS 2005d).

According to the USFWS 5-year review of the species published in 2005, the current threats to this species are essentially the same as they were at listing and include urbanization, alteration of hydrological conditions and channelization, discing, unauthorized OHV activity, grazing, and nonnative plants. Additional threats since listing include manure dumping and mowing. Development remains the most prominent rangewide threat to thread-leaved brodiaea, though the protective provisions of the ESA have had a significant impact relative to addressing this threat through the development of regional HCPs and Section 7 consultations. As habitat continues to be placed into permanent conservation with adaptive management, the threats to thread-leaved brodiaea will be further reduced rangewide; current conservation efforts address approximately 75 percent of occurrences. The second most significant rangewide threat to thread-leaved brodiaea is competition from invasive, nonnative plants, which impact at least 15 of the known occurrences. Other threats from unauthorized OHV use, grazing, and manure dumping threaten specific occurrences of thread-leaved brodiaea, and while they are not rangewide threats to the species, these threats hinder recovery of the species (USFWS 2005d).

Since thread-leaved brodiaea is dependent upon pollinator species to create seeds, another potential threat indicated in studies is that if pollinator habitat within 3,280.8 feet (1,000 m) of some host plants is eliminated (e.g., developed), the number of seeds set by some plant species may be decreased by as much as 50 percent. Additional studies suggest that the degradation of pollinator habitat is likely to adversely affect the abundance of pollinator species (USFWS 2004c).

According to USFWS, due to the threats mentioned above, both rangewide and localized, thread-leaved brodiaea remains likely to become an endangered species within the foreseeable future throughout all, or a significant portion, of its range. The USFWS 5-year review of the species recommended that the current listing status for thread-leaved brodiaea remain unchanged, as threatened; however, a new listing priority number of 8C was assigned. The new recovery priority number indicates that the species faces a moderate degree of threat and has a high recovery potential (USFWS 2005d).

J.20.4. Recovery Strategy Goals

The unpublished draft recovery plan recommends that thread-leaved brodiaea should be evaluated for delisting when, among other criteria, the following occurrences have been fully protected: (1) all known occurrences in Los Angeles and San Bernardino Counties; (2) at least 10 core occurrences in Orange County; (3) at least 10 core occurrences in western Riverside County; (4) at least 12 core occurrences on Camp Pendleton; and (5) at least 20 core occurrences in northwestern San Diego County, especially in the San Marcos area. Where possible, the draft plan proposes delineating a vegetative area of 820.1 feet (250 m) around each eligible occurrence to provide for pollinator habitat (USFWS 2004c).

Thread-leaved brodiaea is included in the Camp Pendleton Thread-Leaved Brodiaea Management Plan (MCBCP 2017). The overarching goal for thread-leaved brodiaea is to maintain or enhance existing occurrences to ensure multiple conserved occurrences with self-sustaining populations to increase resilience to environmental and demographic stochasticity, maintain genetic diversity, and ensure persistence over the long term. The three largest thread-leaved brodiaea occurrences were designated as thread-leaved brodiaea Management Units and are located within the Finch, Juliet, and Lima training areas.

J.20.5. Management and Monitoring

The Camp Pendleton Thread-Leaved Brodiaea Management Plan has three monitoring objectives for the plants within the Management Units: 1) within the three Management Units, demonstrate that thread-leaved brodiaea is self-sustaining; 2) monitor threats within the three Management Units; and 3) determine if high fire frequency is impacting or enhancing the plant within the Finch Management Unit. The Thread-Leaved Brodiaea Management Plan has two monitoring objectives for the plants located outside the Management Units: 1) monitor to prevent the loss of the occurrences located outside of the three Management Units and 2) monitor threats.

As part of the Thread-Leaved Brodiaea Management Plan, all thread-leaved brodiaea will be monitored including mapping population extents, counting individuals and phenophases, and recording threats. All populations within the three Management Units are monitored annually

and the populations outside the Management Units are on a 3-year rotation. However, the populations outside the Management Units will be visited annually for a threat assessment and a thread-leaved brodiaea presence/absence survey. The Thread-Leaved Brodiaea Management Plan has been implemented and the first year of monitoring began in 2019.

The Thread-Leaved Brodiaea Management Plan lists the management actions for the three Management Units. The management actions include the following: (1) conduct thread-leaved brodiaea protocol inventories of the areas within the three management units that have not been surveyed to protocol-level; (2) establish one new population upfront to offset any future training impact; (3) treat fennel to reduce the cover to less than 1 percent; (4) invasive grasses and forbs will be monitored after normal to above average rain years to determine if treatment is needed to reduce their cover; (5) all invasive species designated for surveillance and eradication will be treated; (6) Range regulations will be monitored and enforced each year; (7) the three Management Units will stay on the EOM as restricted areas; (8) monitor Brodiaea hybrids; (9) Carsonite markers will be installed and maintained around the horse pasture manure pile to prevent its encroachment into the Horse Pasture Management Unit; (10) Carsonite markers or other appropriate signage will be installed and maintained to designate the Management Unit and explain the restrictions; (11) evaluate an overlay of burn areas with populations of thread-leaved brodiaea and if it is determined that fire is affecting the plants, then plants will be flagged to avoid prescribed burning to the extent feasible; and (12) Stepp Stables staff will be informed and educated about operational guidelines that protect thread-leaved brodiaea in the Management Unit, including, but not limited to, restrictions on driving and the location of manure piles. An informational brochure will be developed about avoidance of the plant for stable customers

The Base has instituted measures for avoidance and minimization of impacts to thread-leaved brodiaea. The thread-leaved brodiaea located within the three thread-leaved brodiaea Management Units and the three State Park Lease thread-leaved brodiaea occurrences remain under the existing range regulation protections and are displayed on the EOM, while the other 46 occurrences were released from training restrictions. The three thread-leaved brodiaea Management Units are also displayed on the EOM. The EOM lists the following restrictions for thread-leaved brodiaea occurrences that remain on the EOM and three Management Units: (1) keeping bivouac/command post/field support activities at least 50 m from thread-leaved brodiaea locations and Management Units year-round; (2) keeping vehicle/equipment on existing roads (foot traffic is authorized year-round); and (3) prohibiting digging (including construction of fighting positions).

J.21. ENCINITAS BACCHARIS (*BACCHARIS VANESSAE*)

FIGURE 21. ENCINITAS BACCHARIS

Encinitas baccharis is a low-growing perennial shrub in the sunflower family (Asteraceae). Encinitas baccharis is a slender-stemmed, dioecious (separate male and female plants) shrub, that grows approximately 1.6 to 4.3 feet (0.5 to 1.3 m) tall. This species can be distinguished from other members of the genus by its numerous, erect, glabrous stems; linear, entire leaves with only one principal vein; and its delicate, narrowly tapered phyllaries (bracts that form the inflorescence), which are reflexed at maturity. The dark green leaves are 0.04 to 1.77 inches (0.1 to 4.5 cm) long, thread-like, and narrower in width than the portion of the twig adjacent to the leaf. The flower heads (capitulae) are cylindrical receptacles each containing clusters of tiny, whitish, flowers; each flower head contains 15 to 22 flowers. The blooming period is between August and November. Encinitas baccharis is unusual among the California species of the genus *Baccharis* because it occurs mainly in chaparral rather than in riparian environments, washes, or otherwise disturbed lands (USFWS, 2011c). It occurs on coastal sandstones and rocky hillsides, often on unusual soil substrates on locations scattered across San Diego County.

J.21.1. Status

Encinitas baccharis was state listed as endangered in January 1987 and federally listed as threatened in November 1996 (CDFW 2023). A full species profile is available at the USFWS ECOS website (https://ecos.fws.gov/ecp/species/3343), which includes all Federal Register publications related to the listing history, recovery documents, and applicable HCPs.

J.21.2. Distribution and Occurrence

All 50 known occurrences of Encinitas baccharis are from San Diego County. Of the 50 occurrences, 35 are considered presumed extant, nine are possibly extirpated, and six are extirpated. Of the 35 extant occurrences, five occurrences are located at Camp Pendleton. In

northern San Diego County, Encinitas baccharis also occurs in the Cleveland National Forest. Further south, Encinitas baccharis has been mapped in Carlsbad, San Marcos, Encinitas, vicinity of San Dieguito Regional Park, Del Mar, Escondido, Rancho Santa Fe, 4S Ranch, Miramar Peak, Poway, Gibson Highlands Preserve, and Otay Mountain Wilderness Area.

The first specimens found on-Base were discovered when conducting the San Diego Plant Atlas Inventories in the Delta Training Area during the summer of 2015. Prior to conducting the inventories, this species was not known to occur on-Base. As a result of the findings, the Base completed the first survey for Encinitas baccharis in August 2015. The survey resulted in the finding of 177 Encinitas baccharis plants located in the Delta Training Area in generally undisturbed chaparral habitat, and adjacent to the Cleveland National Forest Wilderness Area. Surveys to date at Camp Pendleton have found 218 individuals, 40 populations, and five occurrences. All Encinitas baccharis plants detected on the Base are in the Delta Training Area in generally undisturbed chaparral habitat, an area with very rugged terrain adjacent to the Cleveland National Forest San Mateo Canyon Wilderness Area. Additional plants occur just off-Base within the Cleveland National Forest.

J.21.3. Threats

Habitat for this plant is threatened by altered fire regimes that consist of indirect impacts associated with development such as fuel reduction activities (e.g., brush removal and thinning), and activities associated with fire control. This species has a narrow geographical range in fire-adapted habitats, and the threat from lack of an appropriate fire regime is essentially rangewide, but more in evidence at occurrences and sites in proximity to urban developments. This may result in limited suitable habitat for recruitment of new plants. Impacts from nonnative plants are anticipated to increase with increasing development and have been reported to outcompete Encinitas baccharis individuals. The relatively small population size of most Encinitas baccharis occurrences increases their risk of becoming extirpated by random environmental fluctuations or habitat modification such as brush clearing (USFWS 2011d). The species is also threatened by urbanization, hillside agriculture, road maintenance, utility pole/line maintenance, and climate change and drought.

J.21.4. Recovery Strategy Goals

Like the management of other listed plants on Base, the primary goal for conservation of Encinitas baccharis is no net loss. Objectives that will achieve this goal and contribute to the recovery of Encinitas baccharis include 1) finishing the baseline surveys to document how many populations and individual plants currently occur on Base; 2) implementing on-going surveys to monitor survival and response of plants to stressors including possible disturbance

from training, and 3) supplementing current populations of Encinitas baccharis and establishing new ones by planting and seeding new individuals.

J.21.5. Management and Monitoring

Encinitas baccharis is included in the Camp Pendleton Rare Plant Management Plan (Camp Pendleton 2017). The goal for Encinitas baccharis in the Rare Plant Management Plan is to inventory all potential habitat and collect distribution, abundance, ecological, and natural history data for Encinitas baccharis within 5 years for the purpose of developing management recommendations and to manage for no net loss of populations because of anthropogenic causes. Management actions for Encinitas baccharis include the following: 1) maintain EOM restrictions; 2) reduce the EOM buffer for federally listed plants from 164 feet (50 meters) to 16 feet (5 meters); 3) inventory all potential habitat on-Base by Year 5 of this Plan, if funded; 4) re-inventory burned chaparral the second or third year after a wildfire; 5) collect phenology, age class, and sex ratios during the inventories; 6) develop and refine inventory and monitoring methods during the first 5 years of implementing this Plan; 7) develop a study to determine effects of wildfire on the species by the Year 5 of this Plan. Implement if a wildfire moves through occupied habitat; 8) require bio-monitors for road maintenance, fire break grading/disking, and utility line/pole maintenance in occupied habitat; 9) provide all information gained from inventorying and phenology data collection to USFWS to be incorporated into their formal 5-year review for this species; and 10) require a 2:1 mitigation ratio for NEPA projects. The monitoring objectives for Encinitas baccharis are the same as for San Diego button-celery.

The Base has instituted measures for avoidance and minimization of impacts to Encinitas baccharis. The Camp Pendleton Environmental Operations Map lists the following restrictions for Encinitas baccharis: (1) keeping bivouac/command post/field support activities at least 50 m from Encinitas baccharis locations year-round; (2) keeping vehicle/equipment on existing roads (foot traffic is authorized year-round); and (3) prohibiting digging (including construction of fighting positions).

Candidate Species

J.22. MONARCH BUTTERFLY (*DANAUS PLEXIPPUS*)

Adult monarch butterflies are large and conspicuous, with bright orange wings surrounded by a black border and covered with black veins. The black border has a double row of white spots, present on the upper side of the wings. Adult monarchs are sexually dimorphic, with males having narrower wing venation and scent patches. The bright coloring of a monarch serves as a warning to predators that eating them can be toxic (USFWS 2023).

During the breeding season, monarchs lay their eggs on their obligate milkweed host plant (primarily *Asclepias* spp.), and larvae emerge after two to five days. Larvae develop through five larval instars (intervals between molts) over a period of 9 to 18 days, feeding on milkweed and sequestering toxic chemicals (cardenolides) as a defense against predators. The larva then pupates into a chrysalis before emerging 6 to 14 days later as an adult butterfly. There are multiple generations of monarchs produced during the breeding season, with most adult butterflies living approximately two to five weeks; overwintering adults enter reproductive diapause (suspended reproduction) and live six to nine months (USFWS 2023).

FIGURE 22. MONARCH BUTTERFLY

In many regions where monarchs are present, monarchs breed year-round. Individual monarchs in temperate climates, such as eastern and western North America, undergo long-distance migration, and live for an extended period. In the fall, in both eastern and western North America, monarchs begin migrating to their respective overwintering sites. This migration can take monarchs distances of over 3,000 km and last for over two months. In early spring (February-March), surviving monarchs break diapause and mate at the overwintering sites before dispersing. The same individuals that undertook the initial southward migration begin flying back through the breeding grounds and their offspring start the cycle of generational migration over again (USFWS 2023).

J.22.1. Status

The monarch butterfly is not federally listed under ESA but is a candidate for listing. The USFWS expects to decide on listing this species in 2024. More information is available at the ECOS page for monarch butterfly at https://ecos.fws.gov/ecp/species/9743.

J.22.2. Distribution and Occurrence

Western and eastern populations of monarch butterflies occur from southern Canada, throughout the continental United States, and south into Mexico. Monarchs in eastern and central U.S. make long migrations into Mexico for winter while monarchs in the west migrate to coastal areas. On Camp Pendleton, monarchs are regularly seen flying by at many parts of the Base. Wintering butterflies on Base are seen congregating at several roosts, especially in groves of Eucalyptus trees. At least two species of native milkweeds occur in grasslands on Base, which provide breeding habitat for the butterflies.

J.22.3. Threats

Monarch butterflies are most threatened by loss of wintering, migratory, and breeding habitats. Exposure to pesticides and climate change are also threats to the continued success of monarch populations (USFWS, 2023).

J.22.4. Recovery Strategy Goals

No recovery plans or goals are available for monarch butterfly.

J.22.5. Management and Monitoring

Biologists have periodically surveyed winter roosts at up to four locations on Base. In 1997, an estimated 10,000 monarchs were seen at a roost called CPEN Main (3202). A survey in November 2021 recorded over 1,000 monarchs at Tomato Fields roost (3203). Uplands staff collaborate with staff from Xerces Society and CA Department of Fish and Wildlife to plan survey efforts. Currently, Base biologists perform winter surveys annually as part of the Western Monarch Counts and have started mapping milkweed locations in grassland habitats. Environmental Security has proposed funding contracted milkweed and monarch larval surveys on Base.

Base biologists will evaluate the current amount and condition of monarch habitat on Base after completion of milkweed surveys on Base. These results will be considered after the listing decision due in 2024 to determine future management objectives for monarch butterflies on Base.

Species of Special Concern

Wildlife

J.23. SOUTHWESTERN POND TURTLE (*ACTINEMYS PALLIDA*)

The southwestern pond turtle is a small to medium-sized, drab-colored turtle with a shell length of 3.5 to 8.5 inches (8.9 to 21.6 cm). The western pond turtle has an olive-brown or blackish-brown carapace that is relatively flat with a pattern of spots, lines, or dashes radiating from the center of each scute. Other distinguishing characteristics include a network of black markings on the pond turtle's head and neck, and prominent scales on limbs that are flecked or lined in black.

This turtle inhabits a wide variety of water bodies ranging from permanent to intermittent, and freshwater to brackish environments. Western pond turtles prefer habitat with slow-flowing water, underwater cover, and emergent basking sites. They are found in creeks, slow moving rivers, marshes, ponds, lakes, reservoirs, vernal pools, canals, and even irrigation ditches and sewage treatment plants. Pond turtles require terrestrial habitat for reproduction, aestivation, and overwintering. Mating typically occurs in April and May and females climb onto land sometime between April and August to dig a nest, usually in adjacent uplands along stream or pond margins. Pond turtles hibernate underwater and aestivate during summer droughts by burying themselves in soft bottom mud or within moist mats of algae in shallow pools.

FIGURE 23. WESTERN POND TURTLE

J.23.1. Status

The western pond turtle, *Actinemys marmorata*, was split into two full species, corresponding to the previous two subspecies – northwestern pond turtle, *Actinemys marmorata*, and southwestern pond turtle, *Actinemys pallida* (Spinks et al. 2014). The southwestern pond turtle is not included in the Federal List of Threatened and Endangered Species but is under review based on a 90-day finding issued in April 2015 (USFWS 2015). The species is listed as sensitive by BLM and the U.S. Forest Service. A full species profile is available at the USFWS ECOS website (https://ecos.fws.gov/ecp/species/4768), which includes all Federal Register publications related to the listing status review and applicable HCPs.

The species is state listed as a Species of Special Concern.

J.23.2. Distribution and Occurrence

The southwestern pond turtle ranges from the central Coast Range of California south of San Francisco, to northern Baja Mexico. It is discontinuously distributed and uncommon in parts of is range. Isolated populations occur in the Mojave River in California, the lower Columbia River, the Puget Sound Trough, and in areas south of the Transverse Ranges in southern California and northern Baja California. The southwestern pond turtle is San Diego's only native freshwater turtle and historically occupied eight of the 10 watersheds in the county. Today the pond turtle is known to occupy 13 sites within seven of the 10 watersheds (USGS 2005).

In the 1990s, the pond turtle occupied most of the major drainages on-Base. Population estimates completed in 1996 and again in 1999 revealed a 16 percent Basewide decline in pond turtle populations. Surveys conducted in 2008 and 2010 detected breeding populations of pond turtles at six sites: Cristianitos Creek, Upper San Mateo Creek, Cocklebur Lagoon, Las Flores Lagoon, and the Upper and Lower Santa Margarita River. Successful recruitment was observed at four of these sites: Upper San Mateo Creek, Cocklebur Lagoon, and the Upper and Lower Santa Margarita River (USGS 2010b).

Surveys resumed in 2022-2023 and include satellite telemetry for gravid females to detect upland migration and nesting areas. This data will help determine where there might be conflicts with training, recreation and or facilities maintenance should the pond turtle be federally listed and in need of further protection.

J.23.3. Threats

The main threat to the southwestern pond turtle is loss or degradation of habitat primarily due to urbanization and agriculture. Over 90 percent of the wetland habitats within the historic range of the species in California have been eliminated by development, and flood and water diversion projects (USFWS 1992). Associated with these threats has been an increase in habitat fragmentation and decrease in genetic variability. The species has also declined due to commercial exploitation, invasion of nonnative species competition and predation, and disease. Localized threats include contaminant spills, grazing, and off-road vehicle use (USFWS 1992).

J.23.4. Recovery Strategy Goals

No recovery plan or goals have been established for the southwestern pond turtle.

J.23.5. Management and Monitoring

Because the southwestern pond turtle is only considered a Species of Special Concern, it receives no formal legal protection. However, the programmatic instructions and habitat management measures outlined in the Estuarine and Beach Ecosystem Conservation Plan, Riparian Ecosystem Plan, and the Riparian BO directly and/or indirectly benefit the southwestern pond turtle through the management of suitable wetlands and adjacent habitat including estuaries, rivers, creeks, and vernal pools.

