Integrated Natural Resources Management Plan

U.S. Army Garrison
Fort Hunter Liggett,
California

Final

December 2022

Integrated Natural Resource Management Plan
U.S. Army Garrison Fort Hunter Liggett

FINAL

Prepared for

Department of the Army
U.S. Army Garrison Fort Hunter Liggett
Fort Hunter Liggett, CA

Prepared by

Desert Research Institute

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INRMP ACCEPTANCE PAGE

This Integrated Natural Resources Management Plan (INRMP), December 2022, has been prepared in accordance with regulations, standards, and procedures of the Department of Defense, the U.S. Army, and the Sikes Act Improvement Act (SAIA), as amended through 2003 (16 United States Code [U.S.C.] 670a et seq.) in cooperation with the U.S. Fish and Wildlife Service and the California Department of Fish and Wildlife. This INRMP provides for management and stewardship of all natural resources present on the installation.

To the extent that resources permit, the U.S. Fish and Wildlife Service, California Department of Fish and Wildlife, and the U.S. Army, by signature of their agency representative, do hereby agree to enter a cooperative program for the conservation, protection, and management of natural resources present on Fort Hunter Liggett, California. The intention of this agreement is to develop functioning, sustainable ecological communities on Fort Hunter Liggett that integrate the interests and missions of the agencies charged with conservation, protection, and management of natural heritage in the public interest. This agreement may be modified and amended by mutual agreement of the authorized representatives of the three agencies. This agreement will become effective upon the date of the last signatory and shall continue in full force for a period of 5 years or until terminated by written notice to the other parties, in whole or in part, by any of the parties signing this agreement.

By their signatures below, or an enclosed letter of concurrence, all parties grant their concurrence with and acceptance of the following document.

Approving Officials:

LAMB.LISA.MONIQUE.1032630363 Digitally signed by LAMB.LISA.MONIQUE.1032630363 Date: 2023.02.02 19:09:18 -08'00'

2 February 2023

COL Lisa M. Lamb
Colonel, U.S. Army
Garrison Commander

Date

STEPHEN HENRY Digitally signed by STEPHEN HENRY Date: 2023.03.09 14:15:53 -08'00'

9 March 2023

Stephen P. Henry
Field Supervisor
Ventura Fish and Wildlife Office
U.S. Fish and Wildlife Service

Date

DocuSigned by: Julie Vance FA83F09FE08945A...

5/9/2023

Julie Vance
Regional Manager – Central Region
Region 4
California Department of Fish and Wildlife

Date

Executive Summary

This Integrated Natural Resources Management Plan (INRMP) update has been developed for U.S. Army Garrison Fort Hunter Liggett (FHL) in Monterey County, California, in accordance with Department of Defense Instruction 4715.03, Natural Resources Conservation Program; and Army Regulation (AR) 200-1, Environmental Protection and Enhancement. This INRMP provides a description of the approximately 65,559-ha (162,000-acre) installation and its natural environment, an overview of natural resources found on site, and presents management practices to mitigate negative impacts and enhance positive effects of FHL's mission on natural resources.

The FHL INRMP is intended to be updated periodically according to the Sikes Act to facilitate management of natural resources to conserve biodiversity and environmental quality, while supporting mission activities on site. This INRMP update specifically reviews and revises existing land use and natural resource overviews, reevaluating best management practices to provide the latest agency and science-based recommendations. These recommendations are balanced against the requirements of FHL to accomplish its mission with the highest efficiency. To obtain an accurate assessment of installation influences on resources for this update, all available data, including past implementation and monitoring reports, were reviewed to determine the physical and biotic nature of the installation and its current land use.

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1 Introduction

1.1 Purpose and Scope

The purpose of this Integrated Natural Resources Management Plan (INRMP) update is to integrate science-based natural resources management strategies with the installation mission at United States Army Garrison Fort Hunter Liggett (FHL), streamlining the presentation of relevant information along with updating issues, goals, and actions. This INRMP will serve as the primary guidance for managing the installation's ecosystems while providing for the successful accomplishment of the military mission at the highest possible levels of efficiency. It is developed in accordance with Army Regulation (AR) 200-1, *Environmental Protection and Enhancement*; Department of Defense (DoD) Instruction 4715.03, *Natural Resources Conservation Program*; provisions of the Sikes Act Improvement Act (SAIA 1997; 16 United States Code [U.S.C.] 670a et seq., as amended through 2019), and all applicable Department of Army (DA) and DoD policies, directives, instructions, and manuals. The U.S. Army also intends for this updated INRMP to remain within the existing coverage of the programmatic biological opinion (PBO) for activities conducted at Fort Hunter Liggett (8-8-09-F-54R, issued May 26, 2010, U.S. Fish and Wildlife Service [USFWS] 2010) and the biological opinion that authorizes pesticide use at Fort Hunter Liggett (1-8-96-F-40, issued August 11, 1997; USFWS 1997). The information presented in this INRMP will be incorporated into the FHL Master Plan so that the growth of the installation can progress in a manner consistent with, and complementary to, the objectives of the DA with respect to the protection of natural resources.

1.2 Authority

This INRMP update is consistent with guidance and regulations provided in SAIA, DoD Instruction 4715.03 (*Natural Resources Conservation Program)*, AR 200-1, (*Environmental Protection and Enhancement* 2007), and the most current DA and DoD SAIA and INRMP guidance memoranda. These guidance documents collectively require a plan and management approach that integrates mission support, multipurpose use, ecosystem or landscape-level management, and environmental compliance and stewardship.

The SAIA is the driver behind the installation natural resources management program and INRMP. The SAIA provides that "The Secretary of Defense shall carry out a program to provide for the conservation and rehabilitation of natural resources on military installations" and that an INRMP is to be prepared to facilitate implementation of that program (U.S. Army 2006). Consistent with the use of military installations to ensure the preparedness of the Armed Forces, the Sikes Act further specifies that the Secretaries of the military departments shall carry out a natural resources management program to provide for:

1) Conservation and rehabilitation of natural resources on military installations.
2) Sustainable multipurpose use of the resources, which shall include hunting, fishing, trapping, and non-consumptive uses; and
3) Public access—subject to safety requirements and military security—to military installations to facilitate use.

The INRMP must be cooperatively developed with the USFWS and the state fish and wildlife agency, which for FHL is the California Department of Fish and Wildlife (CDFW; formerly California Department of Fish and Game). The resulting plan reflects the mutual agreement of all three parties concerning conservation, protection, and management of natural resources on the installation. A series of DoD memoranda and tools provide additional guidance by defining INRMP coordination, reporting, and implementation, as well as miscellaneous SAIA requirements.