In addition, the Base has instituted measures for avoidance and minimization to wetland habitats. These measures are specified in Camp Pendleton Base Order 3500.1 (*Range and Training Regulations*), which prescribes regulations and general precautions for range and training area users that limit impacts to natural resources. Restrictions specific to wetland habitats (including vernal pools, coastal marshes and lagoons) are as follows:

- Vehicles operating in the vicinity of wetlands are authorized year-round and shall remain on existing roads, trails and crossings.
- Foot traffic is authorized year-round on existing roads, trails and crossings.
- Foot traffic is prohibited in all coastal marshes from 1 March to 15 September, and prohibited all year in the Santa Margarita Estuary and the mouth of Cocklebur Canyon.
- Off-road vehicular or foot traffic, excavations, and/or fill occurring in wetlands must be reviewed by ES, and receive appropriate permits and approvals prior to conducting the action.
- Vehicle/equipment operations near known vernal pool areas shall be kept on existing roads, year-round. Contact ES prior to conducting activities involving soil excavation, filling, or grading.
- Digging, including construction of fighting positions, is prohibited in vernal pools.
- Bivouac/command and post/field support activities shall be kept at least 50 m from identified vernal pools.

The Base conducted surveys of southwestern pond turtles in 2008, 2010, and 2022, continuing in 2023 to assess their distribution, abundance, and general health of the pond turtle populations on Camp Pendleton. The information gathered during these surveys is intended to be used for development of protection and management measures if the species is proposed for listing as a threatened or endangered species in the future.

J.24. WESTERN SPADEFOOT TOAD (*SPEA HAMMONDII*)

The western spadefoot toad is a burrowing, stout-bodied toad ranging in size from 1.5 to 2.5 inches (3.7 to 6.2 cm). Spadefoot toads are distinguished by their cat-like vertical pupils, glossy black wedge-shaped "spade" on each hind foot used for digging, and lack of parotid glands (large swellings on the side of the head and behind the eye). The western spadefoot is whitish below and dusky green or gray above with skin tubercles (small, rounded protuberances)

FIGURE 24. WESTERN SPADEFOOT TOAD

that are sometimes orange or reddish in color. This species typically has irregular light-colored dorsal stripes with central stripes occasionally bordering a dark, hour-glass shaped area.

Western spadefoot toads are rarely seen because they spend most of their life buried underground in earth-filled burrows up to 3 feet (90 cm) deep and enter water only to breed. They usually use the hardened spades on their hind feet to dig their way underground but will occasionally utilize mammal burrows. Emergence from underground retreats is triggered by sound and vibrational cues of raindrops striking the ground surface during rain events in the wet season, typically between January and May, at which time breeding and foraging take place. Breeding takes place in vernal pools and other temporary water sources, such as intermittent streams. Females lay 300 to 500 eggs underwater. The eggs hatch quickly (3 to 4 days) and tadpoles transform in 4 to 11 weeks. Juveniles leave the breeding pool a few days after metamorphosis. Western spadefoot toads forage on a variety of insects, worms, and other invertebrates before returning to their long dormancy (8 to 9 months) underground.

J.24.1. Status

The western spadefoot toad is not included in the Federal List of Threatened and Endangered Species but is under review by USFWS. The species is also listed as sensitive by BLM. Despite not being federally listed, western spadefoot toad is included in the approved recovery plan for the listed species of southern California vernal pools. A full species profile is available at the USFWS ECOS website (https://ecos.fws.gov/ecp/species/5425), which includes all Federal Register publications related to the listing review and applicable HCPs.

The species is state listed as a Species of Special Concern.

J.24.2. Distribution and Occurrence

The western spadefoot is endemic to California and northern Baja California. It ranges throughout the Central Valley and adjacent foothills and in the Coast Ranges from Point Conception, Santa Barbara County, south into northwestern Baja California. Elevations of occurrence extend from near sea level up to 4,500 feet (1,365 m), but they are generally found below 3,000 feet (900 m) (CDFG 1994). Western spadefoot toads prefer open areas with sandy or gravelly soil in a variety of habitats including, but not limited to, grasslands, coastal sage scrub, chaparral, river floodplains, foothills, and mountains. The species has been extirpated throughout most of the lowlands of southern California (Stebbins 1985).

Surveys conducted in 2013 detected western spadefoot toad on 70 locations across the Base in the following geographic areas: Bravo bluffs (Bravo 2 Training Area), coastal bluffs

(Romeo Two Training Area to the Agricultural Lease Area and Oscar One Training Area in the south), Echo Training Area, Papa Training Area, Range 409, Santa Margarita River Watershed, and along the southern boundary of the Base. The species was found utilizing breeding locations in grassland, sage scrub, disturbed, and woodland habitats, but the most common breeding locations were roadside pools. The roadside pools generally occurred on the edges of roads or trails created by military and/or urban activity and were unvegetated or had minimal vegetation. The primary location on-Base for western spadefoot toad appears to be the coastal bluffs, where high numbers of breeding pools as well as high densities of tadpoles were found.

J.24.3. Threats

The primary threat to the western spadefoot toad is loss of habitat, particularly of vernal pool breeding sites, because of urban and agricultural development. The California Department of Fish and Game (1994) estimated that over 80 percent of habitat once known to be occupied by the western spadefoot toad in southern California (from the Santa Clara River Valley in Los Angeles and Ventura Counties southward) has been developed or converted to land use that is incompatible with successful reproduction and recruitment of the species. Roads represent another threat to the western spadefoot toad. Road construction can result in direct mortality, loss and fragmentation of habitat, and motor vehicle strikes. Additionally, western spadefoot toads face the threat of predation by nonnative species such as bullfrogs, crayfish, aquatic insects, and tadpole shrimp.

J.24.4. Recovery Strategy Goals

One of the overall goals of the vernal pool recovery plan (USFWS 1998a) is to ensure the long-term conservation of vernal pool species of concern, including western spadefoot toad, by stabilizing and protecting populations so further decline in species status and range are prevented. To meet this goal, the recovery plan uses an ecosystem-level strategy that focuses on protection of vernal pool regions representing the suite of vernal pool communities in California that are necessary to conserve the species addressed in the plan. Within each vernal pool region, the plan identifies core areas where recovery actions will be focused. Portions of Camp Pendleton fall within the Western Riverside and San Diego Vernal Pool Regions; however, no core areas are identified on-Base.

J.24.5. Management and Monitoring

Because the western spadefoot toad is considered a Species of Special Concern, it receives no formal legal protection. However, the U.S. Marine Corps is currently in consultation with USFWS regarding programmatic Basewide management of upland habitats including vernal pool habitat used by western spadefoot toad. The western spadefoot toad benefits from

current management practices such as invasive, nonnative species control (e.g., bullfrog and crayfish); erosion control; resource conservation awareness and education programs; investigative research (e.g., to examine vernal pool and group enhancement, pool creation, and impact of signing and/or fencing); and avoidance and minimization of vernal pool impacts from projects and Base activities including training.

The Base has instituted measures for avoidance and minimization of impacts to vernal pool habitat and species. These measures are specified in the Base EOM, which prescribes regulations and general precautions for range and training area users that limit impacts to vernal pool species (including western spadefoot toad) by restricting activities in and adjacent to vernal pool habitat. Restrictions specific to vernal pools are as follows:

- Foot traffic is authorized year-round. Digging, including construction of fighting positions, is prohibited in vernal pools.
- Vehicle/equipment operations near known vernal pool areas shall be kept on existing roads year-round. Contact ES prior to conducting activities involving soil excavation, filling, or grading.
- Bivouac/command and post/field support activities shall be kept at least 50 m from identified vernal pools.

Additionally, Camp Pendleton conducted two surveys of western spadefoot toad in 2013 and 2015 to assess their distribution, habitat use, and breeding phenology on Base (Tetra Tech 2013 and 2015). A second survey was completed in 2015. The information gathered during these surveys informs protection and management measures. Western spadefoot is under review for federal listing under ESA (USFWS 2023).

J.25. PACIFIC LAMPREY (*ENTOSPHENUS TRIDENTATUS*)

The Pacific lamprey belong to a group of primitive fishes that are eel-like in form but lack jaws and paired fins of true fishes. Pacific lamprey also lacks scales and gill openings. In place of a jaw, Pacific lamprey have a round sucker-like mouth with an oral disc. Adults can be characterized by three large anterior teeth and multiple smaller posterior teeth.

FIGURE 25. PACIFIC LAMPREY

Pacific lamprey exhibits an anadromous life history living as adults in a marine environment for 1-3 years before migrating to spawn in freshwater streams. Adult lamprey spawn in gravel bottom streams at the upstream end of riffle habitat (like salmonids) and upstream of suitable ammocoete (lamprey larvae) habitat. Spawning occurs between March and July but can range geographically. Both female and male lamprey will create a round nest (i.e., redd) for spawning using their bodies for digging and mouths to move larger gravel. After the eggs are deposited and fertilized, adult lampreys typically die within three to 36 days of spawning. After hatching, ammocoetes slowly drift downstream to live in silt/sand substrates and filter feed for 3-7 years. Larvae will transform to juveniles (macropthalmia) over several months as they migrate to the ocean. This metamorphosis typically occurs in the summer and complete by winter (USFWS 2019).

There is currently no consensus on if Pacific lamprey exhibit homing behavior to natal streams. There is evidence lamprey are attracted to water activated by larval pheromones but on a lesser scale than other lamprey species. This suggests there may be other factors guiding adult migrations (USFWS 2019).

Larval Pacific lamprey filter-feed from burrows in the river bottom. As adults in the marine environment, Pacific lampreys are parasitic and feed while attaching to a variety of fish, including Pacific salmon, flatfish, and rockfish, and are preyed upon by sharks, sea lions and other marine animals. Adult lamprey does not eat once they return to freshwater (USFWS 2019).

J.25.1. Status

The Pacific lamprey is not included in the Federal List of Threatened and Endangered Species but has been designated as a Species of Special Concern by California Department of Fish and Wildlife. A full species profile is available at the USFWS ECOS website

(https://ecos.fws.gov/ecp/species/1865), which includes all Federal Register publications related to the listing status review and applicable HCPs.

J.25.2. Distribution and Occurrence

The historical range of Pacific lamprey is widespread along the West Coast of North America but has constricted considerably throughout Oregon, Washington, Idaho, and California. In general, lampreys have a disjunct distribution south of San Luis Obispo County due to urbanization. A study of the 18 southern most drainages in California, Santa Maria south to Otay River, found Pacific lamprey in Malibu Creek and the Santa Clara River, but absent in 16 other drainages (Wells and Diana 1975). Hubbs (1967) reported "no evidence of any lamprey occurrence at any time in coastal streams south of the Los Angeles (USFWS 2003b). In 2016, USFWS found Pacific lamprey to be absent in watersheds south of Big Sur River but acknowledged that due to lack of targeted surveys and limited attention during salmonid surveys, little is known about their current distribution (Reed and Goodman 2016).

Historically, Pacific lamprey have seldom been found in the Santa Margarita River with the last known presence documented in 1940 (USFWS 2003b). From 2019-2021, Pacific lamprey ammocoetes were detected in the Santa Margarita River on Base between DeLuz Road and bridge and the Lake O'Neill weir and fish ladder. While there is evidence Pacific lamprey have begun repopulating a few coastal watersheds in California, this is the furthest south the species has been seen in decades (Reid and Goodman 2016, USFWS 2019). Additionally, the Base conducted a brief survey of Pacific lamprey in 2016 in a section of upper SMR with USFWS which resulted in the capture of seven ammocoetes.

J.25.3. Threats

Pacific Lamprey face a variety of threats to their various life history stages, and no single threat can be pinpointed as the primary reason for their decline. Threats include artificial barriers to migration, poor water quality, predation by native and nonnative species, stream and floodplain degradation, loss of estuarine habitat, decline in prey, ocean conditions, dredging, dewatering, and climate change (USFWS 2019).

J.25.4. Recovery Strategy Goals

No recovery plan or goals have been established for the Pacific lamprey. In 2015, USFWS (Arcata Office) published a Regional Implementation Plan for Measures to Conserve Pacific Lamprey (*Entosphenus tridentatus*), California – South Coast Regional Management Unit (Goodman and Reid 2015).

J.25.5. Management and Monitoring

Because the Pacific lamprey is only considered a Species of Special Concern, it receives no formal legal protection. However, non-discretionary programmatic instructions in the Riparian BO designed to enhance aquatic habitat on Base directly and/or indirectly benefit Pacific lamprey through the management of suitable habitat including estuaries, rivers, and creeks.

In addition, the Base has instituted measures for avoidance and minimization to wetland and freshwater habitats as specified in Camp Pendleton Base Order 3500.1 (*Range and Training Regulations*). These regulations and general precautions for range and training area users that limit impacts to natural resources. Restrictions specific to wetland and freshwater habitats are as follows:

- Prohibited driving within the main channel of rivers or creeks regardless of water level/presence.
- Training activities (e.g., bridging operations, engineering operations, construction of fighting positions, etc.) that may result in material being deposited or removed from rivers, creeks, wetland, drainages, arroyos, seasonally ponded areas, beaches, or estuaries.
- Vehicles operating in the vicinity of wetlands are authorized year-round and shall remain on existing roads, trails and crossings.
- Foot traffic is authorized year-round on existing roads, trails, and crossings.
- Foot traffic is prohibited in all coastal marshes from 1 March to 15 September and prohibited all year in the Santa Margarita Estuary and the mouth of Cocklebur Canyon.
- Off-road vehicular or foot traffic, excavations, and/or fill occurring in wetlands must be reviewed by ES and receive appropriate permits and approvals prior to conducting the action.

Freshwater fish inventory surveys to assess the presence and distribution of native freshwater fishes including lamprey has been funded for 2023. Annual aquatic exotic species removal benefits native freshwater species and their habitat. Information gathered from incidental capture during these surveys is intended to be used for development of protection and management measures if the species is proposed for listing as a threatened or endangered species in the future.

J.26. CALIFORNIA GRUNION (*LEURESTHES TENUIS*)

The California grunion is a member of the New World silversides (Atheriniopsids spp.) along with jacksmelt and topsmelt. Most grunion are between 5 and 6 in. long, with a maximum length of 7 in. An average one-year old male is 4½ in. long while the average one-year old female is 5 in. Few grunion live for more than three years (CDFW 2023).

FIGURE 26. CALIFORNIA GRUNION

California grunion are a unique recreational fishery, taken only during their characteristic spawning events, or runs. Grunion mature and spawn at around age one. During the spring and summer months, mature grunion leave the water to spawn on beaches for four consecutive nights, beginning on the nights of the full and new moons, during the highest tides of the month. Spawning occurs after high tides and continues for about two hours. After spawning, the grunion return to the ocean with the retreating waves. While the act of spawning may only take 30 seconds, some fish remain stranded on the beach for several minutes. (CDFW 2023).

Grunion food habits are not well known. They have no teeth, so they are presumed to feed on very small organisms. Shore birds, isopods, flies, sand worms, and beetles eat grunion eggs, while humans, larger fish, and other animals prey upon grunion (CDFW 2023).

J.26.1. Status

The California grunion is not included in the Federal List of Threatened and Endangered Species. Endemic to California, California grunion is a recreational fishery regulated by the California Department of Fish and Wildlife. A full species profile is available at the CDFW website (https://wildlife.ca.gov/fishing/ocean/grunion), which includes their annual expected run schedule and fishery regulations.

J.26.2. Distribution and Occurrence

The range of California grunion extend from Point Conception, California to Point Abreojos, Baja California, and are occasionally found as far north as Monterey Bay.

J.26.3. Threats

Despite local concentrations, grunion are not abundant. The most critical problem facing the grunion resource is the loss of spawning habitat caused by beach erosion, harbor

construction, and pollution. By the 1920s, the fishery was showing definite signs of depletion. A regulation was passed in 1927 establishing a closed season of three months, from April through June. The fishery improved, and in 1947 the closure was shortened to April through May. In 2022, the closure was again extended from April through June to better protect grunion during their peak spawning period, and a bag and possession limit of 30 fish was established (CDFW 2023).

J.26.4. Recovery Strategy Goals

No recovery plan or goals have been established for California grunion.

J.26.5. Management and Monitoring

Because the California grunion is a recreational sport fishery in the state of California, the state Department of Fish and Wildlife (CDFW) regulates take and make updates based on the latest available monitoring data. As of 2022, no take is allowed April through June and a bag limit of 30 was established to better protect grunion during their peak spawning period. During the open season, a fishing license is required for persons 16 years and older to capture grunion for sport using hands only. No holes may be dug in the beach to entrap them. State of California fishing regulations apply to all Base users. Both a state fishing license and a Base fishing permit are required for fishing.

Additionally, programmatic instructions and habitat management measures outlined in the Estuarine and Beach Ecosystem Conservation Plan of the Riparian BO indirectly benefit California grunion through the management of suitable beach habitat.

Camp Pendleton developed a Base Grunion Monitoring Plan to conduct seasonal surveys during peak grunion spawning nights March through July. Information on grunion population cannot be gathered by traditional fishing methods so beach spawning surveys are the primary way to monitor grunion populations. Data collected contribute to the state grunion monitoring and reporting which heavily relies on citizen science to assess, and report observed spawning on beaches.

Due to their unique beach spawning behavior, the California grunion has been identified as a key indicator species for central and southern California Marine Protected Areas and an indicator species for climate change. Grunion also serve as an indicator species for nearshore ecosystem health on MCB Camp Pendleton.

J.27. BELDING'S SAVANNAH SPARROW (*PASSERCULUS SANDWICHENSIS BELDINGI*)

The Belding's savannah sparrow is a small brown sparrow approximately 6 inches (14 cm) in length. It has fine streaking on the head and face, and a pale-beige to white belly, and often displays a dark central breast spot. It is like other subspecies of savannah sparrows, but is darker and heavily streaked on the back, breast, and sides.

FIGURE 27. BELDING'S SAVANNAH SPARROW

As with most ground-dwelling species, this bird is inconspicuous and blends well with its environment. The most distinguishing characteristic is the yellowish color of the lores (area between the bill and eyes). The Belding's savannah sparrow is one of four subspecies of savannah sparrows that are otherwise widely distributed and occur in a variety of habitat types, including grasslands, high-elevation meadows, and marshes. The Belding's savannah sparrow is unique in that it represents one of only two wetland-dependent avian species endemic to coastal salt marshes in southern California. This subspecies is a year-round resident of these salt marshes and is therefore reliant upon these habitats to meet all its life history requirements (USFWS 1998d).

J.27.1. Status

The Belding's savannah sparrow is not included in the Federal List of Threatened and Endangered Species but is covered by the MBTA. The species is state listed as endangered. The Belding's savannah sparrow is also a covered species in the North American Landbird Conservation Plan (Cornell Lab of Ornithology 2004), and the California Partners in Flight (CPIF) Draft Grassland Bird Conservation Plan (CPIF 2000).

J.27.2. Distribution and Occurrence

Belding's savannah sparrow is a nonmigratory subspecies of the savannah sparrow that is endemic to the coast of southern California and northern Baja California. It resides year-round in coastal salt marshes from Goleta Slough in Santa Barbara County to northern Baja California. Nesting occurs primarily in pickleweed habitat at the higher elevations of the salt marshes, above the reach of the highest spring tide. Total population size may fluctuate annually. A partial statewide survey was conducted in 1973, and the first statewide survey was done in 1977. Since 1986, statewide surveys have been undertaken at 5-year intervals. The latest statewide count was coordinated by CDFW in 2015. The 2015 census indicated

3,740 breeding pairs in 27 coastal salt marshes, the highest California state total reported since periodic counts began in 1973 (Zembal et al. 2015).

The Belding's savannah sparrow breeds from January through August and has been found at two locations on Camp Pendleton: Aliso Creek and the Santa Margarita River estuary. No breeding pairs have been observed at Aliso Creek since 2001, and the recent absence of sparrows at Aliso Creek has been attributed to disturbance and loss of habitat from military activities. The Santa Margarita Estuary, however, supported an estimated 100 breeding pairs in 2010 (Zembel and Hoffman 2010) and continues to provide suitable habitat for the species on-Base.

J.27.3. Threats

The only known threat to the continued existence of Belding's savannah sparrow in California continues to be the destruction or degradation of its salt-marsh habitat. Adverse impacts rangewide have included filling, dredging, and development of wetlands; loss of regular tidal connection with the ocean; and inconsistent tidal influence on upper marsh habitat. At least 75 percent of southern California's former coastal wetlands have been lost, and the remainder suffers ongoing degradation (CDFW 2002a). Ongoing concerns are flooding or other disruptions in the natural drainage of coastal wetlands because of upstream development or flood control; human disturbance, including trampling of marsh vegetation; and impact of exotic predators in marshes, especially from domestic cats and nonnative red foxes.

J.27.4. Recovery Strategy Goals

No recovery plan or goals have been established for the Belding's savannah sparrow.