Acronyms, terms, and definitions of land management categories used in this INRMP are defined in **Appendix A**. A table to document the updates and changes made for this INRMP is included in **Appendix B**. **Appendix C** provides a list of relevant laws, regulations, policy, and guidance that direct natural resources management on FHL. The FHL INRMP is consistent with, and has been developed according to, these guidance memoranda.

1.3 Department of Defense Management Philosophy

The DoD has modified its land management focus over the past two decades from the protection of individual species to ecosystem management (*Memorandum on Implementation of Ecosystem Management in the DoD* 1994). The two principal reasons for these changes are (1) the SAIA emphasis on promoting effective wildlife and habitat protection, conservation, and management; and (2) the concern that a disproportionate amount of attention in the past has been placed on managing the needs of individual, high-profile species in possible conflict with underlying ecosystem functions.

Ecosystem management incorporates the concepts of biological diversity and ecological integrity in a process that considers the environment as a complex system functioning not as a collection of parts, but as a whole. In its application, a goal-driven approach is used to manage natural and cultural resources in a manner that supports present and future mission requirements, preserving ecosystem integrity at spatial and temporal scales compatible with natural processes. Ecosystem management is realized through effective partnerships among private, local, state, tribal, and federal interests. Because it is based on ongoing studies of ecology, biological diversity, and resources management, and because ecosystems are open, changing, and complex, this planning and management philosophy requires flexibility. Provisions must be made which allow for adaptive management, including monitoring, assessment, reassessment, and adjustment, as necessary.

DoD policy guidelines on ecosystem management are intended to promote and protect natural processes. Those guidelines, however, do not preclude active management intervention deemed necessary to address issues at FHL such as invasive species management, vegetation management, special status species recovery, and migratory bird habitat recovery. The DoD expects its resource managers to use the best available science, collaborative efforts with federal and state wildlife agencies, and consultations with outside experts and the public in reaching and implementing management decisions, including specific needs for intervention.

2 Fort Hunter Liggett Mission, Land Use and Natural Resource Management Overview

2.1 Military Mission

United States Army Garrison Fort Hunter Liggett and its subinstallation, Parks Reserve Forces Training Area, are "one garrison located on two installations that provide complementary training capabilities in support of America's Army Reserve and other DoD partners" (U.S. Army 2019a). FHL provides critical base support that enables Commanders to build mission readiness and provides an enhanced quality of life for service members, families, and civilian employees (U.S. Army 2019a).

2.1.1 Effects of the Military Mission

Having a healthy ecosystem is critical to reaching the objectives of the military mission. Troops need training areas (TAs) that can sustain complete training exercises. Stable soils support training activities such as bivouac areas, land navigation, maneuvering, patrolling, and reconnaissance missions, while a healthy vegetation community supports soil stabilization. However, the military mission also has potential negative effects on soils, water, plants, and animals. Permanent impacts from training activities occur when the natural landscape has been permanently altered (e.g., by adding buildings, structures). Temporary impacts from training activities occur when there is an impact, but the activity does not permanently alter the landscape; for example, setting up a bivouac site. Areas that have been temporarily impacted may need to be restored. Any future changes in mission, training activity, or technology should be analyzed to assess their impacts on natural resources. Additionally, the SAIA requires a "no net loss in the capability of military installation land to support the mission of the installation" (SAIA 1997); therefore, any restrictions or land use changes should be carefully evaluated for their impact to the training mission at FHL.

2.2 Land Use

FHL consists of approximately 65,559 ha (162,000 acres) with 65,073 ha (160,800 acres) of training and maneuver lands subdivided into 34 TAs, which includes 29 TAs and 5 subtraining areas (Figures 1 and 2). An Environmental Assessment (EA) Addressing Installation Development and Training was completed in May 2010 to implement the approved *Fort Hunter Liggett Range Complex Master Plan* and the *Fort Hunter Liggett Real Property Master Plan* (U.S. Army 2012b) through the construction of cantonment area facilities, the improvement and construction of additional ranges, and the upgrade of tactical training base (TTB) facilities to meet U.S. Army standards for increasing maximum supportable annual training days from 750,000 to 1,500,000. Recent development has decreased the undeveloped portion of FHL from 99.1% to 98.6%.

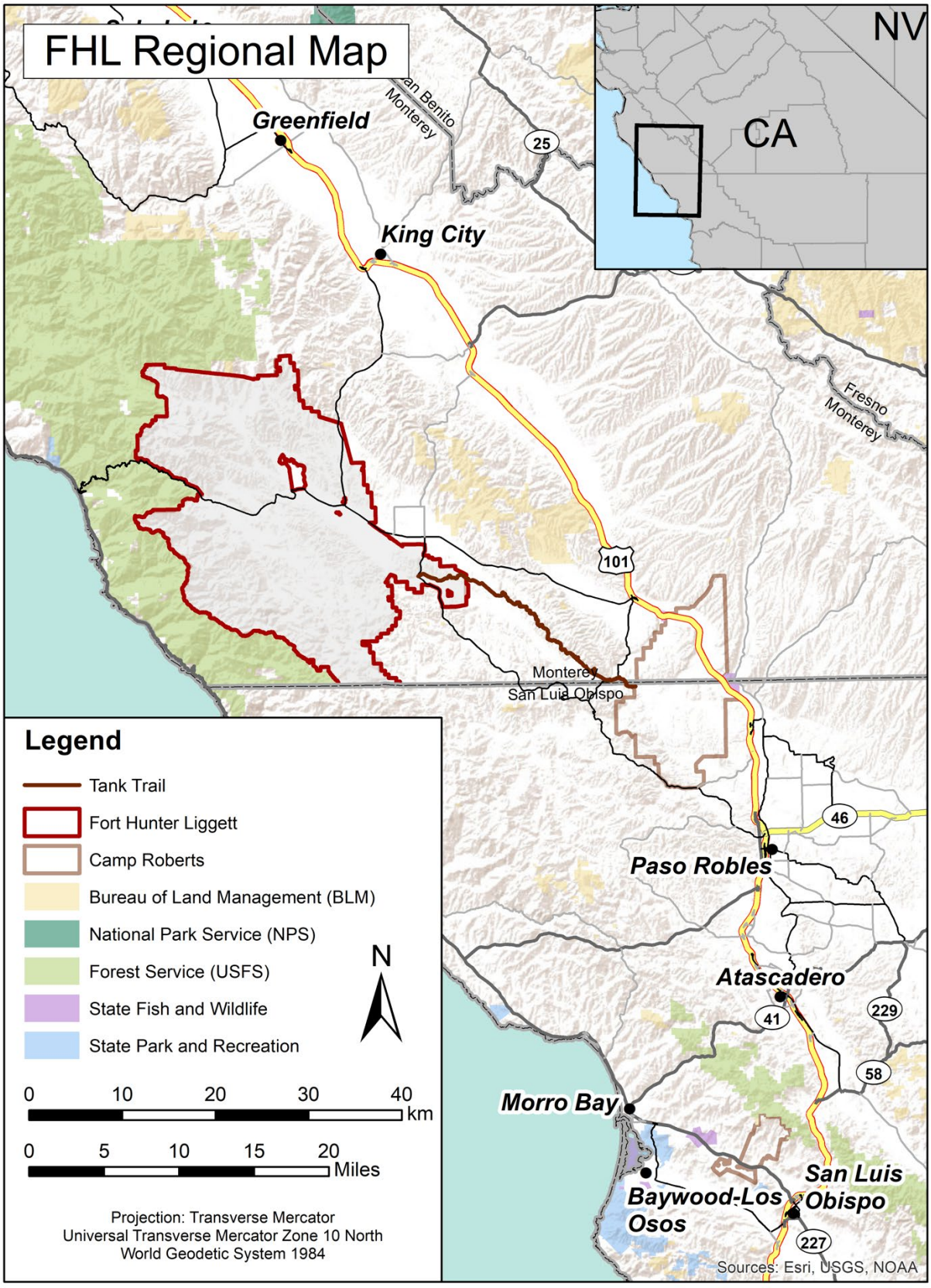

Figure 1: Fort Hunter Liggett Regional Location Map

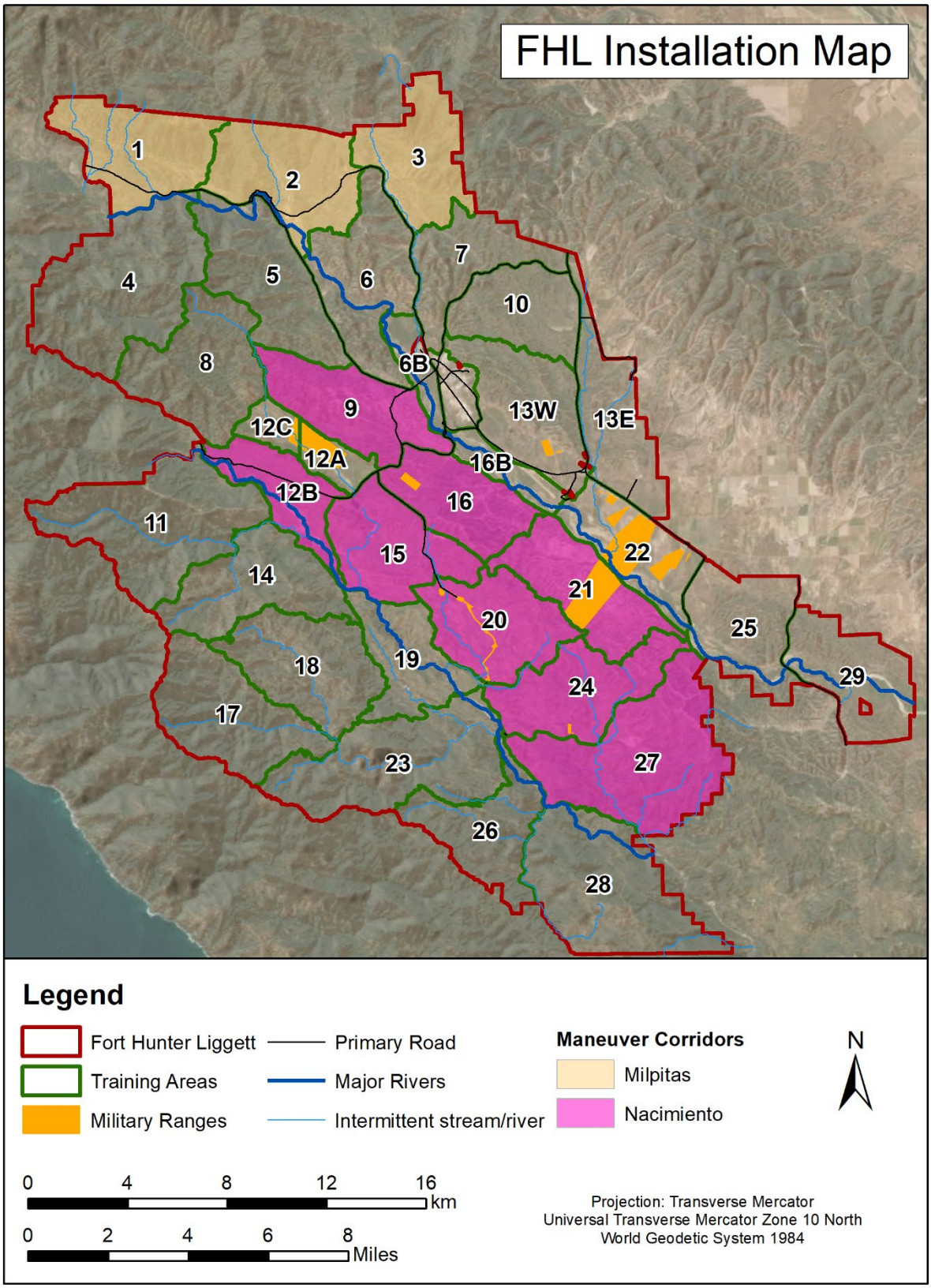

Figure 2: Fort Hunter Liggett Installation Map

2.2.1 Developed and Landscaped Areas

The cantonment area is in the east-central portion of the installation and occupies approximately 436 ha (1,077 acres). There are multiple land uses present in the cantonment area, including mission-related uses and support functions. FHL land use categories in the cantonment consist of administration, airfield, training (both classroom and outdoor), community services/facilities, family housing, unaccompanied housing, maintenance, supply/logistics, medical, utility, and outdoor recreation/open space (U.S. Army 2012b). There are family housing areas currently used to support full-time residents of the installation and lodging for short-term residents in the form of transient training barracks and senior enlisted and officers' quarters (U.S. Army 2012b). Per the 2010 EA, current urban planning areas, which are defined as those areas of FHL affected by multiple buildings, hardscape, or human use for extended periods of time, increased from 280 to 493 ha (639 to 1,220 acres) and an additional 103 ha (255 acres) were added to the existing cantonment area.