J.27.5. Management and Monitoring

Although this species is not covered by the Estuarine and Beach Ecosystem Conservation Plan, Riparian Ecosystem Conservation Plan, or the Riparian BO, the programmatic instructions and habitat enhancement measures outlined in these plans and the BO directly and/or indirectly benefit the Belding's savannah sparrow through the management of occupied habitat, including Aliso Creek and the Santa Margarita River estuary.

The Base has also instituted measures for avoidance and minimization to Endangered Species Management Zones that include both Aliso Creek and the Santa Margarita Estuary. These measures are specified in Camp Pendleton Base Order P3500.1 (*Range and Training Regulations*), which prescribes regulations and general precautions for range and training area users that limit impacts to natural resources. The Base has identified Belding's savannah sparrow as high priority for Species of Regional Concern funding in the next five years.

J.28. BURROWING OWL (*ATHENE CUNICULARIA*)

The burrowing owl is a small owl 7.6 to 9.8 inches (19.5 to 25 cm) and weighs approximately 0.33 pounds (150 grams), with long slender tarsi covered with short hair-like feathers that terminate in sparse bristles on the feet. The head is rounded, lacks ear tufts, and is chocolate in color with white streaking or spotting. There are buffy-white margins around the eyes and a white throat patch. Juveniles are like adults but are unstreaked to lightly streaked, light to brownish buff below, and have more pale secondary coverts. The burrowing owl is the only North American strigiform not exhibiting reversed size dimorphism.

FIGURE 28. BURROWING OWL

Burrowing owls breed in grassland and open scrub using the burrows of small mammals or human-made substitutes such as pipes or culverts. Within southern California, the most used burrows are those created by California ground squirrels (*Otospermophilus beecheyi*). During the breeding season, eggs are produced from late March to mid-June, and fledglings are active through August. Within southern California, during winter months or the nonbreeding season generally 1 September through 31 January, there is an influx of migratory birds. Pairs are typically monogamous and lay seven to nine eggs per clutch. The female incubates the eggs, and the male is responsible for providing her with food during this period. The incubation period is from 21 to 28 days. Nestlings are altricial at hatching. The owlets open their eyes and begin to show evasive behavior at 5 days. At approximately 2 weeks of age, chicks will huddle around the entrance of the burrow to await food. Chicks can take short flights at 4 weeks of age and can fly well by 6 weeks of age. Fledging occurs at 44 days. The male does all the hunting while young require brooding. Females begin hunting as young become less dependent. Chicks are often relocated to "satellite" burrows to presumably reduce the risk of predation and possibly to avoid nest parasites. Dispersing young use satellite burrows in the vicinity of their natal burrows for about 2 months after hatching before departing the natal area. Burrowing owls typically raise one brood per year, but replacement clutches are often laid if the first attempt is lost.

Primary food sources are invertebrates, but they also forage on rodents, reptiles, amphibians and small birds.

J.28.1. Status

The burrowing owl is a Species of Special Concern by CDFW. A full species profile is available at the USFWS ECOS website (https://ecos.fws.gov/ecp/species/9737), which includes all Federal Register publications related to the listing history as well as applicable HCPs.

J.28.2. Distribution and Occurrence

Burrowing owls were once a common, locally abundant species throughout much of California and Arizona. By the 1940s, burrowing owls had become scarce in many portions of the southwest desert because of shooting and collapse of ground squirrel burrows. During the last 10 to 15 years, burrowing owls have been extirpated from approximately 8 percent of their former range including Sonoma, Marin, Santa Cruz, and Napa Counties.

Burrowing owls are widely distributed in proper habitat throughout the lowlands of the state, but rare along the coast north of Marin County and extremely rare east of the Sierra Nevada crest. Burrowing owls are common residents along the Lower Colorado River Valley and around the agricultural areas of the Imperial Valley. They are rare in the undisturbed desert areas of the eastern and southeastern portion of California. Breeding in central California has been reduced to only three isolated populations: the Central Valley, southern San Francisco Bay between Alameda and Redwood City, and near the Livermore area. Within San Diego County in 2003, there were approximately 25 to 30 resident pairs. In 2007, approximately 41 to 46 pairs were breeding within the county and there were approximately 148 to 168 resident birds (including breeding pairs and their offspring). These resident owls were joined by 50 to 100 migrants. The San Diego County owl breeding population has decreased approximately 90 percent from what it was 25 to 30 years ago. It then numbered in the hundreds of pairs, and, at the time of this symposium, it was reduced to perhaps 25 to 30 resident pairs. Even with the recently observed additional East Otay Mesa and Ramona Grasslands owls, there are not likely more than 46 pairs in the county.

The status of burrowing owl on Camp Pendleton has gone from breeding resident to occasional winter resident. In the 1970s, approximately 15 pairs were documented as breeding on-Base. This number dropped to two pair in the 1980s and the last pair was documented in 1994. Currently, the burrowing owl is considered a winter resident only; however, the last survey conducted December 2014 through January 2015 documented no burrowing owls. It's important to note that this survey was limited in scope and did not survey all suitable or potentially suitable habitat on-Base.

J.28.3. Threats

Throughout their range, burrowing owls are threatened by habitat loss, predation, vehicle impacts, and control programs for ground squirrels. Predators at burrows include snakes, raccoons, striped skunks, coyotes, and red foxes, as well as domestic cats and dogs. Various hawks, other owls, and American crows have also been seen as predators of adult and young owls.

The extirpation of burrowing owl as a breeding resident on-Base may have been caused by a variety of factors. These include land use changes from agriculture and cattle grazing to heavy tank training and off-road maneuvers that crush ground squirrel burrows and compact the soil. Cattle were historically grazed on Camp Pendleton; once the military eliminated cattle, the vegetation changed to permit tall nonnative grasses and sweet fennel to flourish. Increased military training activities coupled with vegetation changes led to increased fire activity. Occasional fires are useful in burrowing owl habitat and potentially positive as they open the habitat, but increased fire frequency can lead to a decrease in essential prey items. Consequently, the habitat on-Base has become less conducive to breeding.

J.28.4. Recovery Strategy Goals

No recovery plan or goals are available for the burrowing owl.

J.28.5. Management and Monitoring

The Base collects records of anecdotal sightings of burrowing owls, which have only occurred in winter since their extirpation. However, if any new sightings occur in during the breeding season, then the Base will conduct a follow-up survey of the sight and reconsider another breeding season survey for burrowing owls.

J.29. PEREGRINE FALCON (*FALCO PEREGRINUS ANATUM*)

FIGURE 29. PEREGRINE FALCON

The peregrine falcon has long pointed wings with a wingspan of approximately 3 feet (1 m), which form a sickle-shaped silhouette when extended in flight. The species typically weighs just over 2 pounds (907.2 grams). Adults have a dark grey back, cheeks, and crown, and dark bars or streaks on their pale chest and abdomen. Females and males are identical in appearance; however, the female can be a third larger. Immature peregrines are buff-colored in front and have dark-brown backs. The peregrine falcon feeds primarily on other birds, such as songbirds, shorebirds, and ducks, and in urban areas, starlings, and pigeons. Unique to this species is the notched beak used to efficiently kill prey; they capture prey by flying high above and then stoop-diving, striking in mid-air, and killing with a swift sharp-blow typically by severing the spinal column at the neck.

J.29.1. Status

The peregrine falcon was officially delisted from the Federal Threatened and Endangered Species List on 25 August 1999. However, it is protected by the MBTA. A full species profile is available at the USFWS ECOS website (https://ecos.fws.gov/ecp/species/8831), which includes all Federal Register publications related to the listing/delisting history and recovery, as well as applicable HCPs.

The peregrine falcon was delisted from the California Threatened and Endangered Species List on 4 November 2009, and removed from the fully protected species list under the California Fish and Game Code in 2023.

J.29.2. Distribution and Occurrence

In North America, peregrine falcons occur in mountains, valleys, and along the coastline, from the Arctic tundra down to Mexico. By the mid-1960s there were no peregrine falcons in the eastern United States. The decline spread westward and, by the 1970s, western populations had declined by 90 percent. The peregrine falcon disappeared as a breeding species from southern California and in many other parts of the western United States,

southern Canada, and the Northwest Territories. Beginning in 1974, various states, provinces, and national agencies in both Canada and the United States put forth great efforts for the recovery of the peregrine falcon. Since 1977, over 2,700 peregrine falcons were released in the western United States (Tarski 2001). In 1998, the total known breeding population of peregrine falcons was 1,650 pairs in the United States and Canada (USFWS 1999). Since their federal delisting in 1999, the U.S. population has grown from 1,750 pairs to 3,005 pairs in 2003 (USFWS 2006).

Peregrine falcons can be seen on Camp Pendleton at any time of the year. During several years, peregrine falcon pairs have been observed occupying a nesting site in the Ysidora Basin cliffs that overlooked the Santa Margarita River. Occasionally, the peregrine falcon can be seen using the mouths of the Santa Margarita River, and the San Mateo and San Onofre Creeks to forage. Breeding season begins early March to late August. Individuals that breed in the north migrate into California for the winter. Peregrine falcon that have been trapped and relocated to the Oregon state border with California to protect listed shorebirds on Base often return within days or weeks.

J.29.3. Threats

The decline in the peregrine falcon population is attributed to environmental contaminants primarily dichlorodiphenyltrichloroethane (DDT) polybrominated diphenyl ethers (PBDEs), polychlorinated biphenyls (PCBs), and various metal contaminants. Pesticide biomagnification caused organochlorine to build up in the species' fat tissues, reducing the amount of calcium in their eggshells; with thinner shells, significantly fewer falcon eggs survived to hatching. Electrocution, human disturbance, and degradation of suitable nesting and foraging habitats also contributed to their rangewide population decline. Currently, their recovered population is considered secure and vital throughout the United States (USFWS 2006).

J.29.4. Management and Monitoring

Although this species is not covered by the Estuarine and Beach Ecosystem Conservation Plan, Riparian Ecosystem Conservation Plan, or the Riparian BO, the programmatic instructions and habitat enhancement measures outlined in these plans and the BO directly and/or indirectly benefit the peregrine falcon through the management of suitable foraging and nesting areas.

J.30. TRICOLORED BLACKBIRD (*AGELAIUS TRICOLOR*)

The tricolored blackbird is a medium-sized passerine, ranging in size from 7 to 9.5 inches (18 to 24 cm) in length. This species closely resembles its near-relative, the red-winged blackbird (*Agelaius phoeniceus*), except adult males of the tricolored blackbird are black with red with white edges rather than yellow on the wing shoulder. Adult females are sooty brown-black with distinct grayish streaks, a relatively white chin and throat, and a smaller reddish shoulder-patch.

FIGURE 30. TRICOLORED BLACKBIRD

J.30.1. Status

The tricolored blackbird is not included in the Federal List of Threatened and Endangered Species but listing status is under review by USFWS. A full species profile is available at the USFWS ECOS website (https://ecos.fws.gov/ecp/species/3910), which includes all Federal Register publications related to the listing review and applicable HCPs. This species is also protected under the MBTA.

The tricolored blackbird is a state Species of Special Concern and was given emergency endangered status under the California Endangered Species Act in December 2014, which provided temporary protection, but was allowed to expire in June 2015. In August 2015, the Center for Biological Diversity submitted a petition to the California Fish and Game Commission to formally list the tricolored blackbird as a threatened or endangered species. CDFW requested input from the public between March and June 2016. The petition is still under review (CDFW 2016).

J.30.2. Distribution and Occurrence

The tricolored blackbird occurs in California, Oregon, Nevada, Washington, and Baja California. The species mainly occurs in the lowlands of California west of the Sierra Nevada. Most tricolored blackbirds breed in California's Central Valley. The most favored sites for colonies are heavy growths of cattails and bulrushes, though other vegetation including sedges, nettles, willows, thistles, mustard, blackberry, wild rose, and tall grass may be resorted to for nesting (CDFW 2015). In recent years, some of the largest colonies have occurred in grain fields in the San Joaquin Valley, particularly in agricultural areas (American Bird Conservancy 2016).

Tricolored blackbirds form the largest colonies of any North American land bird, with a single breeding colony often numbering tens of thousands of birds. Breeding typically occurs between April and July. The female builds an open cup nest woven out of vegetation. Four eggs are typically laid during a first nesting and second nest attempts, with clutches of three or more eggs, are common (American Bird Conservancy 2016).

Tricolored blackbirds have been detected on-Base and have historically nested near the Base. There are no breeding records on-Base, however.

J.30.3. Threats

Loss of breeding habitat to urban expansion and changes in agricultural land uses and loss of foraging habitat are considered the primary threats to tricolored blackbirds. Use by the tricolored blackbird of agricultural fields, where reproduction often fails due to human activities and to increased predation, another factor contributing to the population decline (CDFW 2015).

Because of the severe, ongoing drought in California, tricolored blackbirds have increasingly turned to nesting in agricultural silage fields, which now hold a significant proportion of the breeding population. Harvesting often occurs when the chicks are just beginning to fledge, which severely limits nesting success. Lack of insect prey and water nearby can also severely limit colony productivity (American Bird Conservancy 2016).

J.30.4. Recovery Strategy Goals

No recovery plan or goals have been established for the tricolored blackbird.

J.30.5. Management and Monitoring

Although this species is not covered by the Estuarine and Beach Ecosystem Conservation Plan, Riparian Ecosystem Conservation Plan, or the Riparian BO, the programmatic instructions and habitat enhancement measures outlined in these plans and the BO directly and/or indirectly benefit the tricolored blackbird through the management of suitable foraging habitat.

Plants

In the below discussion, populations for Pendleton button-celery and Nuttall's acmispon use the 7-meter mapping rule and populations for Brand's phacelia use the 4-meter mapping rule. For example, all Pendleton button-celery plants that are within 7 meters of each other would be considered one population. This definition of population was developed by the Base and

represents a method to define boundaries of groupings of individuals and is not necessarily a biological distinction. An occurrence are all plants of the same species that are within a quarter-mile of each other and this is the same as the California Natural Diversity Database's definition of Element Occurrence**.**

J.31. PENDLETON BUTTON-CELERY (*ERYNGIUM PENDLETONENSE*)

FIGURE 31. PENDLETON BUTTON-CELERY

Pendleton button-celery, a member of the carrot family (Apiaceae), is a perennial herb with sprawling stems up to 7.8 inches (20 cm) long. The main stem is branched and has leaves that are 3.1 to 9.8 inches (8 to 25 cm) long. The inflorescences are heads in cymes with nine to 19 flowers per inflorescence. The flowers bloom from April through July. Pendleton button-celery is unique among the rare and sensitive plant species on-Base, as it is only known to occur on Camp Pendleton. Habitat for Pendleton button-celery includes clay and vernally mesic soils in areas containing coastal bluff scrub, valley and foothill grasslands, and vernal pools at less than 164 feet (50 m) above sea level (Dudek and Associates 2006).

J.31.1. Status

Pendleton button-celery is not federally, or state listed.

J.31.2. Distribution and Occurrence

Pendleton button-celery is unique among the rare and sensitive plant species on-Base, as it is only known to occur on Camp Pendleton (Marsden and Simpson 1999). Pendleton button-celery was first identified on 13 June 1992 and was described as a new species in 1999. Pendleton button-celery was distinguished from the more widespread San Diego button-celery, a federally endangered listed species that also occurs on Camp Pendleton. The Base has conducted inventories in all potential habitat and by the end of 2021 has identified 1,224 populations in 10 occurrences with 455,417 individual plants, totaling approximately 65.70 acres. New Pendleton button-celery populations are typically found each year, while other

populations occasionally merge due to Pendleton button-celery plants being mapped between two nearby populations.

J.31.3. Threats

Pendleton button-celery is vulnerable to many threats, including introduction of invasive plant species, changes in habitat hydrology, erosion, road maintenance, climate change and drought, and military training activities such as fighting position digging, foot traffic and off-road vehicle use.

J.31.4. Recovery Strategy Goals

Pendleton button-celery is included in the Camp Pendleton Rare Plant Management Plan (Camp Pendleton 2017). The goal for Pendleton button-celery in the Rare Plant Management Plan is to manage Pendleton button-celery populations to be self-sustaining and to avoid losing populations to human disturbance.

J.31.5. Management and Monitoring

The Base has inventoried all potential habitat and determined distribution and abundance. The Base has also collected in-depth phenology and density information.

The Camp Pendleton Rare Plant Management Plan lists the following management actions for Pendleton button-celery: (1) manage invasive species that are impairing Pendleton button-celery; (2) include this species in NEPA assessments to avoid, if possible, and if plants cannot be avoided, populations will be replaced at a 1:1 ratio; (3) utilize a no net loss approach to populations, and if a population is lost due to anthropogenic reasons, the population will be replaced; (4) establish new populations lost by training, anthropogenic causes, and NEPA actions; (5) to offset potential losses, add 10 new populations with at least 10 individuals each in historical agriculture areas by Year 5 of this Plan; (6) use ongoing wildfire mapping database to investigate the connection between fire and observed populations, while considering the influence of varying precipitation, and if populations are found negatively affected by fire, then adjust future management to address this threat; and (7) reanalyze the species using the Five-Point Policy at Year 10 to determine if it continues to support the species not being federally listed.

The following four monitoring objectives were identified in the Camp Pendleton Rare Plant Management Plan for Pendleton button-celery: (1) use a sampling strategy over the life of the Plan to demonstrate that populations are self-sustaining and stable; (2) determine whether human activity causes a significant decline or extirpation of populations of non-listed rare plants in this Plan not covered by the Range Regulations; and (3) monitor for success of new populations.

The Rare Plant Management Plan has been implemented and the first year of monitoring began in 2019. All information gained from monitoring and management activities will be provided to USFWS to avoid federal listing under the ESA.

J.32. BRAND'S STAR PHACELIA (*PHACELIA STELLARIS*)

FIGURE 32. BRAND'S STAR PHACELIA

Brand's star phacelia is an herbaceous annual in the Hydrophyllaceae (waterleaf) subfamily of the Boraginaceae family of flowering plants. The species is spreading to erect ranging from 2.5 to 10 inches (6.4 to 25.4 cm) tall. Leaves are basal, deeply lobed, and 0.2 to 3 inches (0.5 to 7.6 cm) long. The lower pedicels are recurved, and usually longer than the upper ones. The calyx lobes are 0.11 to 0.16 inch (3 to 4 mm) long when in flower, and 0.2 to 0.31 inch (5 to 8 mm) long when in fruit. This species of the genus *Phacelia* is distinguished from other similar taxa by its annual habit, pinnately deeply lobed leaves, calyx lobes that are 0.11 to 0.16 inch 3 to 4 mm long, small less than 0.2 inch (5 mm) usually deciduous corollas, corolla scales 0.02 inch (0.5 mm) or less in length, and its coarsely pitted seeds (USFWS 2004).

J.32.1. Status

Brand's phacelia was removed as a candidate for federal listing by USFWS on 22 November 2013 (78 Federal Register 70104). A full species profile is available at the USFWS ECOS website (https://ecos.fws.gov/ecp/species/7084), which includes all Federal Register publications related to the listing history, applicable HCPs, and the Candidate Conservation Agreement.

Brand's star is not listed by the state as endangered or threatened.

J.32.2. Distribution and Occurrence

Brand's star phacelia is an annual whose population varies yearly depending upon environmental conditions at each known location. It primarily occurs within coastal dunes

and sandy washes in Diegan sage scrub habitat, and is a sensitive plant associated with the southern foredune community. This species was historically found in Los Angeles, Riverside, and San Diego Counties, and in coastal northern Baja California, Mexico. A significant portion of the linear extent of the coastal occurrences of this species has been lost to urbanization and habitat degradation. Extant populations occur on Naval Base Coronado, Silver Strand State Beach, and Lichty Mesa in San Diego County and on Riverside County park lands, adjacent to the Santa Ana River. Two populations may remain in Mexico, although one has not been verified since 1975.

Brand's star phacelia was discovered on Camp Pendleton in 1993 during a rare plant survey of the Santa Margarita Dunes. Prior to this study, there was no record of Brand's star phacelia north of the Silver Strand State Beach (10 miles (16.1 km) north of the U.S./Mexican border). This small new population was found just along the eastern fence line of the North Spit of the mouth of the Santa Margarita River (Blue Beach), and it represented a northern range extension of 45 miles (72.4 km) for this species. Since the distribution of Brand's star phacelia is very limited, the new population was noted as being of extremely high biological significance (Garcia, 1996). The site supported 88 plants in three subpopulations over an area of 376.7 square feet (35 square meters [m^2]). Since the initial discovery of Brand's star phacelia in 1993, the Base has made annual efforts to estimate the size and area occupied by this species. The trend has been an increase in number of individuals, with the highest estimate on record in 2020 at 103,936, which corresponded to above average rainfall (17.73 inches). The population count declined from the peak in 2021 (22,862) and rebounded partially in 2022 (61,367), corresponding with below average precipitation years. Survey timing influences accuracy of population estimates, with February-March corresponding to peak detectability. The area occupied by Brand's phacelia has remained relatively stable .25-.4 acres (.1-.16 ha)], indicating seed dispersal is limited for this species.