2.2.2 Military Training

FHL is the nation's largest U.S. Army Reserve Command (USARC) training installation and the seventh largest Army facility in the continental United States. FHL strives to maintain and allocate training areas, airspace, facilities, and ranges to support field maneuvers, live-fire exercises, testing, and institutional training. All 34 TAs are currently active and contain 26 facilities and 10 training ranges. Twenty-one of the TAs are designated for light forces maneuver training, and the remaining 13 TAs can support heavy forces maneuver training. The Multi-Purpose Range Complex supports up to Tank/Bradley. The Stony Valley area allows units to design their own live-fire scenarios. As for maneuver training, TAs 12, 15, and 20 are suited for Mechanized Combat Operations and Lane Training. The varied terrain equally challenges light units (U.S. Army 2007). Per the 2010 EA, 132 ha (325 acres) were added to the current TTBs. Range development in the TAs increased the current footprint from 324 ha to 421 ha (800 acres to 1,040 acres).

2.2.3 Land Management

The Directorate of Public Works (DPW) manages real property, natural resources, environmental protection, pollution abatement, master planning, engineering, construction, operations, and maintenance of buildings, structures, grounds, and utilities. The Directorate of Plans, Training, Mobilization, and Security (DPTMS), particularly its Range Operations Division, is the interface between the DPW Environmental Division (PWE) and troops training in the field. DPTMS is responsible for managing range complexes, coordinating military training, implementing Integrated Training Area Management (ITAM), and releasing training areas for land restoration and recreational use. DPTMS provides control of military activities, access to ranges to accomplish natural resources management, and opportunities for wildlife-related recreation. It also enforces environmental requirements involving TA use.

2.3 Natural Resource Management

The PWE is responsible for environmental compliance, pollution prevention, cultural resources, and natural resources programs, including implementation of this INRMP. The natural resources program for FHL integrates environmental protection, conservation, and restoration within the constraints of the installation's military mission; at the same time, the natural resource manager will identify risks to the environment that might result from military activities and report these potential risks to the DPW Environmental Chief so that alternatives can be developed that reduce or eliminate the potential impacts.

2.3.1 Resource Management Practices

Table 1 gives a brief overview of the current FHL land and resource management subject areas and pertinent regulatory drivers (U.S. Army 2012a). Under these subject areas, FHL implements management practices to sustain the mission and mitigate natural resource impacts.

Table 1: Management Practices Subject Areas at FHL

Management Practice Subject Area	Federal, State, DoD, or DA Law, Policy, or Guidance
Agency and Public Coordination	SAIA, ESA, California Endangered Species Act (CESA), CA Mgmt. of Fish and Wildlife on Military Lands (CA MIL), DoD Instruction 4715.03, DoD Manual 4715.03, AR 200-1
Conservation Outreach and Education	DoD Instruction 4715.03, DoD Manual 4715.03, AR 200-1
Data Management and Integrity	SAIA, DoD Instruction 4715.03, DoD Manual 4715.03, AR 200-1
Ecosystem Management	SAIA, DoD Instruction 4715.03, DoD Manual 4715.03, AR 200-1, CFR Part 651
Grounds Maintenance	SAIA, EO 13112, CA MIL, DoD Instruction 4715.03, DoD Manual 4715.03, AR 200-1
Invasive or Noxious Plant Control & Pest Management	SAIA, EO 13112, CA MIL, DoD Instruction 4715.03, DoD Manual 4715.03, AR 200-1
Conservation Law Enforcement	SAIA, DoD Instruction 4715.03, DoD Manual 4715.03, AR 200-1
Management of Special Status Species	SAIA, ESA, CESA, CA MIL, DoD Instruction 4715.03, DoD Manual 4715.03, AR 200-1, CA Habitat Enhancement Act, Programmatic Biological Opinion (USFWS 2010)
Migratory Bird Management	SAIA, Migratory Bird Treaty Act (MBTA), DoD Instruction 4715.03, DoD Manual 4715.03, AR 200-1, Army MBTA Guidance: Army Policy guidance on Mig. Bird Treaty Act, Supplemental Army Policy on Mig. Bird Treaty Act
Natural Resources Monitoring, Protection, and Restoration	SAIA, CA MIL, CA Habitat Enhancement Act, DoD Instruction 4715.03, DoD Manual 4715.03, AR 200-1
National Environmental Policy Act (NEPA) Environmental Review	CFR Part 651 sets forth policies and responsibilities for implementing NEPA

Management Practice Subject Area	Federal, State, DoD, or DA Law, Policy, or Guidance
Planning Level Surveys (PLSs)	SAIA, DoD Instruction 47150.3, DoD Manual 4715.03, AR 200-1
Pollution Prevention	SAIA, CWA, CA Wetlands Preservation, DoD Instruction 4715.03, DoD Manual 4715.03, AR 200-1
Professional Development	SAIA, DoD Instruction 4715.03, DoD Manual 4715.03, AR 200-1
Protection and Enhancement of Sensitive and Rare Habitats (Native Oak Communities, Bunch Grass Communities, Rock Outcrops)	SAIA, ESA, CESA, CA MIL, CA Riparian Habitat Conservation Program, DoD Instruction 4715.03, DoD Manual 4715.03, AR 200-1
Recreational Use, Hunting, Fisheries, Summer Water Sources	SAIA, CWA, CA MIL, DoD Instruction 4715.03, DoD Manual 4715.03, AR 200-1
Riparian Areas	SAIA, CA Habitat Enhancement Act, DoD Instruction 4715.03, DoD Manual 4715.03, AR 200-1
Soil, Erosion & Sedimentation Control	Clean Water Act (CWA), SAIA, CA Habitat Enhancement Act, DoD Instruction 4715.03, DoD Manual 4715.03, AR 200-1
Stream Stability	SAIA, CWA, CA Wetlands Preservation, DoD Instruction 4715.03, DoD Manual 4715.03, AR 200-1
Surface Waters and Wetlands	SAIA, CWA, CA Wetlands Preservation, DoD Instruction 4715.03, DoD Manual 4715.03, AR 200-1
Wildland Fire Management Program & Fuel Wood	SAIA, CA Habitat Enhancement Act, DoD Instruction 4715.03, DoD Manual 4715.03, AR 200-1

2.4 Objectives and Goals

Specific management practices, or goals, identified in this INRMP have been developed to maintain biological diversity and ecosystem function within FHL. Table 2 provides the overriding goals of this INRMP, and the relevant success indicators associated with each. Pursuant with the DoD management philosophy, protecting corridors of sensitive habitat that supports a variety of species at FHL will help perpetuate, on a local and regional basis, viable, sustainable populations of native species, and the communities composed by those populations. Each of the management strategies described in this INRMP should be monitored so that modifications can be made during implementation as conditions change.