J.32.3. Threats

Threats to this species are primarily from existing and potential destruction, modification, and/or curtailment of its habitat or range. A significant portion of the linear extent of this species coastal habitat, sandy washes and dune in the Diegan sage scrub, has been lost to urbanization and habitat degradation. Additional threats to this species include trampling or habitat degradation by foot, equestrian and vehicular traffic, and the invasive spread of nonnative plants (e.g., highway ice plant [*Carpobrotus edulis*] and sea fig [*Carpobrotus chilensis*]) (USFWS 2004; NatureServe 2009).

Brand's star phacelia is closely related to *Phacelia douglasii* and *Phacelia insularis*, and it is suggested that, in at least part of its range, Brand's star phacelia has hybridized with one or both of these species to produce "intermediates" (NatureServe 2006). Although hybridization with other species within the genus will ultimately cause genetic degradation

of the listed species over time (NatureServe 2006), hybridization can play an important role in evolutionary biology.

J.32.4. Recovery Strategy Goals

No recovery plans or goals are available for Brand's star phacelia.

J.32.5. Management and Monitoring

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

To meet this objective, the Base inventoried the lower Santa Margarita River for new populations, monitoring all known populations, and collected data on the species phenology for the duration of the CCA (2018). Habitat enhancement has and will also be conducted in occupied habitat. The Base will coordinate annually with other CCA members to write a combined yearly report documenting progress made implementing the plan. The CCA was updated in 2021 and the Base agreed to implement invasive plant control on an annual basis, monitor the species every year, and attempt to establish another population in the southern Blue Beach tern enclosure for the duration of the agreement (2021-2026; USFWS 2021).

J.33. NUTTALL'S ACMISPON (*ACMISPON PROSTRATUS*)

Nuttall's acmispon is a low-growing taprooted annual herb in the pea family (Fabaceae). Nuttall's acmispon has a slender branching stem that is typically prostrate and grows 23 to 31 inches (60 to 80 cm) long. Leaves of Nuttall's acmispon are dissected with three to six

leaflets that are 0.1 to 0.4 inch (3 to 10 mm) in length. The umbel-shaped flower clusters of Nuttall's acmispon are composed of three to eight yellow-red flowers that bloom from March through June. Fruits are in the form of slender two-seeded pods that are 0.4 to 0.6 inch (1 to 1.5 cm) long. The presence of Nuttall's acmispon is strongly correlated with sandy soils that are located near the coast. This narrow endemic plant persists in small, isolated occurrences that are associated with coastal dunes and coastal scrub habitats at elevations less than 30.3 feet (<10 m) (AMEC 2007).

FIGURE 33. NUTTALL'S ACMISPON

J.33.1. Status

Nuttall's acmispon is not federally or state listed.

J.33.2. Distribution and Occurrence

The presence of Nuttall's acmispon is strongly correlated with sandy soils located near the coast, within coastal dunes and coastal scrub habitats at elevations of less than 30.3 feet (10 meters). These sites occur near the mouths of lagoons and major stream courses along the coast of central San Diego County, around Mission Bay, around San Diego Bay, along the Silver Strand, and near the border with Mexico (MCBCP 2017).

Nuttall's acmispon is known to occur on the coastal area at the southern end of the Base, adjacent to the Del Mar South Jetty and within the Blue Beach Training Area. A total of 86 Nuttall's acmispon populations were observed on-Base in 2017 (MCBCP 2017). There were 75 Nuttall's acmispon populations mapped on-Base following the 2021 surveys. The populations have declined with only 33 populations relocated in 2019 and 19 populations in 2021 (Camp Pendleton rare plant geodatabase June 2023).

J.33.3. Threats

Threats to this species are primarily from existing and potential destruction, modification, and/or curtailment of its habitat or range. In addition to urbanization, threats to this species

include trampling or habitat degradation by foot, equestrian and vehicular traffic, and the invasive spread of nonnative plants (AMEC, 2007).

J.33.4. Recovery Strategy Goals

Nuttall's acmispon is included in the Camp Pendleton Rare Plant Management Plan (MCBCP 2017). The goal for Nuttall's acmispon in the Rare Plant Management Plan is to manage Nuttall's acmispon populations to be self-sustaining so the species does not require federal listing and to manage for no net loss of populations as a result of anthropogenic causes.

J.33.5. Management and Monitoring

The Base will inventory all potential habitat to determine distribution, abundance, and phenology of Nuttall's acmispon. The Base has been managing for no net loss of populations due to military training or anthropogenic causes and has attempted to establish new populations north of the described range. At least one successful population was established in restored dune habitat on White Beach Training Area. All information gained from monitoring and management activities will be provided to USFWS to avoid federal listing under the ESA.

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Appendix K

State Listed and Other Species of Special Concern on MCB Camp Pendleton

Table K-1
Federal and State Listed Wildlife Species Occurring on Marine Corps Base Camp Pendleton

Common Name in Alphabetical Order	Scientific Name	Conservation Listing Status			Ecosystem	
		Federal	State	Other	Terrestrial Upland	Wetland, Aquatic, and Marine
Invertebrates						
Riverside Fairy Shrimp	*Streptocephalus woottoni*	FE				X
San Diego Fairy Shrimp	*Branchinecta sandiegonensis*	FE				X
Fish						
Southern California Steelhead Southern California DPS	*Oncorhynchus mykiss irideus*	FE	SC			X
Southern Tidewater Goby	*Eucyclogobius kristinae*	FE				X
Amphibians						
Arroyo Toad	*Anaxyrus californicus*	FE			X	X
Coast Range Newt	*Taricha torosa torosa*		CSSC			X
Western Spadefoot	*Spea hammondii*	FC	CSSC		X	X
Reptiles						
Belding's Orange-throated Whiptail	*Aspidoscelis hyperythra beldingi*			USFS	X	
Blainville's Horned Lizard	*Phrynosoma blainvillii*		CP, CSSC	USFS	X	
California Glossy Snake	*Arizona elegans occidentalis*		CP, CSSC		X	
Coast Patch-nosed Snake	*Salvadora hexalepis virgultea*		CSSC		X	
Southwestern Pond Turtle	*Actinemys pallida*	FC	CSSC	USFS		X
Red Diamond Rattlesnake	*Crotalus ruber*		CSSC		X	
Rosy Boa	*Lichanura orcutti*			USFS	X	
San Diegan Legless Lizard	*Anniella stebbinsi*		CSSC	USFS	X	
San Diego Banded Gecko	*Coleonyx variegatus abbotti*		CCSC		X	
San Diego Ring-necked Snake	*Diadophis punctatus similis*			USFS	X	
South Coast Garter Snake	*Thamnophis sirtalis* ssp.nov.		CSSC			X
Two-striped Garter Snake	*Thamnophis hammondi*		CSSC	USFS	X	X
Birds						
American Peregrine Falcon	*Falco peregrinus anatum*			MBTA	X	X
American White Pelican	*Pelecanus erythrorhynchos*		CSSC	MBTA		X
Baird's Sandpiper	*Calidris bairdii*		CSSC	MBTA		X
Bald Eagle	*Haliaeetus leucocephalus*		SE, CFP	BGEPA		X
Bank Swallow	*Riparia riparia*		ST	MBTA		X
Bell's Sage Sparrow	*Amphispiza belli belli*		CSSC	MBTA	X	

Common Name in Alphabetical Order	Scientific Name	Conservation Listing Status			Ecosystem	
		Federal	State	Other	Terrestrial Upland	Wetland, Aquatic, and Marine
Belding's Savannah Sparrow	*Passerculus sandwichensis beldingi*		SE	MBTA	X	X
Black Skimmer	*Rynchops nigra*		CSSC	MBTA		X
Black Tern	*Chlidonias niger*		CSSC	MBTA		X
Burrowing Owl	*Athene cunicularia*		CSSC	MBTA	X	
California Brown Pelican	*Pelecanus occidentalis californicus*		SD	MBTA		X
California Horned Lark	*Eremophila alpestris actia*		CSSC	MBTA	X	
California Gull	*Larus californicus*		CSSC	MBTA		X
California Least Tern	*Sterna antillarum browni*	FE	SE	MBTA		X
Coastal Cactus Wren	*Campylorhynchus brunneicapillus sandiegoense*		CSSC	USFS, MBTA	X	
Coastal California Gnatcatcher	*Polioptila californica californica*	FT	CSSC	MBTA	X	
Common Loon	*Gavia immer*		CSSC	MBTA		X
Cooper's Hawk	*Accipiter cooperii*		CSSC	MBTA	X	
Double-crested Cormorant	*Phalacrocorax auritus*		CSSC	MBTA		X
Elegant Tern	*Sterna elegans*		CSSC	MBTA		X
Ferruginous Hawk	*Buteo regalis*		CSSC	MBTA	X	X
Golden Eagle	*Aquila chrysaetos*		CFP, CSSC	BGEPA	X	
Hooded Oriole	*Icterus cucullatus*		CSSC	MBTA	X	
Least Bell's Vireo	*Vireo bellii pusillus*	FE	SE	MBTA		X
Least Bittern	*Ixobrychus exilis*		CSSC	MBTA		X
Light-footed Ridgway's Rail	*Rallus obsoletus levipes*	FE	SE	MBTA		X
Loggerhead Shrike	*Lanius ludovicianus*		CSSC	MBTA	X	
Long-billed Curlew	*Numenius americanus*		CSSC	MBTA	X	X
Long-eared Owl	*Asio otus*		CSSC	MBTA	X	
Merlin	*Falco columbarius*		CSSC	MBTA		X
Northern Harrier	*Circus cyaneus*		CSSC	MBTA	X	X
Osprey	*Pandion haliaetus*		CSSC	MBTA		X
Prairie Falcon	*Falco mexicanus*		CSSC	MBTA	X	
Purple Martin	*Progne subis*		CSSC	MBTA		X
Sharp-shinned Hawk	*Accipiter striatus*		CSSC	MBTA	X	
Short-eared Owl	*Asio flammeus*		CSSC	MBTA	X	X
Southern California Rufous-crowned Sparrow	*Aimophila ruficeps canescens*		CSSC	MBTA	X	
Southwestern Willow Flycatcher	*Empidonax traillii extimus*	FE	SE	MBTA, USFS		X
Swainson's Hawk	*Buteo swainsoni*		ST	MBTA	X	

Common Name in Alphabetical Order	Scientific Name	Conservation Listing Status			Ecosystem	
		Federal	State	Other	Terrestrial Upland	Wetland, Aquatic, and Marine
Tricolored Blackbird	*Agelaius tricolor*		ST	MBTA	X	X
Vaux's Swift	*Chaetura vauxi*		CSSC	MBTA	X	
Western Snowy Plover	*Charadrius alexandrinus nivosus*	FT	CSSC	MBTA		X
White-faced Ibis	*Plegadis chihi*		CSSC	MBTA		X
White-tailed Kite	*Elanus leucurus*		CFP	MBTA	X	X
Wood Stork	*Mycteria americana*		CSSC	MBTA		X
Yellow-billed Cuckoo Western DPS	*Coccyzus americanus*	FT	SE	MBTA, USFS		X
Yellow Warbler	*Dendroica petechia*		CSSC	MBTA		X
Mammals						
American Badger	*Taxidea taxus*		CSSC		X	
California Sea Lion	*Zalophus californianus*		CP	MMPA		X
Dulzura (California) Pocket Mouse	*Chaetodipus californicus femoralis*		CSSC		X	
Mountain Lion Southern California/Central Coast ESU	*Puma concolor*		SC		X	
Northern Elephant Seal	*Mirounga angustirostris*		CP, CFP	MMPA		X
Pallid Bat	*Antrozous pallidus*		CSSC		X	
Pacific Pocket Mouse	*Perognathus longimembris pacificus*	FE			X	
San Diego Black-tailed Jackrabbit	*Lepus californicus bennettii*		CSSC		X	
Bryant's Woodrat	*Neotoma bryanti intermedia*		CSSC		X	
Stephens' Kangaroo Rat	*Dipodomys stephensi*	FT	ST		X	
Western Mastiff Bat	*Eumops perotis californicus*		CSSC		X	
Western Red Bat	*Lasiurus blossevillii*		CSSC		X	
Yuma Myotis	*Myotis yumanensis*		CSSC		X	

FC = Federal Candidate FE = Federally Endangered FT = Federally Threatened MBTA = Migratory Bird Treaty Act MMPA= Marine Mammal Protection Act
SC = State Candidate SD = State Delisted SE = State Endangered ST = State Threatened
CP = California Protected CFP = California Fully Protected CSSC = California Species of Special Concern
USFS = U.S. Forest Service Sensitive Species

Table K-2
Listed and Other Rare Plants Occurring on Marine Corps Base Camp Pendleton
29 June 2017

Scientific Name	Common Name	Fed[1]	State[2]	CNPS[3]	State Rank[4]	Global Rank[4]	Populations Per Mapping Rule[5]	Occurrences Per 0.25-Mile Rule	Individuals	Acres Occupied[6]
Abronia maritima	red sand-verbena		SP	4.2	S3S4	G4	429	14	4,396	8.919657
Abronia villosa var. aurita	chaparral sand-verbena		SP	1B.1	S2	G5T2T3	178	13	3,991	10.46695
Acmispon prostratus	Nuttall's acmispon		SP	1B.1	S1	G1G2	86	3	15,886	12.27059
Aphanisma blitoides	Aphanisma		SP	1B.2	S3	G3G4	5	4	183	0.020837
Arctostaphylos rainbowensis	Rainbow manzanita		SP	1B.1	S2	G2	32	12	73	12.152735
Artemisia palmeri	San Diego sagewort		SP	4.2	S3?	G3G4	2	2	3	0.000144
Asplenium vespertinum	western spleenwort		SP	4.2	S4	G4	2	1	5	0.000144
Atriplex coulteri	Coulter's saltbush		SP	1B.2	S1S2	G3	124	24	9,613	1.151358
Atriplex pacifica	South Coast saltscale		SP	1B.2	S2	G4	1	1	1	0.000072
Baccharis vanessae	Encinitas baccharis	FT	SE	1B.1	S1	G1	39	4	223	4.292283
Bahiopsis laciniata (=Viguiera laciniata)	San Diego County viguiera		SP	4.2	S4	G4	51	7	21,949	138.456496
Brodiaea filifolia	thread-leaved brodiaea	FT	SE	1B.1	S2	G2	397	52	316,130	81.931282
Brodiaea orcuttii	Orcutt's brodiaea		SP	1B.1	S2	G2	4	2	235	0.059205
Calandrinia breweri	Brewer's calandrinia		SP	4.2	S4	G4	4	4	14	0.000287
Calochortus catalinae	Catalina mariposa lily		SP	4.2	S4	G4	2	1	55	0.000144
Calystegia soldanella	beach morning-glory			CBR			26	12	1,454	0.320507
Camissoniopsis lewisii	Lewis' evening-primrose		SP	3	S4	G4	74	13	24,148	4.974117
Caulanthus simulans	Payson's jewel-flower		SP	4.2	S4	G4	3	3	890	48.63913
Centromadia parryi ssp. australis	southern tarplant		SP	1B.1	S2	G3T2	1	1	1	0.000072
Centromadia pungens ssp. laevis	smooth tarplant		SP	1B.1	S2	G3G4T2	1	1	1	0.000072
Chamaebatia australis	southern mountain misery		SP	4.2	S4	G4	4	2	324	2.181155
Chorizanthe polygonoides var. longispina	knotweed spineflower; long-spined spineflower		SP	1B.2	S3	G5T3	Checklist Only	Checklist Only	Checklist Only	Checklist Only
Cistanthe maritima	seaside cistanthe		SP	4.2	S3	G3G4	2	2	120	1.99756

Scientific Name	Common Name	Fed[1]	State[2]	CNPS[3]	State Rank[4]	Global Rank[4]	Populations Per Mapping Rule[5]	Occurrences Per 0.25-Mile Rule	Individuals	Acres Occupied[6]
Comarostaphylis diversifolia ssp. diversifolia	summer-holly		SP	1B.2	S2	G3T2	5	4	33	0.00036
Convolvulus simulans	small-flowered morning-glory		SP	4.2	S4	G4	6	2	2,721	0.162196
Deinandra paniculata	paniculate tarplant		SP	4.2	S4	G4	176	29	44,073	21.77742
Dichondra occidentalis	western dichondra		SP	4.2	S3S4	G3G4	287	41	66,941	191.7379
Dudleya blochmaniae ssp. blochmaniae	Blochman's dudleya		SP	1B.1	S2	G2T2	237	17	278,784	35.20479
Dudleya multicaulis	many-stemmed dudleya		SP	1B.2	S2	G2	175	29	54,204	81.76269
Dudleya variegata	variegated dudleya		SP	1B.2	S2	G2	1	1	1	0.000072
Dudleya viscida	sticky dudleya		SP	1B.2	S2	G2	29	7	214,106	152.5145
Eriogonum giganteum var. giganteum*	Santa Catalina Island buckwheat		SP*	4.3*	S3*	G3T3*	Checklist Only	Checklist Only	Checklist Only	Checklist Only
Eryngium aristulatum var. parishii	San Diego button-celery	FE	SE	1B.1	S1	G5T1	80 VPs	4	34,793	0.911788
Eryngium pendletonense	Pendleton button-celery		SP	1B.1	S1	G1	1243	10	69,237	60.88904
Erysimum aff. ammophilum	sand-loving wallflower		SP	1B.2	S2	G2	35	8	41,082	65.09291
Harpagonella palmeri	Palmer's grapplinghook		SP	4.2	S3	G4	38	16	9910	6.561765
Holocarpha virgata ssp. elongata	graceful tarplant		SP	4.2	S3	G5T3	1680	5	79,652	34.75062
Hordeum intercedens	vernal barley		SP	3.2	S3S4	G3G4	35	16	392	14.16367
Horkelia cuneata ssp. puberula [ssp. per Jon Rebman; var. per CNPS]	mesa horkelia		SP	1B.1	S1	G4T1	3	2	20	0.000215
Horkelia truncata	Ramona horkelia		SP	1B.3	S3	G3	35	1	5,449	40.09454
Isocoma menziesii var. decumbens	decumbent goldenbush		SP	1B.2	S2	G3G5T2T3	73	13	110	0.380674
Iva hayesiana	San Diego marsh-elder		SP	2B.2	S2	G3?	4	3	5	0.000287
Juncus acutus ssp. leopoldii	southwestern spiny rush		SP	4.2	S4	G5T5	48	8	845	2.238724
Lasthenia glabrata ssp. coulteri	Coulter's goldfields		SP	1B.1	S2	G4T2	1	1	1	0.000072
Lepidium virginicum var. robinsonii	Robinson's pepper-grass		SP	4.3	S3	G5T3	8	8	175	0.000574

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Leptosyne maritima	sea dahlia		SP	2B.2	S1	G2	14	4	1,399	0.806029
Lilium humboldtii ssp. ocellatum	ocellated Humboldt lily		SP	4.2	S3	G4T3	20	8	77	11.11152
Lycium californicum	California box-thorn		SP	4.2	S4	G4	224	22	6,370	12.88866
Microseris douglasii ssp. platycarpha	small-flowered microseris		SP	4.2	S4	G4T4	70	11	1,766	4.421232
Monardella hypoleuca ssp. intermedia	intermediate monardella		SP	1B.3	S2S3	G4T2T3	8	6	1,542	0.140928
Myosurus minimus ssp. apus	little mousetail		SP	3.1	S2	G5T2Q	43 VPs	10	527	0.012245
Navarretia fossalis	spreading navarretia	FT	SP	1B.1	S2	G2	27 VPs	7	7,074	0.133592
Navarretia prostrata	prostrate vernal pool navarretia		SP	1B.1	S2	G2	1	1	1	0.086571
Nemacaulis denudata var. denudata	coast woolly-heads		SP	1B.2	S2	G3G4T2	83	3	1,463,926	30.22436
Nolina cismontana	chaparral nolina		SP	1B.2	S3	G3	7	2	176	0.574354
Ophioglossum californicum	California adder's-tongue		SP	4.2	S4	G4	2	1	130	0.000144
Orobanche parishii ssp. brachyloba	short-lobed broomrape		SP	4.2	S3	G4?T4	1	1	1	0.000072
Pentachaeta aurea ssp. aurea	golden-rayed pentachaeta		SP	4.2	S3	G4T3	2	2	1,500	0.226333
Phacelia stellaris	Brand's phacelia	CCA	SP	1B.1; ESA CCA	S1	G1	10	1	14,857	0.2981
Pickeringia montana var. tomentosa	woolly chaparral-pea		SP	4.3	S3S4	G5T3T4	3	2	3	0.000216
Pinus torreyana*	Torrey pine		SP*	1B.2*	S1*	G1T1*	1	1	1	0.000072
Piperia cooperi	chaparral rein orchid		SP	4.2	S3	G3	6	6	8	0.001951
Pseudognaphalium leucocephalum	white rabbit-tobacco		SP	2B.2	S2	G4	110	23	114,663	52.26476
Quercus dumosa	Nuttall's scrub oak		SP	1B.1	S3	G3	7	5	69	0.046607
Quercus engelmannii	Engelmann oak		SP	4.2	S3	G3	526	25	3,645	106.3243
Rhinotropis cornuta var. fishiae (=Polygala cornuta var. fishiae)	Fish's milkwort		SP	4.3	S4	G5T4	55	13	1,129	101.3118
Romneya coulteri	Coulter's matilija poppy		SP	4.2	S4	G4	2	2	151	2.164452

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Saltugilia caruifolia	caraway-leaved woodland-gilia		SP	4.3	S4	G4	1	1	1	0.000072
Salvia munzii	Munz's Sage		SP	2B.2	S2	G2	1	1	1	0.000071
Selaginella cinerascens	ashy spike-moss		SP	4.1	S3S4	G3G4	22	3	25	4.687635
Senecio aphanactis	california groundsel; chaparral ragwort		SP	2B.2	S2	G3?	Checklist Only	Checklist Only	Checklist Only	Checklist Only
Suaeda esteroa	estuary seablite		SP	1B.2	S2	G3	1	1	800	0.000072
Suaeda taxifolia	woolly seablite		SP	4.2	S4	G	66	17	311	1.636663
Viguiera purisimae	La Purisima viguiera		SP	2B.3	S1	G4?	10	1	1,005	2.877005

Legend:

[1] **Federal: CCA =** Candidate Conservation Agreement

[2] **State: SP** = Special Vascular Plants

[3] **CNPS: CBR** = Considered But Rejected

[4] **State & Global Ranks:** Source is CDFW Special Vascular Plants, Bryophytes, and Lichens List

[5] **Populations Per Mapping Rule:**

- **Vernal pool plants:** number of pools occupied
- **Phacelia stellaris:** 4-meter mapping rule
- **All other rare plants:** 7-meter mapping rule

[6] **Acres Occupied:** a dissolve was performed in GIS to eliminate overlapping polygons

*** Planted:** This species was planted on the Base

Appendix L

Watchlist of Nonnative Plant Species for MCB Camp Pendleton

MCBCP Weed Watchlist November 2022				
	Species Name	Common Name	Cal IPC	Tier I*
	Surveillance			
1	*Aegilops cylindrica*	**Jointed Goat Grass**	Watch	X
2	*Aegilops triuncialis*	**Barbed Goat Grass**	High	X
3	*Alhagi maurorum*	**Camelthorn**	Moderate	X
4	*Alternanthera philoxeroides*	**Alligator Weed**	High	X
5	*Ammophila arenaria*	**European Beachgrass**	High	X
6	*Brachypodium sylvaticum*	**Perennial False-Brome**	Moderate	X
7	*Carduus nutans*	**Musk Thistle**	Moderate	X
8	*Carthamus lanatus*	**Woolly Distaff Thistle**	High	X
9	*Centaurea calcitrapa*	**Purple Star Thistle**	Moderate	X
10	*Centaurea diffusa*	**Diffuse Knapweed**	Moderate	X
11	*Centaurea diluta*	**Lesser Star Thistle, Spotted Knapweed**	Watch	X
12	*Centaurea stoebe ssp. micranthos*	**Spotted Knapweed**	High	X
13	*Chondrilla juncea*	**Rush Skeletonweed**	Moderate	X
14	*Chrysanthemoides monilifera ssp. monilifera*	**Boneseed, bientou**	Moderate	X
15	*Cirsium arvense*	**Canada Thistle**	Moderate	X
19	*Cytisus multiflorus*	**Portuguese Broom**	Watch	X
20	*Cytisus scoparius*	**Scotch Broom**	High	X
21	*Dipsacus fullonum*	**Common Teasel**	Moderate	X
22	*Dipsacus sativus*	**Fuller's Teasel**	Moderate	X
23	*Egeria densa*	**Brazilian Egeria**	High	X
25	*Eichhornia crassipes*	**Water Hyacinth**	High	X
26	*Elaeagnus angustifolia*	**Russian-Olive**	Moderate	X
27	*Elymus caput-medusae*	**Medusahead**	High	X
28	*Enchylaena tomentosa*	**Ruby Salt Bush**	None	X
29	*Erodium malacoides*	**Mediterranean Filaree/Storksbill**	None	X
30	*Euphorbia helioscopia*	**Sun Spurge**	None	X
31	*Euphorbia virgata*	**Slender Leafy Spurge**	High	X
32	*Glyceria declinata*	**Waxy Mannagrass**	Moderate	X
33	*Halogeton glomeratus*	**Halogeton**	Moderate	X
34	*Hedera canariensis*	**Canary ivy, Algerian ivy**	High	X
35	*Hedera helix*	**English Ivy**	High	X
36	*Holcus lanatus*	**Common Velvet Grass**	Moderate	X
37	*Hydrilla verticillata*	**Hydrilla**	High	X
38	*Hypericum canariense*	**Canary Island Hypericum**	Moderate	X
39	*Hypericum perforatum*	**Common St. John's Wort, Klamathweed**	Limited	X
40	*Iris pseudacorus*	**Yellowflag Iris**	Limited	X
41	*Kochia scoparia*	**Kochia (Scarlet Wisteria)**	Limited	X
42	*Lepidium appelianum*	**Hairy Whitetop**	None	X
43	*Leucanthemum vulgare*	**Ox-Eye Daisy**	Moderate	X
44	*Limonium duriusculum*	**European Sea Lavender**	Moderate	X
45	*Linaria dalmatica ssp. dalmatica*	**Toadflax**	Moderate	X
46	*Lythrum salicaria*	**Purple Loosestrife**	High	X
47	*Myriophyllum aquaticum*	**Parrotfeather**	High	X
48	*Myriophyllum spicatum*	**Eurasian Watermilfoil**	High	X
49	*Onopordum acanthium*	**Scotch Thistle**	High	X
50	*Parthenium hysterophorus*	**Santa Maria Feverfew**	Watch	X
51	*Potamogeton crispus*	**Curlyleaf Pondweed**	Moderate	X
52	*Prunus cerasifera*	**Cherry Plum**	Limited	X
53	*Rhaponticum repens*	**Russian Knapweed**	Moderate	X
54	*Rytidosperma caespitosum*	**wallabygrass**	Watch	X
55	*Rytidosperma penicillatum*	**hairy wallaby grass; hairy oat grass**	Limited	X
56	*Saccharum ravennae*	**Ravennagrass**	Moderate	X
57	*Salsola soda*	**Opposite Leaf, Russian Thistle**	Moderate	X
58	*Salvinia molesta*	**Giant Salvinia**	High	X
60	*Sesbania punicea*	**Red Sesbania, Scarlet Wisteria**	High	X
61	*Solanum rostratum*	**Buffalo Berry**	None	X
62	*Spartina alterniflora x S. foliosa*	**Smooth Cordgrass and hybrids, Atlantic Cordgrass**	High	X
63	*Spartina anglica*	**Common Cordgrass**	Moderate	X
64	*Spartina densiflora*	**Dense-Flowered Cordgrass**	High	X
65	*Spartina patens*	**Saltmeadow Cordgrass**	Limited	X
66	*Stipa capensis*	**Mediterranean Steppegrass, Twisted-Awned Speargrass**	Moderate	X
67	*Stipa tenuissima*	**Mexican Feather Grass**	Watch	X
68	*Ulex europaeus*	**Gorse**	High	X
69	*Zantedeschia aethiopica*	**Calla lily**	Limited	X

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	Species Name	Common Name	Cal IPC #	Tier I*
	Eradication			
1	*Ageratina adenophora*	**Croftonweed, Eupatorium**	Moderate	X
2	*Ailanthus altissima*	**Tree of Heaven**	Moderate	X
3	*Araujia sericifera*	**Bladder Flower**	Watch	X
4	*Arctotheca calendula*	**Fertile Capeweed**	Moderate	X
5	*Arundo donax*	**Arundo, Giant Reed**	High	X
6	*Asphodelus fistulosus*	**Onion Weed, Hollow-Stem Asphodel**	Moderate	X
7	*Carrichtera annua*	**Ward's Weed**	Moderate	X
8	*Centaurea benedicta*	**Blessed Thistle**	None	X
9	*Centaurea solstitialis*	**Yellow Star Thistle**	High	X
10	*Chasmanthe floribunda*	**African cornflag**	Watch	X
11	*Cortaderia jubata*	**Purple Jubata Grass**	High	X
12	*Cortaderia selloana*	**Selloa Pampas Grass**	High	X
13	*Delairea odorata*	**German-Ivy, Cape-Ivy**	High	X
14	*Diplotaxis muralis*	**Wall Rocket**	None	X
15	*Dittrichia graveolens*	**Stinkwort**	Moderate	X
24	*Ehrharta calycina*	**Purple Veldtgrass**	High	X
16	*Ehrharta longiflora*	**Long-Flower Veldt Grass**	Limited	X
17	*Emex spinosa*	**Devil's Thorn, Spiny Emex**	Moderate	X
18	*Euphorbia lathyris*	**Caper Spurge, Gopher Plant**	Watch	X
19	*Euphorbia terracina*	**Carnation Spurge**	Limited	X
20	*Ficus carica*	**Edible Fig**	Moderate	X
21	*Fraxinus uhdei*	**Shamel Ash**	None	X
22	*Genista monosperma*	**Bridal Veil Broom**	Moderate	X
23	*Hyparrhenia hirta*	**Thatchgrass**	Watch	X
24	*Lepidium chalepense*	**Lens-Podded White-Top**	Moderate	X
25	*Lonicera japonica*	**Japanese Honeysuckle**	None	X
26	*Oncosiphon pilulifer*	**Stinknet**	High	X
27	*Quercus ilex*	**Holly Oak**	None	X
28	*Rapistrum rugosum*	**Annual Bastard Cabbage**	None	X
29	*Reseda luteola*	**Dyer's mignonette**	None	X
30	*Rubus armeniacus*	**Himalaya Blackberry**	High	X
31	*Senecio angustifolius/linearifolius/quadridentatus*	**Australian Fireweed**	Watch	X
32	*Solanum eleagnifolium*	**Silver-Leaf Horse-Nettle**	None	X
33	*Sorghum halepense*	**Johnson Grass**	None	X
34	*Spartium junceum*	**Spanish Broom**	High	X
35	*Tragopogon porrifolius*	**Purple Salsify**	None	X
	Species Name	**Common Name**	**Cal IPC #**	**Tier I***
	Management			
1	*Acacia baileyana*	**Cootamundra Wattle**	Watch	X
2	*Acacia cyclops*	**Western Coastal Wattle, Cyclops Acacia**	Watch	X
3	*Acacia dealbata*	**Silver Wattle**	Moderate	X
4	*Acacia longifolia*	**Sydney Golden Wattle**	Watch	X
5	*Acacia melanoxylon*	**Black Acacia, Blackwood Acacia**	Limited	X
6	*Acacia retinodes*	**Everblooming Acacia**	None	X
7	*Acacia saligna*	**Golden Wreath Wattle**	Watch	X
8	*Agave americana*	**American Agave**	None	X
9	*Agrostis avenacea*	**Pacific Bentgrass**	Limited	X
10	*Agrostis stolonifera*	**Creeping Bentgrass**	Limited	X
11	*Apium graveolens*	**Common Celery**	None	X
12	*Asparagus asparagoides*	**Florist's Smilax, Bridal Creeper**	Moderate	X
13	*Atriplex amnicola*	**Swamp Saltbush**	None	X
14	*Atriplex glauca*	**Waxy Saltbush**	None	X
15	*Bothriochloa laguroides ssp. torreyana*	**Silver Beardgrass**	None	X
16	*Brassica tournefortii*	**Sahara Mustard**	High	X
17	*Caesalpina spinosa*	**Tara**	None	X
18	*Cakile maritima*	**European Sea-Rocket**	Limited	X
19	*Carduus tenuiflorus*	**Slenderflower Thistle**	Limited	X
20	*Carpobrotus chilensis*	**Sea-Fig, Iceplant**	Moderate	X
21	*Carpobrotus edulis*	**Hottentot-Fig, Iceplant**	High	X
22	*Carya illinoinensis*	**Pecan**	None	X
23	*Casuarina equisetifolia*	**Horsetail Tree**	Watch	X
24	*Centaurium pulchellum*	**Lesser Centaury**	None	X
25	*Centaurium tenuiflorum*	**Centaury**	None	X
26	*Cirsium vulgare*	**Bull Thistle**	Moderate	X
27	*Crassula ovata*	**Jade Plant**	None	X
28	*Cynara cardunculus*	**Artichoke Thistle, Cardoon**	Moderate	X
29	*Daucus carota*	**Carrot, Queen Anne's Lace**	None	X
30	*Dichondra micrantha*	**Asian Ponyfoot**	None	X

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		Management		
31	*Digitaria sanguinalis*	Large Crabgrass	None	X
32	*Dimorphotheca fruticosa*	Trailing African Daisy	None	X
33	*Dimorphotheca sinuata*	Glandular Cape Marigold	None	X
34	*Dysphania ambrosiodes*	Mexican Tea	None	X
35	*Dysphania multifida*	Cut-Leaf Goosefoot	None	X
36	*Dysphania pumilio*	Tasmanian Goosefoot	None	X
37	*Echium candicans*	Pride of Madeira	Limited	X
38	*Ehrharta erecta*	Panic Veldt Grass, Erect Veldt Grass	Moderate	X
39	*Eragrostis lehmanniana*	Lehmann's Lovegrass	None	X
40	*Erigeron sumatrensis*	Asthmaweed	None	X
41	*Eucalyptus camaldulensis*	River Red Gum	Limited	X
42	*Eucalyptus citriodora*	Lemon-Scent Gum	None	X
43	*Eucalyptus cladocalyx*	Sugar Gum	Watch	X
44	*Eucalyptus cornuta*	Bushy Yate	None	X
45	*Eucalyptus globulus*	Blue Gum, Tasmanian Blue Gum	Limited	X
46	*Eucalyptus leucoxylon*	Yellow Gum	None	X
47	*Eucalyptus polyanthemos*	Silver Dollar Gum	None	X
48	*Eucalyptus rudis*	Australian Flooded Gum	None	X
49	*Festuca arundinacea*	Tall Fescue	Moderate	X
50	*Foeniculum vulgare*	Fennel	Moderate	X
51	*Gazania linearis*	Treasure Flower	Moderate	X
52	*Glebionis coronaria*	Crown Daisy, Garland, Chrysanthemum	Limited	X
53	*Koeleria gerardii*	Bristly Koeler's Grass	None	X
54	*Lepidium draba (1% or less)*	Heart-Pod Hoary-Cress	Moderate	X
55	*Lepidium latifolium (1% or less)*	Perrenial Pepperweed, Broad-Leaf Peppergrass	High	X
56	*Limonium perezii*	Perez's Sea Lavender	None	X
57	*Limonium ramosissimum*	Algerian Sea Lavender	Limited	X
58	*Limonium sinuatum*	Notch-Leaf Marsh-Rosemary	None	X
59	*Lotus corniculatus*	Birdfoot Trefoil	None	X
60	*Ludwigia grandiflora*	Large-Flower Primrose-Willow	None	X
61	*Ludwigia hexapetala*	Uruguayan Primrose-Willow, Uruguayan Marsh-Purlane	High	X
62	*Ludwigia peploides*	Creeping Water-Primrose	High	X
63	*Malephora crocea*	Crocea Iceplant	Watch	X
64	*Medicago sativa*	Alfalfa, Lucerne	None	X
65	*Melaleuca nesophila*	Showy Honey-Myrtle, Pink Melaleuca	None	X
66	*Melia azedarach*	China Berry, Persian-Lilac	None	X
67	*Melinis repens*	Natal Grass	None	X
68	*Mesembryanthemum crystallinum*	Crystalline Iceplant	Moderate	X
69	*Mesembryanthemum nodiflorum*	Slender-Leaf Iceplant	Limited	X
70	*Morus alba*	White Mulberry	None	X
71	*Myoporum laetum*	Ngaio Tree, Mousehole Tree	Moderate	X
72	*Myoporum montanum*	Water Bush	None	X
73	*Myoporum parvifolium*	Slender Myoporum	None	X
74	*Nymphaea cf. odorata*	Water Lily	None	X
75	*Olea europaea*	Olive	Limited	X
76	*Opuntia ficus-idica*	Mission Prickly-Pear, Indian Fig	None	X
77	*Oxalis pes-caprae*	Bermuda-Buttercup, Buttercup Oxalis, Yellow Oxalis	Moderate	X
78	*Panicum miliaceum*	Broomcorn Millet	None	X
79	*Parapholis incurva*	Sickle Grass	None	X
80	*Paspalum dilatatum*	Dallis Grass	None	X
81	*Paspalum vaginatum*	Seashore Paspalum	Watch	X
82	*Pennisetum clandestinum*	Kikuyu Grass	Limited	X
83	*Pennisetum setaceum*	Fountain Grass	Moderate	X
84	*Pentameris airoides*	False Hair Grass	None	X
85	*Persicaria maculosa*	Lady's Thumb	None	X
86	*Phalaris aquatica*	Harding Grass	Moderate	X
87	*Phoenix canariensis*	Canary Island Date Palm	Limited	X
88	*Physalis philadelphica*	Tomatillo	None	X
89	*Pinus halepensis*	Aleppo Pine	None	X
90	*Plumbago auriculata*	Cape Leadwort	None	X
91	*Robinia pseudoacacia*	Black Locust	Limited	X
92	*Schinus molle*	Peruvian Pepper Tree	Limited	X
93	*Schinus terebinthifolius*	Brazilian Pepper Tree	Moderate	X
94	*Senna didymobotrya*	African Senna	None	X
95	*Solanum furcatum*	Forked Nightshade	None	X
96	*Stenotaphrum secundatum*	Saint Augustine Grass	None	X
97	*Tamarix aphylla*	Athel Tamarisk	Limited	X
98	*Tamarix gallica (1% or less)*	French Tamarisk	High	X