Table 2: FHL Integrated Resource Management Plan Goals

Goal	Objective	Indicator
Engage Internal and External Stakeholders on Natural Resources Issues	Coordinate environmental planning	Natural resources staff included in pre-project planning meetings
	Coordinate with regulatory agencies	Delivery of annual natural resources report(s) and responsiveness to agency feedback

Goal	Objective	Indicator
	Enhance environmental awareness	Staff are trained on resource protection measures and outreach
	Foster community and external stakeholder relationships	Volunteer opportunities and outreach events held that are open to public
	Employ Conservation Law Enforcement Officers	Trained officers on staff and projects/tasks implemented
Manage Special-Status Species	Monitor and manage federally listed species and habitat	Stable or increasing populations and acres of habitat protected or restored
	Monitor and manage California-listed species, fully protected species, and Species of Special Concern	Stable or increasing populations and acres of habitat protected or restored
	Detect protected bumblebee species	Number of surveys conducted
	Manage Candidate Species	Stable or increasing populations and acres of habitat protected or restored
	Manage bat species	Number of surveys conducted, and species successfully identified
	Manage invasive bullfrog, crayfish, and fish populations	Reduction of bullfrogs, crayfish, and non-native fish encountered during surveys
Manage Migratory Birds and Eagles	Protect migratory birds and eagles	Number of measures/project consultations taken to ensure migratory bird surveys
	Monitor migratory birds and eagles	Number of breeding bird surveys conducted
Conduct Ecosystems Management	Manage invasive plants	Number of control measures implemented, and change in invasive species density and distribution
	Inventory and monitor wildlife populations	Proportion of taxa for which an inventory has been completed, number of monitoring programs implemented
	Promote native plants	All planting/seeding projects using native plants/locally sourced seed; acres of habitat restored
	Protect and enhance sensitive and rare habitats	Acres of riparian, native oak community, native bunch grass community and rock outcrop habitat protected or restored; number of projects implemented
	Review impacts of actions on natural resources	Proportion of projects reviewed before suspense date

Goal	Objective	Indicator
	Support Wildland Fire Program	Ensure that the Integrated Wildfire Fire Management Plan (IWFMP) is current, and PWE's role in IWFMP implementation is fulfilled
	Promote professional natural resources data collection and management	Data standardized, protocols developed and implemented
	Consider impacts of climate change on resource management planning and decisions	INRMP component plans and installations account for potential climate change variability
	Conduct habitat restoration and rehabilitation	Number of projects implemented, and post-action success standards met; coordination with ITAM
Conserve Water Resources	Protect wetlands, vernal pools, and waters	Acres of wetlands identified and protected; acres of wetland areas restored; Stormwater Pollution Prevention Plan (SWPPP) recommendations met
	Groundwater and surface water pollution prevention	SWPPP and Installation Action Plan recommendations met
	Prevent and control erosion	Projects follow best management practices outlined in forthcoming Soil Erosion and Sedimentation Control Component
Implement Sustainable Game and Fish Management	Prevent invasive mussel introduction	Number of watercrafts inspected; prevention program actions implemented
	Implement Hunting and Fishing Program	Meet harvest and management goals
	Inventory and monitor game species	Number of surveys conducted and results within established parameters
	Facilitate recreational use	Development of recreational activities while conserving natural and cultural resources and environmental compliance
	Improve wildlife habitat	Number of projects implemented to improve habitats on FHL to support healthier and more diverse biological communities
	Reduce wildlife collisions	Number of projects to reduce the potential for wildlife-vehicle collisions
Conserve Native Oak Trees	Implement the FHL Oak Management Plan	Proportion of damaged and removed trees replaced through successful native oak mitigation plantings

2.5 Review, Revision and Reporting

The SAIA requires that INRMPs must be reviewed for operation and effect no less than once every five years by the installation, the USFWS, and the state fish and wildlife agency (in this case, CDFW). The DoD and DA have provided specific guidance on the joint review and coordination process and timeframe (DUSD [I&E] 2002; DoD Instruction 4715.03; AR 200-1).

Installations must document the outcome of the joint review to reflect the parties' mutual agreement (U.S. Army 2006). If the five-year INRMP review for operation and effect results in major revisions to the plan, FHL must solicit public review and comments (U.S. Army 2006). The National Environmental Policy Act (NEPA) process may be used to meet public review requirements. FHL must afford the USFWS and the CDFW the opportunity to review all public comments.

Installation natural resources managers must conduct an internal review of the INRMP in coordination with other installation managers (e.g., DPTMS) annually to verify the following (DoD Instruction 4715.03; U.S. Army 2006):

- Current information on INRMP conservation metrics, as described for Army Environmental Quality reporting, is accurate and current.
- 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 INRMP revision.
- All required coordination has occurred.
- All significant changes to the installation's mission requirements or its natural resources have been identified.
- INRMP goals and objectives are still valid.
- No net loss of training capability has occurred due to implementation of the INRMP in accordance with the SAIA.

3 Installation Overview

3.1 Regional Land Use and Setting

FHL is in the Central Coast region of California, approximately 113 km (70 mi) southeast of the City of Monterey, approximately 37 km (23 mi) southwest of King City, and approximately 19 km (12 mi) west of Lockwood (Figure 1). FHL is approximately 65,559 ha (162,000 acres), and the entirety of the installation is within Monterey County. Part of the San Luis Obispo County line forms the southern boundary of the installation. The Pacific Ocean is approximately 6.5 km (4 mi) west of the western boundary of FHL.

The land surrounding FHL consists of Los Padres National Forest, which is adjacent to the installation to the north and west and includes portions of the Ventana and Silver Peak Wilderness areas. Private lands used for grazing and farming, and some Monterey County lands are located to the east and south (U.S. Army 2014a). The Mission San Antonio de Padua is located inside FHL as an in-holding. There is a 27-km (17-mile) tank trail between Camp Roberts and FHL held as an easement from the Monterey County Water Resources Agency to the Army (Figure 1). Land use on the west, north, and east sides of FHL are regulated by Monterey County, while land uses to the south are regulated by San Luis Obispo County. Agricultural zoning or other low-density uses are the primary land use designations for the areas surrounding the installation. Nacimiento-Fergusson Road bisects the installation, connecting Highway 1 to Jolon Rd and Highway 101. The eastern portion of FHL and adjacent off-installation land have been designated as the Jolon Road Segment of the Agriculture and Winery Corridor by Monterey County.