MCBCP Weed Watchlist November 2022				
	Species Name	Common Name	Cal IPC #	Tier I*
	Management			
99	*Tamarix hohenackeri (1% or less)*	**Tamarisk**	None	X
100	*Tamarix ramosissima (1% or less)*	**Salt Cedar**	High	X
101	*Tanacetum vulgare*	**Common Tansy**	Moderate	X
102	*Tetragonia tetragonioides*	**New Zealand Spinach**	Limited	X
103	*Torilis arvensis*	**Hedge Parsley**	Moderate	X
104	*Trifolium subterraneum*	**Subterraneum Clover**	None	X
105	*Tropaeolum majus*	**Garden Nasturtium**	None	X
106	*Ulmus parvifolia*	**Chinese Elm**	None	X
107	*Verbena litoralis*	**Seashore Vervain**	None	X
108	*Vinca major*	**Greater Periwinkle, Big Periwinkle**	Moderate	X
109	*Washingtonia robusta*	**Mexican Fan Palm**	Moderate	X
	Species Name	**Common Name**	**Cal IPC #**	**Tier I***
	Naturalized (Treated in Restoration projects)			
1	*Abutilon theophrasti*	**Velvet Leaf**	None	
2	*Aira caryophyllea*	**Silver European Hairgrass**	None	
3	*Alternanthera cracasana*	**Alligator Weed**	None	
4	*Amaranthus albus*	**White Tumbleweed**	None	
5	*Amaranthus hybridus*	**Slender Pigweed**	None	
6	*Amaranthus restroflexus*	**Rough Pigweed**	None	
7	*Anagallis arvensis*	**Scarlet Pimpernel, Poor Man's Weatherglass**	None	
8	*Anthemis cotula*	**Mayweed, Stinkweed, Dog-Fennel**	None	
9	*Anthrisus caucalis*	**Bur Chervil**	None	
10	*Aptenia cordifolia*	**Baby Sun Rose**	None	
11	*Atriplex prostrata*	**Spearscale**	None	
12	*Atriplex semibaccata*	**Australian Saltbush**	Moderate	
13	*Atriplex suberecta*	**Peregrine Saltbush**	None	
14	*Avena barbata*	**Slender Wild Oat**	Moderate	
15	*Avena fatua*	**Wild Oat**	Moderate	
16	*Avena occidentalis*	**Western Oat**	None	
17	*Avena sterilis*	**Animated Oat**	None	
18	*Bassia hyssopifolia*	**Five-Hook Bassia**	Limited	
19	*Beta vulgaris*	**Sea Beet**	None	
20	*Brachypodium distachyon*	**Annual False-Brome, Purple False Brome**	Moderate	
21	*Brassica napus*	**Swede Rape, Rapesweed**	None	
22	*Brassica nigra*	**Black Mustard**	Moderate	
23	*Brassica rapa*	**Turnip, Field Mustard, Birdsrape Mustard**	Limited	
24	*Briza minor*	**Quaking Grass**	None	
25	*Bromus catharticus*	**Recuegrass**	None	
26	*Bromus diandrus*	**Ripgut Brome**	Moderate	
27	*Bromus hordeaceus*	**Soft Chess, Soft Brome**	Limited	
28	*Bromus madritensis ssp. madritensis*	**Compact Brome**	High	
29	*Bromus madritensis ssp. rubens*	**Red Brome**	High	
30	*Bromus sterilis*	**Poverty Brome**	None	
31	*Bromus tectorum*	**Cheat Grass, Downy Brome**	High	
32	*Capsella bursa-pastoris*	**Shepherd's Purse**	None	
33	*Carduus pycnocephalus*	**Italian Thistle**	Moderate	
34	*Cenchrus spinifex*	**Coast Sandbur**	None	
35	*Centaurea melitensis*	**Tocalote, Malta Star Thistle**	Moderate	
36	*Cerastium glomeratum*	**Mouse-Eared Chickweed**	None	
37	*Chenopodium album*	**Lamb's Quarters**	None	
38	*Chenopodium murale*	**Nettle-Leaf Goosefoot**	None	
39	*Chenopodium strictum*	**White-Leaf Goosefoot**	None	
40	*Chloris gayana*	**Rhodes Grass**	None	
41	*Conium maculatum*	**Common Poison Hemlock**	Moderate	
42	*Convolvulus arvensis*	**Field Bindweed**	None	
43	*Cotula australis*	**Australian Brass-Buttons**	None	
44	*Cotula coronopifolia*	**African Brass-Buttons**	Limited	
45	*Crassula tillaea*	**Mossy Stonecrop**	None	
46	*Crypsis schoenoides*	**Prickle Grass**	None	
47	*Crypsis vaginiflora*	**Swamp Grass**	None	
48	*Cynodon dactylon*	**Bermuda Grass**	Moderate	
49	*Cyperus involucratus*	**African Umbrella Plant**	None	
50	*Dactylis glomerata*	**Orchard Grass**	Limited	
51	*Echinochloa crus-galli*	**Common Barnyard Grass**	None	
52	*Encelia farinosa var. farinosa*	**Brittlebush**	None	
53	*Eragrostis cilianensis*	**Stinkgrass**	None	
54	*Erigeron bonariensis*	**Flax-Leaf Fleabone**	None	
55	*Erodium botrys*	**Long-Beak Filaree/Storksbill**	None	

MCBCP Weed Watchlist November 2022				
	Species Name	Common Name	Cal IPC #	Tier I*
Naturalized (Treated in Restoration projects)				
56	*Erodium brachycarpum*	**Short-Beak Filaree/Storksbill**	None	
57	*Erodium cicutarium*	**Red-Stem Filaree/Storksbill**	Limited	
58	*Erodium moschatum*	**White-Stem Filaree/Storksbill**	None	
59	*Euphorbia maculata*	**Spotted Spurge**	None	
60	*Euphorbia peplus*	**Petty Spurge**	None	
61	*Euphorbia serpens*	**Creeping Spurge**	None	
62	*Festuca bromoides*	**Brome Fescue**	None	
63	*Festuca myuros*	**Rat-Tail Fescue**	Moderate	
64	*Festuca perennis*	**Perennial Ryegrass, Italian Ryegrass**	Moderate	
65	*Festuca temulenta*	**Darnel**	None	
66	*Galinsoga parviflora var. parviflora*	**Small-Flower Galinsoga**	None	
67	*Galium parisiense*	**Wall Bedstraw**	None	
68	*Gamochaeta pensylvanica*	**Purple Cudweed**	None	
69	*Gastridium phleoides*	**Nit Grass**	None	
70	*Geranium dissectum*	**Cut-Leaf Geranium**	Limited	
71	*Glinus lotoides*	**Lotus Sweetjuice**	None	
72	*Gypsophila paniculata*	**Baby's Breath**	Watch	
73	*Hainardia cylindrica*	**Barbgrass**	None	
74	*Hedypnois cretica*	**Crete Hedypnois**	None	
75	*Helminthotheca echioides*	**Bristly Ox-Tongue**	Limited	
76	*Hirschfeldia incana*	**Shortpod Mustard, Summer Mustard**	Moderate	
77	*Hordeum marinum*	**Mediterranean Barley**	Moderate	
78	*Hordeum murinum ssp. glaucum*	**Glaucous Barley**	None	
79	*Hordeum murinum ssp. leporinum*	**Hare Barely**	None	
80	*Hordeum vulgare*	**Cultivated Barley**	None	
81	*Hypochaeris glabra*	**Smooth Cat's Ear**	Limited	
82	*Hypochaeris radicata*	**Hairy Cat's Ear, Rough Cat's Ear, Hairy Dandelion**	Moderate	
83	*Lactuca serriola*	**Prickly Lettuce**	None	
84	*Lamarckia aurea*	**Golden-Top**	None	
85	*Lamium amplexicale*	**Henbit**	None	
86	*Lantana camara*	**Lantana**	Watch	
87	*Lepidium didymum*	**Lesser Water-Cress**	None	
88	*Lobularia maritima*	**Sweet Alyssum**	Limited	
89	*Logfia gallica*	**Narrow-leaf Cottonrose**	None	
90	*Lycopersicon esculentum*	**Garden Tomato**	None	
91	*Lythrum hyssopifolium*	**Grass Poly, Hyssop Loosestrife**	Moderate	
92	*Malva parviflora*	**Cheeseweed**	None	
93	*Marrubium vulgare*	**Horehound**	Limited	
94	*Matricaria discoidea*	**Common Pineapple-Weed**	None	
95	*Medicago lupulina*	**Black Medick, Yellow Trefoil**	None	
96	*Medicago polymorpha*	**California Burclover**	Limited	
97	*Melilotus albus*	**White Sweet Clover**	None	
98	*Melilotus indicus*	**Indian Sweet Clover**	None	
99	*Mentha pulegium*	**Pennyroyal**	Moderate	
100	*Mentha spicata*	**Spearmint**	None	
101	*Nerium oleander*	**Oleander**	None	
102	*Nicotiana glauca*	**Tree Tobacco**	Moderate	
103	*Oenothera speciosa*	**Beautiful Evening-Primrose**	None	
104	*Oxalis corniculata*	**Creeping Woodsorrel**	None	
105	*Pelargronium peltatum*	**Ivy Geranium**	None	
106	*Phalaris minor*	**Little-Seed Canary Grass**	None	
107	*Phalaris paradoxa*	**Paradox Canary Grass**	None	
108	*Phragmites australis*	**Common Reed**	None	
109	*Physalis pubescens var. grisea*	**Ground Cherry**	None	
110	*Phytolacca americana*	**Common Pokeweed**	Limited	
111	*Plantago coronopus*	**Cut-Leaf Plantain**	None	
112	*Plantago lanceolata*	**English Plantain, Rib-Grass, Buckhorn Plantain**	Limited	
113	*Plantago major*	**Common Plantain**	None	
114	*Poa annua*	**Annual Bluegrass**	None	
115	*Poa pratensis*	**Kentucky Bluegrass**	Limited	
116	*Polycarpon tetraphyllum*	**Four-Leaf Allseed**	None	
117	*Polygonum aviculare spp. depressum*	**Common Knotweed, Door Weed**	None	
118	*Polygonum aviculare spp. neglectum*	**Prostrate Knotweed**	None	
119	*Polypogon interruptus*	**Ditch Beard Grass**	None	
120	*Polypogon maritimus*	**Mediterranean Beard Grass**	None	
121	*Polypogon monspeliensis*	**Annual Beard Grass, Rabbitfoot Polypogon**	Limited	

MCBCP Weed Watchlist November 2022				
	Species Name	Common Name	Cal IPC #	Tier I*
Naturalized (Treated in Restoration projects)				
122	*Polypogon viridis*	**Water Beard Grass**	None	
123	*Portulaca oleracea*	**Common Purslane**	None	
124	*Pseudognaphalium luteoalbum*	**Fragrant Everlasting Cudweed**	None	
125	*Pulicaria paludosa*	**Spanish False-Fleabane**	None	
126	*Ranunculus repens*	**Creeping Buttercup**	Limited	
127	*Raphanus raphanistrum*	**Jointed Charlock**	None	
129	*Raphanus sativus*	**Radish**	Limited	
130	*Ricinus communis*	**Castor Bean**	Limited	
131	*Rumex conglomeratus*	**Whorled Dock**	None	
132	*Rumex crispus*	**Curly Dock**	Limited	
133	*Rumex dentatus*	**Toothed Dock**	None	
134	*Rumex pulcher*	**Fiddle Dock**	None	
135	*Rumex stenophyllus*	**Narrow-Leaf Dock**	None	
136	*Salsola australis*	**Australian Tumbleweed**	None	
137	*Salsola tragus*	**Prickly Russian Thistle, Tumbleweed**	Limited	
138	*Schismus arabicus*	**Arabian Schismus**	Limited	
139	*Schismus barbatus*	**Mediterranean Schismus**	Limited	
140	*Senecio vulgaris*	**Common Groundsel**	None	
141	*Silene gallica*	**Common Catchfly**	None	
142	*Silybum marianum*	**Milk Thistle**	Limited	
143	*Sisymbrium altissimum*	**Tumble Mustard**	None	
144	*Sisymbrium irio*	**London Rocket**	Limited	
145	*Sisymbrium officinale*	**Hedge Mustard**	None	
146	*Sisymbrium orientale*	**Hare's-Ear Cabbage**	None	
147	*Solanum nigrum*	**Black Nightshade**	None	
148	*Sonchus asper*	**Prickly Sow-Thistle**	None	
149	*Sonchus oleraceus*	**Common Sow-Thistle**	None	
150	*Spergula arvensis*	**Stickwort, Starwort**	None	
151	*Spergularia bocconi*	**Buccone's Sand-Spurry**	None	
152	*Spergularia rubra*	**Ruby Sand-Spray**	None	
153	*Spergularia villosa*	**Villous Sand-Spray**	None	
154	*Stellaria media*	**Common Chickweed**	None	
155	*Stellaria neglecta*	**Greater Chickweed**	None	
156	*Stellaria pallida*	**Pale Starwort**	None	
157	*Stipa miliacea var. miliacea*	**Smilo Grass**	Limited	
158	*Tagetes erecta*	**Marigold**	None	
159	*Taraxacum officinale*	**Common Dandelion**	None	
160	*Torilis nodosa*	**Knot Hedge-Parsley**	None	
161	*Tribulus terrestris*	**Puncture Vine**	Limited	
162	*Trifolium hirtum*	**Rose Clover**	Limited	
163	*Triticum aestivum*	**Cereal Wheat**	None	
164	*Urtica urens*	**Dwarf Nettle**	None	
165	*Verbascum thapsus*	**Common Mullein, Woolly Mullein**	Limited	
166	*Verbascum virgatum*	**Wand Mullein**	None	
167	*Veronica anagallis-aquatica*	**Water Speedwell**	None	
168	*Veronica catenata*	**Broad-Fruit/Chain Speedwell**	None	
169	*Vicia benghalensis*	**Purple Vetch**	None	
170	*Vicia sativa ssp. nigra*	**Narrow-Leaf Vetch, Common Vetch**	None	
171	*Vicia sativa ssp. sativa*	**Spring Vetch**	None	
172	*Vicia villosa*	**Winter Vetch**	None	
173	*Westringia fruticosa*	**Coastal Rosemary**	None	

Cal IPC=California Invasive Planc Council - Invasive Plant Inventory

High – These species have severe ecological impacts on physical processes, plant and animal communities, and vegetation structure.
Their reproductive biology and other attributes are conducive to moderate to high rates of dispersal and establishment. Most are widely distributed ecologically.
conducive to moderate to high rates of dispersal and establishment. Most are widely distributed ecologically.

Moderate – These species have substantial and apparent-but generally not severe-ecological impacts on physical processes, plant and animal communities, and vegetation structure.
Their reproductive biology and other attributes are conducive to moderate to high rates of dispersal, though establishment is generally dependent upon ecological disturbance.
Ecological amplitude and distribution may range from limited to widespread.

Limited – These species are invasive but their ecological impacts are minor on a statewide level or there was not enough information to justify a higher score. Their reproductive biology and other attributes result in low to moderate rates of invasiveness. Ecological amplitude and distribution are generally limited,
but these species may be locally persistent and problematic.

Watch – These species have been assessed as posing a high risk of becoming invasive in the future in California.

***Tier I** = Zero Tolerance (in Restoration sites)

Appendix M

Goals, Objectives, and Actions Matrix

Appendix M

GOALS, OBJECTIVES AND ACTION MATRIX FOR NATURAL RESOURCES MANAGEMENT ON MARINE CORPS BASE CAMP PENDLETON

Programs and Element Goals	Proposed Actions	Responsible Section within Resource Mgmt Branch (CLS, CRE, or UPL)	ENCORE Reference #
Threatened, Endangered, and Rare Species Program (Section 4.1) **Program Goal: Manage threatened, endangered, and selected species at risk (e.g., regional species of concern) and their habitats to support sustainable populations while providing maximum training flexibility.**			
ESA Management of Federally Listed Animals Element (Section 4.1.1) ***Element Goal: Adaptively manage sustainable populations of federally threatened and endangered species to achieve conservation goals and promote their recovery under ESA while providing maximum training flexibility.***			
	Objective 1. Maintain a comprehensive record of data for all listed species on Camp Pendleton to support effective adaptive management decisions and program funding requirements.		
	4.1.1.1 – Maintain a data of record for listed and sensitive species in the approved Marine Corps GIS structure.	CRE, UPL	N/A
	4.1.1.2 – Monitor Riverside fairy shrimp and San Diego fairy shrimp per Vernal Pool and Fairy Shrimp Conservation Plan and update GIS records. Uplands staff will perform supplemental surveys for this effort.	UPL	CN4330 In-house
	4.1.1.3 – Conduct monitoring of southern tidewater goby annually to detect presence/absence and suitability of habitat.	CRE	CN4102
	4.1.1.4a – Conduct annual Southern California steelhead surveys to document migrating steelhead in historically occupied habitat.	CRE	In-house
	4.1.1.4b – Conduct environmental DNA surveys for Southern California steelhead surveys as funding allows.	CRE	TBD
	4.1.1.5 – Conduct annual arroyo toad population monitoring per the USGS (2003) protocol to determine Proportion Area Occupied.	CRE	CN4150
	4.1.1.6 – Conduct annual least Bell's vireo monitoring to document CORE territories on-Base and record fecundity; survey non-CORE areas on a five-year rotational basis.	CRE	CN4151
	4.1.1.7 – Conduct annual southwestern willow flycatcher monitoring to document territories, transients, and nest success, and band all chicks in historic nesting habitat.	CRE	CN4151
	4.1.1.8 – Record incidental observation data for yellow-billed cuckoo during other bird surveys.	CRE	N/A
	4.1.1.9 – Conduct annual least tern monitoring to document nest location and determine nesting success rate.	CRE	CN4200
	4.1.1.10 – Conduct annual snowy plover nest monitoring to document nesting sites, determine nest success, and estimate number of fledglings.	CRE	CN4205
	4.1.1.11 – Conduct light-footed Ridgway's rail studies once every two years to determine breeding locations.	CRE	CN4201
	4.1.1.12 – Monitor coastal California gnatcatcher in core and rotating areas on CPEN annually. Modify survey methods started in 2022.	UPL	CN4258
	4.1.1.13 – Annually monitor Stephens' kangaroo rat populations using Proportion Area Occupied (PAO) protocol surveys.	UPL	CN4252
	4.1.1.14 – Annually monitor Pacific pocket mouse populations using PAO protocol surveys.	UPL	CN4251
	4.1.1.15 – Finish surveying all potential Encinitas baccharis habitat to determine distribution and abundance by 2025.	UPL	CN4303
	Objective 2. Develop and implement management plans for listed species and implement adaptive management studies to meet Camp Pendleton's ESA responsibilities to conserve listed species while providing maximum training flexibility.		
	4.1.1.18 – Request USFWS consultations as needed for actions that will affect listed species.	CRE, UPL	In-house with ES Planning
	4.1.1.19 – Consult with USFWS for Vernal Pool and Fairy Shrimp Conservation Plan and continue to implement actions identified in the plan including phase 1 restoration at Cocklebur Mesa (2018), SOMA (2019), and VPG 68 (2021).	UPL	Multiple projects
	4.1.1.20 – Partner with USFWS and CDFW to determine feasibility of translocating Southern tidewater goby individuals to suitable habitat off-Base in 2022-2023.	CRE	In-house
	4.1.1.21a – Analyze 5-year trend data and adapt management as necessary to maintain a stable population of arroyo toad on-Base.	CRE	In-house
	4.1.1.21b – Conduct biweekly arroyo toad surveys May to July in the lower Santa Margarita River to determine breeding status in conjunction with water management activities, per the SMR-CUP BO.	CRE	CN4150

Programs and Element Goals	Proposed Actions	Responsible Section within Resource Mgmt Branch (CLS, CRE, or UPL)	ENCORE Reference #
	Objective 2 CONT. Develop and implement management plans for listed species and implement adaptive management studies to meet Camp Pendleton's ESA responsibilities to conserve listed species while providing maximum training flexibility.		
	4.1.1.22 – Assess predation and competition threats to the survival and recovery of listed shorebirds annually and incorporate recommendations into future management techniques.	CRE	In-house
	4.1.1.23 – Reduce and effectively manage the populations of potential predators in the vicinity of nesting snowy plover and nesting colonies of the endangered least tern on Camp Pendleton beaches to minimize depredation of eggs, chicks, and adult birds, conducted annually.	CRE	CN4202
	4.1.1.24 – Update the Base MBTA permit annually to allow continued removal of problem raptors from the California least tern and western snowy plover management areas.	CRE	In-house
	4.1.1.25 – To limit impacts to breeding listed shorebirds, minimize unauthorized recreational usage of training beaches by posting signage, taking enforcement actions, and reporting trespass issues on an as-needed basis.	CLS, CRE	In-house
	4.1.1.26a – Conduct annual maintenance and improvement of least tern nesting habitat by March 15 of each year using results of micro-habitat study, including vegetation management and sand mobilization.	CRE	CN4203
	4.1.1.26b – Refine California least tern fledgling estimate methods to produce more accurate and consistent results across years by 2024.	CRE	CN4200
	4.1.1.27 – Refine western snowy plover fledgling estimate methods to produce more accurate and consistent results across years by 2024.	CRE	CN4205 In-house
	4.1.1.28 – Purchase informational Carsonite markers and install in sensitive habitat as needed to facilitate compliance with the programmatic 1995 Estuarine, Beach ad Riparian Biological Opinion.	CRE	CN4050
	4.1.1.29 – Monitor creek crossings to avoid or minimize degradation of listed species habitat.	CRE	In-house
	4.1.1.30 – Monitor stream water quality, flood regimes, and storm event frequency seasonally to assess immediate and long-term impacts to listed species.	CRE	In-house
	4.1.1.31 – Amend Riparian and Estuarine/Beach conservation plans to incorporate newly listed species and/or new occurrences of listed species into the plans by 2025	CRE	In-house
	4.1.1.32 – Implement California gnatcatcher occupied Coastal Sage Scrub habitat enhancement project to restore 50-100 acres of degraded occupied habitat.	UPL	CN4334
	4.1.1.33a – Perform annual habitat enhancement at the 53.1-acre Juliet Stephens' kangaroo rat Management Area sufficient to sustain a population of SKR.	UPL	CN4256
	4.1.1.33b – Implement prescribed burns at least every 4 years depending on annual rainfall and invasive grass cover at the Juliet Stephens' kangaroo rat Management Area. Burn last conducted in May 2020.	UPL	In-house
	4.1.1.33c – Revise and consult on an adaptive management plan for Stephens' kangaroo rat.	UPL	N/A
	4.1.1.33d – Monitor dispersal of Stephens' kangaroo rat translocated to SKR mitigation area in Juliet. Assess genetic viability of population as needed.	UPL	CN4252
	4.1.1.33e – Evaluate SKR habitat in Range 409 at least once every 5 years to determine whether training is impacting burrow density.	UPL	CN4252
	4.1.1.33f – Maintain Stephens' kangaroo rat occupancy on at least 1,552 acres (628 hectares) of habitat base-wide.	UPL	CN4252
	4.1.1.33g – Implement Stephens' kangaroo rat habitat enhancement.	UPL	CN4259
	4.1.1.34a – Continue to implement actions identified in the Pacific Pocket Mouse Management Plan and consult on a future, programmatic version of the plan.	UPL	N/A
	4.1.1.34b – Implement Pacific Pocket Mouse Management Plan to include vegetation treatments; identification of water and light sources; and installing signage.	UPL	CN4260
	4.1.1.34c – Implement Pacific Pocket Mouse Management Plan to include vegetation treatment before and after PPM translocations.	UPL	CN4253
	4.1.1.34d – Support San Diego Zoo Captive Breeding program of the Pacific Pocket Mouse to promote conservation and translocation of the species, per the Recovery Plan.	UPL	CN4269
	4.1.1.34e – Implement Pacific Pocket Mouse translocation study on Base to determine the feasibility of translocating PPM from on Base populations to another location on Base, where impacts to training will not occur.	CRE, UPL	CN4005
	4.1.1.34f – Implement prescribed burns in Edson and Oscar 1 to improve habitat for PPM. Burn conducted at Edson in 2020 and additional burns planned for 2022 and 2023.	UPL	In-house
	4.1.1.34g – During annual PPM monitoring, assess Pacific pocket mouse micro-habitat requirements and use the results to inform future habitat improvement projects.	UPL	CN4251
	4.1.1.35 – Contribute information to USFWS 5-year Reviews of listed plants on Base, as needed.	UPL	In-house
	4.1.1.36a – Continue to implement Final Thread-leaved Brodiaea Management Plan in 2023–2028.	UPL	CN4316
	4.1.1.36b – Update Thread-leaved Brodiaea Management Plan every 10 years.	UPL	N/A

Programs and Element Goals	Proposed Actions	Responsible Section within Resource Mgmt Branch (CLS, CRE, or UPL)	ENCORE Reference #
	Objective 2 CONT. Develop and implement management plans for listed species and implement adaptive management studies to meet Camp Pendleton's ESA responsibilities to conserve listed species while providing maximum training flexibility.		
	4.1.1.37a – Revise and consult with USFWS on Listed Plant Management Plan.	UPL	In-house
	4.1.1.37b – Conduct management and monitoring for San Diego button-celery, spreading navarretia, CA Orcutt grass, and Encinitas baccharis per a revised Listed Plant Management Plan.	UPL	CN4316
	4.1.1.39 – Develop and implement management actions for Encinitas baccharis beginning in 2023.	UPL	In-house
	Objective 3. Identify vulnerabilities from climate change on species-specific management to meet Camp Pendleton's ESA responsibilities to sustain and enhance the conservation potential of listed species while providing maximum training flexibility.		
	Objective 3 is carried out through current monitoring and management named in Sections 4.1.1.		Multiple
	Objective 4. Maintain awareness of current and emerging issues related to federally listed species and other species of concern with potential implications to Camp Pendleton.		
	4.1.1.40 – Review electronic federal register updates periodically to maintain awareness of federally listed species that have the potential to be found on or adjacent to Camp Pendleton and obtain status of new listings, critical habitat proposals, recovery plans, and policy decisions that may affect projects on the Base.	CRE, UPL	In-house
	4.1.1.41 – Participate in regional working groups to increase knowledge of federally listed species status and management issues.	CRE, UPL	In-house
	4.1.1.42 – Evaluate the Base's ability to fund or survey species at off-Base locations, including REPI parcels, to help determine regional abundance and distribution.	CRE, UPL	In-house
Regional Wildlife Species of Concern Element (Section 4.1.2) ***Element Goal: Monitor sensitive species that are not federally listed to better understand their distribution and abundance on Camp Pendleton.***			
	Objective 1. Monitor sensitive wildlife species by conducting inventory surveys and studies as needed to comply with military order to participate in and contribute to regional conservation efforts.		
	4.1.2.1 – As funding allows, perform surveys to inventory species of regional concern (e.g., state-listed species, CDFW species of special concern, San Diego County MSCP conservation species, etc.). Obtain 2 years of inventory data for each species.	CRE	CN4051 CN4052
	4.1.2.2 – Annually survey for monarch butterfly roosts in winter and larvae on milkweed in spring and summer. Survey and map existing milkweed locations.	UPL	In-house
	4.1.2.3 – Evaluate management techniques to promote conservation of pollinating species of birds and insects and their habitats per the 2015 MOU between DoD and the Pollinator Partnership.	CRE, UPL	In-house
	4.1.2.4 – As funding allows, perform inventory surveys to comply with the Strategic Plan for Amphibian and Reptile Conservation and Management on DoD Lands.	CRE, UPL	CN4051 CN4052
	4.1.2.5 – Participate in regional partnerships that benefit the goals and objectives of the INRMP per the Marine Corps Order P5090.2 (e.g., California gnatcatcher regional census surveys).	CRE, UPL	In-house
	4.1.2.6 – Monitor bat species on an as-needed basis and evaluate bat species of concern for potential management actions. RMB staff will perform surveys of bat roosts including pallid bats, which are a CA species of concern. Conduct acoustic bat surveys as needed.	UPL	In-house
	4.1.2.7 – Provide access to the Base, when compatible with military training, safety, and natural resources management goals, for qualified research projects that are regional.	CRE, UPL	In-house
	Objective 2. Monitor rare plants and manage selected species in accordance with their Candidate Conservation Agreements (CCA) to ensure their continued survival and preclude their listing under ESA.		
	4.1.2.8 – Conduct plant diversity inventories using methods for the San Diego Plant Atlas as funding allows.	UPL	CN4310
	4.1.2.9 – Survey for rare plants at historic observation sites.	UPL	CN4310
	4.1.2.10 – Revise Pendleton Button-celery Management Plan in collaboration with USFWS using Technical Assistance.	UPL	CN4316
	4.1.1.11 – Monitor existing Brand's phacelia occurrences annually to determine population changes and phenology.	CRE	CN4309
	4.1.2.12 – Enhance Brand's phacelia occupied habitat annually by removing weeds.	CRE	CN4300
	4.1.2.13 – Write Brand's phacelia Candidate Conservation Report annually, and present at CCA member meeting.	CRE	In-house
	4.1.2.14 – Update Candidate Conservation Agreement every five years, starting in 2026.	CRE	In-house
	4.1.1.15 – Monitor existing Brand's phacelia occurrences annually to determine population changes and phenology.	CRE	CN4309

Programs and Element Goals	Proposed Actions	Responsible Section within Resource Mgmt Branch (CLS, CRE, or UPL)	ENCORE Reference #
Sustainable Ecosystem Management Program (Section 4.2) **Program Goal: Manage Camp Pendleton lands to support present and future training requirements while conserving and enhancing ecosystem integrity.**			
Recording Species Observations Element (Section 4.2.1) ***Element Goal: Document incidentally observed species on Camp Pendleton***			
	Objective 1. Submit incidental observations of species from Camp Pendleton to a public database.		
	4.2.1.1 – Collect records of incidentally observed species including, plants, wildlife, and fungi.	CRE, UPL	In-house
	4.2.1.2 – Implement the Avian Knowledge Network (AKN) at Camp Pendleton	CRE, UPL	In-house
Exotic Wildlife Control Element (Section 4.2.2) ***Element Goal: Conduct removal of target exotic wildlife species***			
	Objective 1. Obtain reasonable control (distribution and abundance) of exotic wildlife species to benefit listed and non-listed species through annual removal efforts.		
	4.2.2.1 – Conduct brown-headed cowbird trapping annually to reduce or eliminate parasitism of listed riparian bird species.	CRE	CN4153
	4.2.2.2 – Perform annual exotic aquatic species control activities to reduce competition and predation of native aquatic species. Focus on nonnative fish, bullfrogs, crawfish and beaver.	CRE	CN4100
Ecosystem Mapping Element (Section 4.2.3) ***Element Goal: Map Camp Pendleton vegetation using a method that is compatible with vegetation data from other agencies.***			
	Objective 1. Map Camp Pendleton vegetation using the USNVC every 10 years.		
	4.2.3.1 – Conduct basewide vegetation mapping consistent with National Vegetation Classification system (NVCS) every ten years. Last completed NVCS mapping on Base in 2019. Next mapping effort planned to start with FY24 funding.	UPL	CN4284
	4.2.3.2 – Map vegetation communities to the alliance level.	UPL	CN4284
	4.2.3.3 – Provide GIS mapping to Base customers.	UPL	In-house
Ecosystem Monitoring Element (Section 4.2.4) ***Element Goal: Monitor ecosystem conditions within vegetation communities to promote the sustainability of ecological function and inform adaptive management.***			
	Objective 1. Implement monitoring protocols for each vegetation community.		
	4.2.4.1 – Monitor riparian health every three years to determine percent change in support of the SMR-CUP Biological Opinion, starting in 2023.	CRE	CN4311
	4.2.4.2 – Develop a monitoring plan and 'no net loss' ledger for wetland habitat tracking by 2025.	CRE	CN4311
	4.2.4.3 – Monitor dune biodiversity and determine restoration needs during annual dune habitat maintenance activities.	CRE	CN4300
	4.2.4.4 – Conduct monitoring for coastal sage scrub (CSS) and chaparral.	UPL	CN4332
	4.2.4.5 – Conduct monitoring of invertebrates within CSS in coordination with CSS protocol surveys.	UPL	CN4331
Forest Pest and Disease Management Element (Section 4.2.5) ***Element Goal: Prevent pests and disease from damaging the function and biodiversity of forested ecosystems on Camp Pendleton.***			
	Objective 1. Implement a monitoring program for forest pests and disease.		
	4.2.5.1 – Monitor forests for GSOB, and ISHB, annually.	CRE, UPL	CN4313 In-house
	Objective 2. Anticipate and respond to the detection of forest pests.		
	4.2.5.2 - Initiate treatment if forest pests found.	CRE, UPL	CN4306 CN4313
	4.2.5.3 – Maintain a valid categorical exclusion for emergency removal and treatment of infected trees and wood.	UPL	In-house
	4.2.5.4 – Update the forest pest management plan that integrates prevention strategies, including education, outreach, and monitoring. Use monitoring results to develop and implement new Base policies to limit invasive pests forest pests including GSOB, ISHB, and palm weevils.	CRE, UPL	In-house
Wetland, Aquatic, and Marine Ecosystem Management Element (Section 4.2.6) ***Element Goal: Conserve and enhance the natural and beneficial uses of regulated wetlands and ledger/manage no net loss of size, function, and value of wetlands.***			
	Objective 1. Assess the distribution and extent of wetlands using the NVCS by 2018 and update every 5 years.		
	4.2.6.1 - Assess the distribution and extent of wetlands using the NVCS by 2018 and update every 5 years.	CRE	TBD

Programs and Element Goals	Proposed Actions	Responsible Section within Resource Mgmt Branch (CLS, CRE, or UPL)	ENCORE Reference #
	Objective 1 CONT. Assess the distribution and extent of wetlands using the NVCS by 2018 and update every 5 years.		
	4.2.6.2 – Populate acreages of each wetland type on no net-loss ledger.	CRE	In-house
	4.2.6.3 – Prepare and implement projects to enhance wetland functions and values by 2027.	CRE	N/A
	Objective 2. Assess the ecological function of estuaries annually using the EPA's Rapid Bioassessment Protocols for Use in Streams and Wadeable Rivers: Preiphyton, Benthic Macroinvertebrates and Fish.		
	4.2.6.4 – Conduct quarterly water quality testing in estuaries to assess trends in water chemistry composition for individual coastal lagoon and estuarine habitats.	CRE	In-house
	4.2.6.5 – Conduct quarterly benthic habitat monitoring to detect ecological integrity and fluctuations in biotic composition in coastal lagoons.	CRE	In-house
Vernal Pool Management Element (Section 4.2.7) ***Element Goal: Conserve and enhance vernal pools for no net loss of amount, ecological function, and value including the conservation of listed vernal pool species.***			
	Objective 1. Implement the Vernal Pool and Fairy Shrimp Conservation Plan.		
	4.2.7.1 – Develop methods to maintain and improve the conservation value of vernal pools per the Management Plan.	UPL	CN4320
	4.2.7.2 – Determine USACE regulated vernal pools during NEPA reviews, as needed.	UPL	CN4320
	4.2.7.3 – Assess the ecological function and value of vernal pools. Monitor and conserve vernal pools to ensure no-net-loss of their function.	UPL	CN4320
Nonnative and Invasive Species Management Element (Section 4.2.8) ***Element Goal: Minimize harm from nonnative plant species, by rapidly responding and treating new detections of invasive plants monitoring invasive plant populations to limit their spread; restoring invaded ecosystems and educate people on how to prevent spreading invasive plants in native ecosystems.***			
	Objective 1. Continue to implement invasive plant Early Detection Rapid Response Program to prevent the spread of new populations of highly invasive exotic plants on Camp Pendleton to prevent long-term costs associated with controlling larger infestations.		
	4.2.8.1 – Implement Early Detection – Rapid Response program annually to treat new infestations of noxious and invasive weeds in all habitat types.	CRE	CN4306
	4.2.8.2 – Perform annual monitoring and treatment of major Base roads and firebreaks and other major vectors for new infestations.	CRE	CN4306
	4.2.8.3 – Treat new infestations promptly when discovered.	CRE	CN4306
	Objective 2. Reduce cover of selected invasive plants in the uplands including artichoke thistle, yellow star thistle, chrysanthemum, and fennel.		
	4.2.8.4 – Strategically treat fennel benefit the management of species such as Stephens' kangaroo rat.	UPL	CN4301
	Objective 3. Maintain cover of riparian type-converting invasive plants, including salt cedar, giant reed and perennial pepperweed, to <1 percent cover.		
	4.2.8.5 – Implement annual exotic species treatment program for Santa Margarita River riparian areas; treat other watersheds as funding allows.	CRE	CN4308
	Objective 4. Manage invasive exotic plants in coastal dune, strand habitats, and bluffs, and restore with native dune and bluff plants.		
	4.2.8.6 – Implement the coastal dune restoration plan developed by the Nature Conservancy as funds become available per the 1995 Riparian BO.	CRE	CN4300
	4.2.8.7 – Treat invasive exotic plant infestations in coastal dunes annually (ice plant, New Zealand spinach, radish, perennial pepperweed).	CRE	CN4300
	Objective 5. Support regional invasive plant information sharing.	CRE	CN4300
	4.2.8.8 – Participate in San Diego Weed Management Area steering committee.	CRE, UPL	In-house
Erosion Control Element (Section 4.2.9) ***Element Goal: Conserve soil resources that support the training landscapes and their ecosystems.***			
	Objective 1. Maximize the capability of the landscape to support military training and conserve sensitive habitats.		
	4.2.9.1 – Conduct erosion control projects as prioritized with Base users.	UPL	CN4324 In-house
Wildland Fire Management Element (Section 4.2.10) ***Element Goal: Manage fire potential to minimize harm to highly valued natural resources, cultural resources, and human structures.***			
	Objective 1. Implement a Fire Danger Rating System that complies with National Wildland Fire Management standards.		
	4.2.10.1 – Collect live and dead fuel moisture readings on the coast, inland valley, and mountains.	UPL	CN4305
	4.2.10.2 – Inspect and maintain RAWS stations at least twice, annually.	UPL	CN4303
	4.2.10.3 – Periodically review base-wide Wildfire Risk Assessment and revise, when needed.	UPL	N/A
	4.2.10.4 – Share calculated AFDR results with Base Fire Department and Range Operations Division for dissemination of current FDR condition to trainers.		

Programs and Element Goals	Proposed Actions	Responsible Section within Resource Mgmt Branch (CLS, CRE, or UPL)	ENCORE Reference #
	Objective 2. Support fuels management to enhance the condition of grassland ecosystem and prevent coastal sage scrub habitat type conversion to a disturbed state.		
	4.2.10.5 – At least annually, evaluated fuel loads adjacent to military training facilities, infrastructure, and planned projects.	UPL	N/A
	4.2.10.6 – Collaborate with FMD and CPFD to adjust firebreaks and fuelbreaks, as needed, to reduce wildfire frequency in in coastal sage scrub.	UPL	In-house
	4.2.10.7 – Monitor effects of prescribed burns to grasslands and restore to native perennial grassland if practicable.	UPL	CN4314
	4.2.10.8 – Annually map all prescribed burns and wildfires to monitor the frequency in coastal sage scrub and perennial grasslands.	UPL	CN4334
	Objective 3. Conduct conservation prescribed burns to improve wildlife habitats in accordance with species and ecosystem management goals.		
	4.2.10.9 – Conduct prescribed burns to and maintain habitat for SKR and PPM. Burn sites on 3-to-4-year rotations.	UPL	In-house
	Objective 4. Assist the Fire Department in responding to wildfires and conducting prescribed fires.		
	4.2.10.10 – Describe post-fire suppression tasks that may affect listed species and request formal consultation with USFWS on those actions, e.g., removing soil berms on temporary firebreaks in listed species habitat.	UPL	In-house
	4.2.10.11 – Assist with advising on Natural and Cultural resources during an active wildfire.	UPL	In-house
	4.2.10.12 – Assist with advising on Natural and Cultural resources prior to Base Prescription burns, including those not for conservation.	UPL	In-house
	4.2.10.13 – Explore a programmatic Section 7 consultation with USFWS and NMFS for wildfire suppression tasks that may affect listed species, e.g., fire retardant in creeks.	CRE, UPL	In-house
Habitat Restoration and Enhancement Element* (*Section 4.2.11*)** ***Element Goal: Implement habitat restoration to support sustainable landscapes			
	Objective 1. Support completion of restoration projects required by BOs, sustainable habitat goals, and disturbed areas, as needed.		
	4.2.11.1 – Continue to restore Sierra IV buffer.	CRE	CN4328
	4.2.11.2 – Continue to restore riparian and alkaline marsh habitat in Ysidora Basin, starting in 2023.	CRE	
	4.2.11.3 – Complete phase 1 restorations of vernal pool complexes at San Onofre Management Area, Cocklebur Mesa, and VPG 68.	UPL	CN1111 CN4319 CN4335
	4.2.11.4 – Begin phase 2 restorations of vernal pool complexes at San Onofre Management Area, Cocklebur Mesa, and VPG 68.	UPL	CN1111 CN4319 CN4335
	4.2.11.5 – After completing the Mike, Bravo, and November prescribe burns, follow up with invasive plant treatment and enhance the coastal sage scrub and native grasslands.	UPL	CN4314
Climate Change Monitoring and Data Collection Element (Section 4.2.12) ***Element Goal: Provide data to understand future climate change-induced impact to natural resources and the military mission.***			
	Objective 1. Prepare Vulnerability Assessments for species and habitats.		
	4.2.12.1 – Conduct vulnerability assessment for selected habitats on-Base by 2027.	CRE, UPL	TBD
	4.2.12.2 – Conduct vulnerability assessment for selected species on-Base by 2027.	CRE, UPL	TBD
	Objective 2. Collect climate informed data.		
	4.2.12.3 – Collect appropriate data during monitoring to support future analysis of climate change impacts to species using existing contracts discussed in Section 4.1.1.1.	CRE, UPL	Multiple
Climate Resiliency Element (Section 4.2.13) ***Element Goal: Develop/implement short-term and long-term solutions to build resiliency of the Base's natural resources and military mission to climate change.***			
	Objective 1. Continue with management actions that build resiliency of ecosystems to climate change.		
	Objective 1 is carried out through current management named in Sections 4.1.1. In addition…	CRE, UPL	Multiple
	4.2.13.1 – Evaluate coastal wetlands associated with installation lagoons to determine opportunities for wetland restoration.	CRE	TBD
	4.2.13.2 – Restore up to 20 acres of coastal wetland habitat for carbon sequestration and protection against future sea level rise.	CRE	TBD
	4.2.13.3 – Evaluate the need for kelp forest management for carbon sequestration and resiliency of fish, marine mammal and green sea turtle foraging habitat.	CRE	TBD
	4.2.13.4 – Determine feasibility of restoring and/or developing eelgrass habitat in the Del Mar Boat Basin and near the mouth of the SMR estuary.	CRE	TBD