3.2 Natural Environment

3.2.1 Ecoregion and Climate

FHL has a Mediterranean climate characterized by warm, dry summers and mild, wet winters. Summer fog is uncommon, but coastal fog occasionally reaches the coast ridge area (U.S. Army 2012a). Rainfall is higher in the western portion of the installation and at higher elevations (U.S. Army 2012a). In 21 years of climate data collected in the cantonment area, temperature varied from a record minimum of –8.9 °C (15.6 ° F), to a record maximum of 46.7 °C (116.1 °F) (Station USR0000CFHL; downloaded from https://www.ncdc.noaa.gov/cdo-web on 11/5/21). Twenty-four-hour variations in temperature of up to 25 °C (45 °F) occur year-round but are more common in the summer. Average temperature ranges from 8.2 °C (46.8 °F) in December to 24.7 °C (76.5 °F) in July. Rain year (July 1–June 30) precipitation measured at FHL in the San Antonio Valley from 1961–2002 ranged from 157 mm (6.2 in) in 1975–1976 to 1,119 mm (46.9 in) 1997–1998, showing high interannual variability (U.S. Army 2003b). More recent data on FHL collected since 2001 shows a similar range, from 185 mm (7.3 inches) in rain year 2006–2007 to 795 mm (31.3 inches) recorded in both 2010–2011 and 2016–2017 (https://raws.dri.edu/cgi-bin/rawMAIN.pl?caCFHL).

3.2.2 Topography

The topography of FHL is characterized by rugged moderate- to high-relief ranges separated by low-relief valleys. FHL lies within the coastal Santa Lucia Range that extends for approximately 225 km (140 mi) from Carmel southeast through San Luis Obispo County. The Santa Lucia Range trends northwest-southeast with Junipero Serra Peak (also known as Santa Lucia Peak) rising to 1,785 m (5,857 ft) above sea level. Elevations at FHL range from 1,141 m (3,744 ft) at Alder Peak to 232 m (760 ft) in alluvial channels of the San Antonio River. The Nacimiento River, Stony Creek, Mission Creek, and San Antonio River (Figure 2) are southeast-draining channels that have formed notable valleys at FHL. These stream channels attain local grades of 3–5 m/km (18–25 ft/mi) and drain into local downstream reservoirs prior to feeding the Salinas River valley. Other minor stream systems are tributary to the Nacimiento and San Antonio Rivers and drain local upland areas.

3.2.3 Geology

Three different groups of pre-Quaternary rocks underlie FHL: the Salinian block, also known as the Salinian terrane or Sur series; the Franciscan complex; and late Cretaceous through late Tertiary sedimentary strata deposited in marine and non-marine basins along the Pacific margin of North America. The Salinian block underlies the northern part of FHL and includes Mesozoic crystalline intrusive rocks (granitoid plutons) and metamorphic rocks whose protoliths (original rocks prior to metamorphism) range in age from Precambrian to Mesozoic. The Franciscan complex underlies the southwestern part of FHL. The Franciscan rocks are dominated by graywacke (Jurassic through Cretaceous) as well as chert and greenstone and are weak and highly sheared, making them prone to land sliding (Wills et al. 2001). Ultramafic rocks are also widely distributed throughout the Franciscan complex (Schiffman et al. 1992).

Late Cretaceous and younger sedimentary strata are exposed in the eastern two-thirds of the installation. Subparallel northwest-trending belts of rocks are formed by Upper Cretaceous and Paleocene deposits of sandstone, shale, and conglomerate, and by the Miocene Monterey Formation. Medium- to coarse-grained sandstone, conglomerate, mudstone, and siltstone of marine origin up to 1,067 m (~3,500 ft) thick form an unnamed formation of Paleocene age (Durham 1965). The Vaqueros Formation of the early Miocene age consists primarily of marine sandstone, siltstone, and mudstone about 259 m (~850 ft) thick. The Monterey Shale formation overlies the Vaqueros formation, and consists of marine porcelaneous rocks, mudstone, chert dolomitic carbonate beds, concretions, shale, siltstone, and sandstone. The Monterey Shale ranges in thickness up to 2,012 m (~6,600 ft; Durham 1965). Pliocene and Pleistocene marine sediment are exposed in much of the eastern third of FHL, except were covered by alluvial deposits associated with the San Antonio River. An unnamed Pleistocene era formation consists mostly of very fine-grained sandstone and diatomaceous mudstone of marine origin. This unnamed formation, as well as the Paso Robles Formation, both overlie the Monterey Shale and are exposed south of the San Antonio River. The thickness of the Paso Robles Formation in the San Antonio River Valley varies from a few meters/feet to more than 46 m (150 ft). This formation is comprised mostly of non-marine conglomerate, pebble conglomerate, conglomerate sandstone, and sandstone (Durham 1965).

The pre-Quaternary and early- to mid-Pleistocene consolidated bedrock units have been reworked into younger late Pleistocene to modern fluvial and alluvial deposits throughout FHL. The central parts of the Nacimiento Valley and the Stony Valley consist of Holocene channel sands and gravel deposited by small creeks and drainages that have reworked the surrounding exposed bedrock. Monterey Formation rocks form a local drainage divide that separate these upland valleys from the San Antonio River Valley to the northeast. The exposed bedrock uplands are highly dissected by small streams and form alluvial fan deposits that debouch onto late Pleistocene to Holocene San Antonio River alluvium. These alluvial deposits flank the San Antonio River channel and form alluvial fans, plains, and terrace deposits, indicating episodic sedimentation and downcutting of the San Antonio River.

FHL lies between two major fault zones that show evidence for Quaternary (<2.6 Ma) activity, although other large pre-Quaternary structures are also present at FHL (USGS and CGS 2020). The San Simeon fault zone is located along the coastline and slightly offshore, about 6 km (4 miles) from the western FHL boundary. This zone has been active through the Holocene in places with slip rates of approximately 1–5 mm/kyr posing a moderate hazard to FHL activities. The Rinconada fault zone occurs northeast of FHL and was active during Pleistocene time (130-150 ka) with modest slip rates of approximately 0.2–1 mm/kyr. Several fault strands occur along the mountain front within 2-3 km (1–2 miles) from the eastern FHL boundary. Although they have been inactive for the past 15 kyrs, these faults still pose potential hazards to FHL. Several Quaternary fault traces of the Jolon Fault zone have also been identified within FHL. These are relatively inactive with no slip during the past 15 kyrs but occur within 2 km (1 mile) of the main cantonment, so constitute a potential hazard within FHL. Additionally, the San Andreas fault zone is located about 45 km (28 miles) northeast of FHL and has been active historically with slip rates >5 mm/kyr, posing a potential hazard to structures within FHL given a sizeable rupture.