Programs and Element Goals	Proposed Actions	Responsible Section within Resource Mgmt Branch (CLS, CRE, or UPL)	ENCORE Reference #
	Objective 2. Partner with Base departments (e.g., Public Works, Range and Training, Public Liaisons Office) to develop infrastructure projects supporting the resiliency of natural resources, Base infrastructure, and training lands.		
	4.2.13.5 – Continue to support Camp Pendleton's Public Works Department with the San Onofre Beach coastal study.	CRE, ES Planning Staff	In-house
	4.2.13.6 – Explore multiple partner climate resiliency initiatives to address vulnerabilities to listed species and habitat.	CRE, UPL	Multiple
Migratory Bird and Raptor Management Program (Section 4.3) **Program Goal: Provide that populations of migratory birds and raptors are conserved in compliance with legal drivers while ensuring maximum flexibility to the Marine Corps military training mission.**			
Migratory Bird and Raptor Conservation Element (Section 4.3.1) ***Element Goal: Promote the conservation of migratory birds and raptors through MBTA compliance, population monitoring, and habitat management.***			
	Objective 1. Monitor the compliance of Base policies, programs, and procedures with the MBTA, and develop measures to avoid and minimize impacts to bird populations, as well as conservation measures.		
	4.3.1.1 – Monitor and interpret new local/regional/state/federal policies related to migratory birds as they are issued. Develop new guidance in response to new policies as needed.	CRE	In-house
	4.3.1.2 – Review projects for potential impacts to migratory bird populations through the NEPA process.	CRE, UPL	In-house
	4.3.1.3 – Engage in early planning and scoping with USFWS to address migratory bird conservation, and to initiate appropriate actions to avoid or minimize the exposure of birds and their habitats to avian stressors that may result in take of migratory birds.	CRE, UPL	In-house
	4.3.1.4 – Provide as-needed support to the Planning Branch for including applicable conservation measures in environmental review documents.	CRE	In-house
	Objective 2. Identify activities on Camp Pendleton having population-level effects on migratory bird populations through annual and as-needed monitoring.		
	4.3.1.5 – Conduct annual neotropical migratory bird studies to monitor populations and survivorship (MAPS Program) to determine population level impacts in accordance with the Military Readiness Rule.	CRE	CN4152
	4.3.1.6 – Evaluate landscape attributes as needed to determine patch sizes and connectivity of habitat support sustainable populations of migratory birds.	CRE	In-house
	4.3.1.7 – Support access for annual Christmas bird counts by providing access to Audubon Society.	CRE	In-house
	4.3.1.8 – Perform in-house annual surveys to map blue heron nesting colonies (locations and number of nests).	CRE	In-house
	Objective 3. Monitor and manage raptor populations on Camp Pendleton to support healthy populations, comply with federal laws (BGEPA and MBTA), and support the military mission.		
	4.3.1.9 – Track population changes of raptors and raptor electrocution by conducting surveys every 5 years.	CRE	CN4254
	4.3.1.10 – Update existing avian protection plan (2010) by 2023.	CRE	In-house
	4.3.1.11 – Partner with Facilities Maintenance Department to identify and prioritize power lines, wind turbines, and communication towers for modifications that are hazardous to large birds concurrent with updating the avian protection plan.	CRE	In-house
	Objective 4. Manage and maintain permits for authorized removal of birds and bird nests.		
	4.3.1.12 – Maintain and renew tri-annually a Migratory Bird Salvage Permit for passerine birds/nests that cause safety hazards.	CLS	In-house
	4.3.1.13 – Maintain and renew annually a Migratory Bird Depredation Permit for removing problem raptors and corvids from shorebird nesting sites.	CRE	In-house
	4.3.1.14 – Submit permit data back to issuing agency as required within each permit.	CLS, CRE	In-house
	Objective 5. Restore native perennial grass and forb lands in prescribed burn areas to promote nesting and foraging areas for grassland migratory bird populations.		
	4.3.1.13 – After a prescription burn, conduct weed treatment and restoration on perennial grasslands invaded by nonnative grasses.	UPL	CN4314
Marine and Fish Management Program (Section 4.4) **Program Goal: Manage sustainable populations of native marine and freshwater species to meet the conservation objectives of applicable regulations and provide maximum flexibility for the military training mission.**			
Magnuson-Stevens Act and MMPA Compliance Element (Section 4.4.1) ***Element Goal: Support compliance with the Magnuson-Stevens Act and MMPA***			
	Objective 1. Support compliance with the Magnuson-Stevens Act and Marine Mammal Protection Act.		
	4.4.1.1 – Review existing and new policies on an as-needed basis to inform Planning Branch.	CRE	In-house

Programs and Element Goals	Proposed Actions	Responsible Section within Resource Mgmt Branch (CLS, CRE, or UPL)	ENCORE Reference #
	4.4.1.2 – Develop and maintain standard operating procedure document for whales in the Del Mar Boat Basin.	CRE	In-house
	4.4.1.3 –Manage records of dead or stranded marine mammals; implement NOAA Fisheries stranding mammal guidance and coordinate with NOAA Fisheries and/or Sea World® as necessary regarding stranded mammals and enforcement actions.	CRE, CLS	In-house
Marine and Freshwater Monitoring Element (Section 4.4.2) ***Element Goal: Conduct monitoring of marine and freshwater habitats***			
	Objective 1. Monitor marine and freshwater environments and species to document diversity of native aquatic species through periodic inventory and habitat assessments.		
	4.4.2.1 – Periodically (every 5-10 years) monitor biodiversity of native estuarine and freshwater fishes in recreational lakes, estuaries, and streams using seining, minnow traps, electrofishing, and other applicable monitoring techniques.	CRE	CN4101
	4.4.2.2 – Periodically (every 5-10 years) assess the condition of nearshore habitat and diversity of marine species.	CRE	CN4101
	4.4.2.3 – Conduct focused freshwater fish surveys by 2024 and implement outcome of analyses.	CRE	CN4110
Game Management Program (Section 4.5) **Program Goal: Manage sustainable game populations to support a sustainable food web and a recreational hunting program that is consistent with the military mission and other species management programs.**			
Game Species Element (Section 4.5.1) ***Element Goal: Monitor and manage game species to support recreational hunting.***			
	Objective 1. Implement management strategies to sustain mule deer populations as determined by current deer harvest and survey data.		
	4.5.1.1 – Collect deer data from hunting and deer-vehicle strikes on the same day deer were taken.	CLS	In-house
	4.5.1.2 – Evaluate deer data annually and look for population trends.	CLS	In-house
	4.5.1.3 – Manage hunter effort through lottery check-in times and a software program to create efficiency.	CLS	In-house
	4.5.1.4 – Develop a deer management plan that would incorporate current data collection methods and develop new methods for deer population analysis, via contract.	CLS	CN4400
	Objective 2. Collect game species data that are useful in evaluating appropriate hunting bag limits, monitor for over-harvest, and identify health/disease conditions.		
	4.5.1.5 – Tally the number of doves, rabbits, pigeons, squirrels, and ducks harvested seasonally and annually.	CLS	In-house
	4.5.1.6 – Measure hunter effort for small game and waterfowl hunters seasonally and annually and record sex data for quail and waterfowl.	CLS	In-house
	4.5.1.7 – Measure hunter effort on game species seasonally and annually.	CLS	In-house
	4.5.1.8 – Pursue game species Management Plans to reflect current data collection and management actions, via contract.	CLS	TBD
Bison Management Element (Section 4.5.2) ***Element Goal: Monitor and manage the bison population.***			
	Objective 1. Manage the bison population in a scientifically sound manner that minimizes mission conflicts and impacts to habitat and safety.		
	4.5.2.1 – Employees respond to reported bison emergencies to minimize conflicts.	CLS	In-house
	4.5.2.2 – Implement Bison Management Plan recommendations in a timely manner once the specific course of action is approved by management.	CLS	In-house
Outdoor Recreation Program (Section 4.6) **Program Goal: Provide natural resources-related recreational opportunities to installation personnel, their dependents, and the general public to the maximum extent practicable when compatible with the military mission, security, and natural resources sustainability.**			
Fishing Element (Section 4.6.1) ***Element Goal: Provide natural resources-related recreational opportunities to installation personnel to the maximum extent practicable when compatible with the military mission, security, and natural resources sustainability.***			
	Objective 1. Manage fisheries to provide a high-quality recreational fishing program and experience consistent with the military mission and other species management programs.		
	4.6.1.1 – Stock Lake O'Neill with exotic game fish annually, or as conditions allow. Stock nonnative fish salvaged during aquatic exotic species removal effort to the extent practicable; augment with hatchery fish when funding is available.	CRE	CN4104 CN4100
	4.6.1.2 – Install and maintain floating Solar Bee™ pond circulators in Lake O'Neill annually to oxygenate water.	CRE	CN4103 In-house
	4.6.1.3 – Collect accurate fish counts and data from anglers when information is needed by biologists.	CLS	In-house

Programs and Element Goals	Proposed Actions	Responsible Section within Resource Mgmt Branch (CLS, CRE, or UPL)	ENCORE Reference #
	4.6.1.4 – Meet with fishery biologist annually to fund fish plantings at Lake O'Neill.	CLS	In-house
	Objective 2. Provide an accessible, sustainable outdoor fishing experience for military and civilian patrons within the constraints of the military mission and capability of the resources.		
	4.6.1.5 – Track fishing permit sales annually.	CLS	In-house
	4.6.1.6 – Track anglers each time they access fishing areas within training areas.	CLS	In-house
	4.6.1.7 – Collect information from anglers.	CLS	In-house
	4.6.1.8 – Evaluate fishing program annually.	CLS	In-house
	4.6.1.9 – Keep annual prices reasonable and consistent with other bases with similar programs.	CLS	In-house
Hunting Element (Section 4.6.2) ***Element Goal: Manage quality, mission-compatible and ecologically sustainable hunting opportunities that enhance quality of life for Base patrons.***			
	Objective 1. Provide a quality, sustainable outdoor hunting experience for those permitted to hunt on Base within the constraints of the military mission, and capability of the resources.		
	4.6.2.1 – Revise and document harvest bag limits and dates seasonally and annually.	CLS	In-house
	4.6.2.2 – Authorize specific training/hunting area use each hunting day dependent upon training use, hunter numbers, effort, and safety with sufficient manpower to run programs.	CLS	In-house
	4.6.2.3 – Evaluate hunting program annually.	CLS	In-house
	4.6.2.4 – Keep annual prices reasonable and consistent with other Bases with similar programs.	CLS	In-house
Human-Wildlife Safety Management Program (Section 4.7) **Program Goal: Manage base-wide wildlife safety response and resolution.**			
Human-Wildlife Safety Management Element (Section 4.7.1) ***Element Goal: Assist and resolve human-wildlife conflict for Camp Pendleton Base personnel.***			
	Objective 1. Manage wildlife safety responses as related to human health and safety, military operations, quality of life, cantonment areas, and other species management programs.		
	4.7.1.1 – Respond to human-wildlife safety hazards and provide follow-up support.	CLS, CRE, UPL	In-house
	4.7.1.2 – Remove problem wildlife to minimize emergencies.	CLS	In-house
	4.7.1.3 – Prioritize wildlife emergency responses.	CLS	In-house
	4.7.1.4 – Assist in response to service calls regarding retrieval, capture, and safe delivery of wildlife.	CLS	In-house
	4.7.1.5 – Maintain animal handling and transportation equipment in good working order.	CLS	In-house
Incident Management Program (Section 4.8) **Program Goal: Support conservation compliance and oversight for the Base mission and activities.**			
Incident Management Element (Section 4.8.1) ***Element Goal: Manage the timely redress of unauthorized impacts to regulated resources.***			
	Objective 1. I In a timely manner investigate, report, and address solutions for environmental incidents pertaining to regulated resources as needed using the EIRS.		
	4.8.1.1 – Conduct timely investigations and make recommendations/redress to provide reports on incidents that inform managers and other Environmental Security staff of potential and identified impacts to regulated resources that may require corrective actions.	CLS, CRE, UPL	In-house
	Objective 2. Mitigate unauthorized impacts to regulated resources on an as-needed basis.		
	4.8.1.3 – Continue vernal pool restoration at VP68 to finish phase 2 until 2031.	UPL	CN4218
	4.8.1.4 – Continue to implement horse pasture fennel control annually (started in 2016) to offset impacts to thread-leaved brodiaea.	UPL	CN4301
	4.8.1.5 – Continue to implement 51 Area Reservoir Pacific pocket mouse restoration (started in 2019).	UPL	MILCON
	4.8.1.6 – Conduct new restoration projects as required 2023-2028.	UPL	various
	4.8.1.7 – Conduct multi-year analysis on disturbance events in the Santa Margarita River Endangered Species Management Zone by 2023 to determine outreach needs to units and other Base users.	CRE	TDB

Programs and Element Goals	Proposed Actions	Responsible Section within Resource Mgmt Branch (CLS, CRE, or UPL)	ENCORE Reference #
Natural Resources Awareness and Education Program (Section 4.9) **Program Goal:** ***Raise awareness of Camp Pendleton's natural resources management program successes and contribution to conservation of the resources entrusted to USMC stewardship.***			
Data Sharing Element (Section 4.9.1) ***Element Goal: Share ecological data with stakeholders and interested parties to promote regional conservation of sensitive natural resources.***			
	Objective 1. Facilitate the public availability of ecological data collected on Camp Pendleton to support regional conservation and research efforts.		
	4.9.1.1 – Make available survey data and copies of completed reports, when requested.	CRE, UPL	In-house
	4.9.1.2 – Partner with groups to improve regional sharing of ecological data.	CRE, UPL	In-house
Internal Education Element (Section 4.9.2) ***Element Goal: Inform military staff about natural resources and the programs to manage these resources, maintain natural resources staff technical expertise related to ecosystem management, and provide Conservation Law Enforcement Officers (CLEOs) with training opportunities to meet their mandated training requirements.***			
	Objective 1. Provide training opportunities and information to other units and staff on a periodic basis to enhance their understanding of wildlife and land management programs being conducted on Camp Pendleton and ensure compliance with CLS, UPL, and CRE programs.		
	4.9.2.1 – Coordinate with and support each section in ES through as-needed informal meetings, staff support, and project coordination.	CLS, CRE, UPL	In-house
	4.9.2.2 – Participate in annual Unit Training conference to inform training units of wildlife conservation issues.	CRE, UPL	In-house
	4.9.2.3 – Provide annual briefs to the primary units training on installation beaches to promote compliance with the Estuarine/Beach Conservation plan by March 30 annually, and continue briefs, as needed, throughout the nesting season.	CRE	In-house
	Objective 2. Provide mandated and focused training for all CLEOs.		
	4.9.2.4 – CLEOs shall complete the FLETC LMPT course (or equivalent) within one year of hire (as available).	CLS	In-house
	4.9.2.5 – CLEOs shall qualify with all issued firearms twice annually.	CLS	In-house
	4.9.2.6 – CLEOs will attend the annual CLEO In-Service training (dependent upon manpower or other factors).	CLS	In-house
	4.9.2.7 – CLEOs will meet and hold any special certifications as required to perform their duties (e.g., hunter education instructor, defensive tactics instructor, firearms instructor).	CLS	In-house
	Objective 3. Support current trainings for staff on technical issues related to wildlife and plant species, ecosystem habitat management, and biodiversity.		
	4.9.2.8 – Attend regional and range-wide workshops, symposiums, meetings, etc. to maintain and share knowledge of listed species management techniques and issues (e.g., annual Western Snowy Plover Regional Unit 6 Working Group Meeting).	CRE, UPL	N/A
	4.9.2.9 – Attend formal trainings to develop and maintain proficiency in natural resources management.	CRE, UPL, CLS	N/A
External Education Element (Section 4.9.3) ***Element Goal: Promote public awareness of Camp Pendleton's natural resources management program and USMC stewardship.***			
	Objective 1. Maintain public awareness of Camp Pendleton's effort to manage natural resources and INRMP programs through public outreach.		
	4.9.3.1 – Develop and maintain resource briefs to provide overviews on MCB Camp Pendleton INRMP programs.	CLS, CRE, UPL	In-house
	4.9.3.2 – Present papers, posters, articles, and briefings to appropriate venues, newspapers, and professional periodicals.	CLS, CRE, UPL	In-house
	4.9.3.3 – Participate in annual events such as science fairs, Earth Day, and other appropriate venues to help educate Base residents about conserving natural resources.	CLS, CRE, UPL	In-house
	4.9.3.4 – Develop curriculum and provide "nature talk" presentations at the three MCCS camping resorts, minimally bi-monthly from May to September each year to support guest experience and provide natural resources outreach.	CRE	In-house
	4.9.3.5 – Complete restoration of three beach/estuarine kiosk signs at Del Mar Beach resort by 2023 to inform guests of natural resources management and compliance rules.	CRE	CN4055
	4.9.3.6 – Create and edit cinema-style short documentaries highlighting the successful integration of the military mission with endangered species management to be presented to Base residents in 2026.	CRE	CN4055
	4.9.3.7 – Conduct presentations on natural resources programs to off-Base groups such as conservation organizations and college classes.	CLS, CRE, UPL	In-house
	4.9.3.8 – Support newspaper articles, online stories, social media, and other visual media (e.g., tv) on the natural resources program as spearheaded by the Camp Pendleton Public Liaison Office.	CLS, CRE, UPL	In-house
	4.9.3.8 – Develop and install new signs and kiosks to inform Base users of sensitive habitat and endangered species in site-specific locations annually, or as opportunities are identified.	CRE, UPL	CN4055

Programs and Element Goals	Proposed Actions	Responsible Section within Resource Mgmt Branch (CLS, CRE, or UPL)	ENCORE Reference #
	Objective 2. Elevate public awareness and elicit understanding of and support for listed species conservation objectives.		
	4.9.3.9 – Annually distribute informational brochures to MCCS recreational beach program managers to help educate beach users about listed species and regulations associated with Endangered Species Management Zone.	CRE	In-house
	4.9.3.10 – Conduct natural resource brief on fairy shrimp to groups using Oscar II, Fire Base Gloria, Cal Site 23, and DZ Tank Park.	UPL	In-house
	4.9.3.12 – Make recreation regulations available to customers through available recreational hunting/fishing software.	CLS	Unk

List of Acronyms and Abbreviations:

ADFR	Adjective Fire Danger Rating
BASH	Bird Air Strike Hazard
BGEPA	Bald and Golden Eagle Protection Act
BO	Biological Opinion
CA	California
CCA	Candidate Conservation Agreement
CDFW	California Department of Fish and Game
CLEO	Conservation Law Enforcement Officer
CLS	Conservation Law Enforcement Section
CPEN	Camp Pendleton
CRE	Coastal and Riparian Ecosystem Section
CSS	Coastal Sage Scrub
CUP	Conjunctive Use Project
DoD	Department of Defense
EIRS	Environmental Incident Reporting System
ES	Environmental Security
ESA	Endangered Species Act
FLETC	Federal Law Enforcement Training Center
FMD	Facilities Maintenance Department
GIS	Geographic information system
GSOB	Goldspotted oak borer
In-house	Surveys conducted by USMC staff
INRMP	Integrated Natural Resources Management Plan
ISHB	Invasive shot hole borer
LMPT	Land Management Police Training
MAPS	Monitoring Avian Productivity and Survivorship
MBTA	Migratory Bird Treaty Act
MCAS	Marine Corps Air Station
MCB	Marine Corps Base
MMPA	Marine Mammal Protection Act
MOU	Memorandum of Understanding
MSCP	Multiple Species Conservation Plan
NEPA	National Environmental Policy Act
NOAA	National Oceanic and Atmospheric Administration
NVCS	National Vegetation Classification System
OPBUD	Operating Budget
PAO	Proportion Area Occupied

PPM	Pacific pocket mouse
RAWS	Remote Automatic Weather Stations
REPI	Readiness and Environmental Protection Integration
SKR	Stephens' kangaroo rat
SMR	Santa Margarita River
SOMA	San Onofre Management Area
UPL	Uplands Management Section
USACE	U.S. Army Corps of Engineers
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
USMC	U.S. Marine Corps
VPG 68	Vernal Pool Group 68