Landslides are common in the area and have been mapped in detail along major coastal highway corridors (Wills et al. 2001). Although landslides have not been mapped within FHL, landslide scars are observable at FHL in Monterey Formation deposits. Landslide potential may be high at FHL, depending on local soil, bedrock, meteorologic, and land-use conditions.

3.2.4 Hydrology

FHL encompasses much of the headwaters of both the Nacimiento River and San Antonio River watersheds. Both rivers originate north of FHL on U.S. Forest Service property, then cross the installation from northwest to southeast. The San Antonio River flows into the San Antonio Reservoir, which is located partially within the boundary of FHL (although portions of the reservoir located within FHL have been dry in recent years), and the Nacimiento River flows completely though the installation before entering Nacimiento Reservoir. After leaving their respective reservoirs, both rivers then flow east into the Salinas River. The rivers create two gently sloping, meandering valleys separated by steep hills. Both rivers are primarily intermittent. They are seasonally scoured by flooding during the winter and flow is primarily subsurface through summer and fall, although some reaches maintain surface pooling or flowing water at a reduced rate. The Nacimiento River lies farther west, and its watershed includes the

east side of the Coast Range; the San Antonio River lies east of the hills separating the two watersheds.

Two groundwater aquifers underlie FHL, including areas of both confined (capped by sediments with low permeability) and unconfined (level can rise and fall through relatively permeable sediments) groundwater. The Jolon Fault separates the Lockwood groundwater basin to the east from the San Antonio Basin to the west (U.S. Army 2012a).

3.3 Installation History

FHL is situated on the ancestral homelands of the Salinan Indians. The earliest human occupation at FHL is estimated at 8,000 BC. Spanning more than 10,000 years, the pre-Hispanic period included a long history of adaptive shifts in population, subsistence, and social organization (U.S. Army 2012a). The Salinans were complex hunter-gatherers who managed the landscape in which they hunted, fished, and gathered, occupying almost 7,770 square kilometers (3,000 square miles) at the time of initial European occupation in 1769 (U.S. Army 2012a). The San Antonio River and Nacimiento River valleys and tributary stream valleys were grazed during the Spanish Mission and Mexican rancho periods (1771–1848). Established in 1771, the Mission San Antonio de Padua dramatically changed the valley, altering the landscape with extensively built infrastructure that included an irrigation system to support crop cultivation. The Mexican regime (1822–1848) redistributed mission lands, creating vast ranchos, many of which were extensively used for grazing or cultivation (U.S. Army 2012a). During the American settlement period (1850–1880), homesteading resulted in fragmentation of the large Mexican land grants, and valley bottoms were intensively farmed. In the 1920s, publishing magnate William Randolph Hearst Jr. purchased large land holdings and continued to add to his vast ranch until it nearly equaled several of the Mexican ranchos (U.S. Army 2012a).

Hunter Liggett Military Reservation was established in January 1941 when the U.S. Army, in anticipation of World War II, purchased over 80,937 ha (200,000 acres) of land belonging to William Randolph Hearst, Jr. and other private landowners along with lands acquired from the U.S. Forest Service (U.S. Army 2012a, 2018). The installation was named after Lieutenant General Hunter Liggett, who was General John J. Pershing's chief of staff during World War I. By 1941, troops began arriving at Hunter Liggett Military Reservation to train for World War II.

Until 1952, fort administration was under Camp Roberts' authority. Fort Hunter Liggett was a subinstallation of Fort Ord until November 1993, when the installation came under United States Army Reserve Command. Today, the command is officially designated as the U.S. Army Garrison Fort Hunter Liggett with Parks Reserve Forces Training Area (PRFTA) located in Dublin, California as a subinstallation, providing opportunities for "real world" training and defense technology testing (U.S. Army 2018). Natural resources at PRFTA are managed under a separate installation specific INRMP (U.S. Army 2022a).

3.4 Current Military Missions

FHL is the nation's largest U.S. Army Reserve (USAR) training installation and the seventh largest Army facility in the continental United States. Major tenant units located at FHL are the

3rd Brigade/91st Division-356th Logistical Support Battalion, 7th Brigade/80th Division (Institutional Training Command), the 31st Naval Construction Regiment, and the 63rd RRSC-Equipment Concentration Site 170. FHL also provides training opportunities for other branches of the U.S. military and government agencies. For example, the Air National Guard (ANG), Army National Guard (ARNG), Reserve Officer Training Corps (ROTC), U.S. Air Force (USAF) and Reserves, Army, U.S. Coast Guard (USCG), U.S. Marine Corps (USMC), U.S. Navy (Navy), and other Federal and international government entities conduct exercises at FHL. Other international coalition partners including Great Britain, Canada, Belgium, and France routinely train at FHL. In the future, other nations may train at FHL.

Military training at FHL supports from 750,000 to 1.5 million person-days of training, primarily for Combat Support (CS)/Combat Service Support (CSS) activities (U.S. Army 2012a; 2019b). Training exercises range from classroom activities to brigade-sized field training exercises and include training in live-fire munitions and use of high explosives at designated ranges, convoy operations, TTB activities, heavy equipment operations, and other activities. Training units are typically on site for several days to several weeks per exercise. Existing infrastructure to support training includes more than 60,703 ha (150,000 acres) of TAs, an airfield capable of handling C-17 aircraft, more than 20 drop zones, widely varied terrain, convoy live-fire range, TTBs, weapons qualification and multi-purpose ranges, live-fire range complexes, training classrooms, dining facilities, barracks, and other billeting.

3.5 Public and Affiliate Access

Although several roads that cross FHL (Jolon Rd, Nacimiento-Fergusson Rd, Vasquez Rd, and Del Venturi Rd) provide public through access, FHL is a closed installation, and all visitors who leave the public roadway must have a valid reason to visit and first be vetted by installation staff per required procedures. Public access is limited because of military training, safety and security issues, and asset protection. However, external stakeholders such as Native American groups and researchers can coordinate with FHL to request access for specific reasons. FHL determines feasibility of these access requests on a case-by-case basis. Requests for access are reviewed by FHL staff and may be approved by the Garrison Commander only if they do not interfere with military training. Instructions on access requests are available on the Visitor Information webpage.

4 Integration Overview

Successfully implementing an INRMP requires the support of natural resources personnel, other installation staff, command personnel, and installation tenants. The following section discusses the responsibilities for INRMP implementation within the DA, as well as other federal and state agency stakeholders.

4.1 Internal Stakeholders

Table 3: List of Installation Stakeholders

Installation Stakeholders	Responsibility
Garrison Commander	Overall management of the facilities and successfully carrying out the FHL mission. Implementing and enforcing this INRMP and managing installation operations. The Commander ensures that there is installation-wide support for the implementation of this INRMP.
U.S. Army Reserve Command	The U.S. Army Reserve Command has review and approval authority for this INRMP and can provide funding for INRMP implementation.
U.S. Army Installation Management Command (IMCOM)	IMCOM has review and approval authority of the INRMP and provides oversight of all installation programs.
Directorate of Public Works (DPW)	Manages real property, master planning, engineering, construction, operations and maintenance of buildings, structures, grounds, and utilities.
DPW Environmental Division (PWE)	Responsible for the installation environmental programs, including implementation of the INRMP, wildlife management, vegetation management, endangered species management, land management, water quality protection, air quality protection, NEPA compliance, and cultural resources conservation.

Installation Stakeholders	Responsibility
Directorate of Plans, Training, Mobilization, and Security (DPTMS)	Scheduling and approving troop training and is the interface between the PWE and usage of FHL. Responsible for managing range complexes, coordinating military training, implementing ITAM, and releasing training areas for land restoration and recreational use.
Integrated Training Area Management (ITAM)	The ITAM Program is a subcomponent of the Army's Sustainable Range Program, which is the Army's overall approach for improving the way in which it designs, manages, and uses its ranges to ensure long-term sustainability. ITAM has five components: Range and Training Land Assessment (RTLA), Land Rehabilitation and Maintenance (LRAM), Sustainable Range Awareness (SRA), Training Requirements Integration (TRI), and Geographic Information System (GIS).
Public Affairs Office (PAO)	Responsible for formulating, implementing, and disseminating all command information to the public, including information about natural resources management.
Installation Legal Office (ILO) through Judge Advocate General (JAG)	Provides legal advice to the installation in all areas of the law, including compliance with applicable environmental and natural resources management laws and regulations. The JAG provides advice about the statutory and policy framework in which this INRMP is implemented.
Directorate of Emergency Services (DES)	The Directorate of Emergency Services (DES) is the garrison entity that provides for the protection, welfare, and safety of the garrison community. DES includes the Police and Fire Departments and the Physical Security Office.
Other Installation, Tenant Organizations and Partners	The formal mechanism by which the INRMP and natural resources program are integrated with facility-wide activities is through participation on the Environmental Quality Control Committee (EQCC). The EQCC is a communications forum for environmental planning and management of installation lands.

4.2 External Stakeholders

Table 4: List of Signatory Agencies

Signatory Agencies	Responsibilities
U.S. Fish and Wildlife Service (USFWS) Pacific Southwest Region Office Ventura Fish and Wildlife Office	Signatory agency of installation INRMPs in accordance with the SAIA. In addition, the DoD, and DA consult formally and informally with the USFWS on federally listed species and provide additional consultation for federally proposed candidate species. FHL benefits from the January 2006 Memorandum of Understanding (MOU) between DoD, USFWS, and the International Association of Fish and Wildlife Agencies for a Cooperative Integrated Natural Resources Management Program on Military Installations.
California Department of Fish and Wildlife (CDFW)	Oversees the management and use of the state's forests and parks, fisheries, and wildlife. It has statewide responsibilities for assessing and restoring water quality and habitat; managing and regulating recreational boating, fishing, and hunting; and managing wetlands, wildlife, state threatened and endangered (T&E) species, and species of concern.

Table 5: List of Supporting Agencies and Organizations

Agencies and Organizations	Supporting Activities
California Biodiversity Council (CBC)	This collaborative brings together a broad range of leaders and groups across landscapes and ecosystems to advance meaningful action (CBC 2021).
California Department of Food and Agriculture (CDFA)	Provides subject matter experts and technical support in the field of invasive species management.
California Department of Water Resources (CDWR)	Manages California's water resources, systems, and infrastructure in a responsible, sustainable way (CDWR 2021).
California Environmental Protection Agency (Cal/EPA)	Charged with developing, implementing, and enforcing the state's environmental protection laws that ensure clean air, clean water, clean soil, safe pesticides, and waste recycling and reduction.
Colleges and Universities	Seventeen universities and research institutions, along with nine federal agencies (including DoD) comprise the Cooperative Ecosystem Studies Unit (CESU). FHL has access to any of the partners in the CESU nation-wide.

Agencies and Organizations	Supporting Activities
Contractors/Cooperators	Contractors and/or cooperators must adhere to the requirements and management actions detailed in the INRMP.
DoD Legacy Resource Management Program	Instituted by Congress in 1991, the intent of the program is to fund natural and cultural resources management projects that might go unfunded through normal funding procedures.
Monterey County Department of Agriculture	Provides subject matter experts in the field of invasive species management and Pest Control Advisor support.
Natural Resources Conservation Service (NRCS)	The NRCS has several natural resources conservation programs that could assist FHL in managing resources, including conserving soils, improving water quality, increasing wildlife habitat, and reducing damage resulting from floods or other natural disasters.
NatureServe and State Heritage Programs	The objective scientific information about species and ecosystems developed by NatureServe and state heritage programs are used by all sectors of society, such as conservation groups, government agencies, corporations, academia, and the public, to make informed decisions about managing our natural resources. NatureServe has a long history of working with DoD to accomplish mutual conservation goals.
Partners in Flight (PIF)	The DoD PIF program consists of a cooperative network of natural resources personnel from military installations across the United States. Established in 1991, DoD PIF works collaboratively with partners throughout the Americas to conserve migratory and resident birds and their habitats on DoD lands (DoD PIF 2016).
Rocky Mountain Elk Foundation (RMEF)	Since the RMEF was created, the foundation has partnered with other organizations to protect and enhance more than 2.3 million ha (5.7 million acres) of habitat, and has conducted more than 6,500 permanent land protection, habitat stewardship, elk restoration, conservation education, and hunting heritage projects.
Salinan Tribe	The Salinan Tribe lives in areas surrounding the installation and is active and interested in installation activities. The Salinan Tribe is not a recognized tribe by the federal government but is actively seeking formal recognition (U.S. Army 2003a).
Santa Barbara Botanic Garden Herbarium	Provides technical expertise associated with ongoing Floristic Survey additions to the FHL RTLA reference plant collection.

Agencies and Organizations	Supporting Activities
The Nature Conservancy (TNC)	TNC and DoD signed a cooperative agreement in 1988 which allows installation commanders to obtain technical assistance from TNC and participate in programs and projects of mutual interest. TNC may study significant ecosystems managed by the Army.
Trust for Public Land	The agency has partnered with DoD to battle encroachment around military bases. The Army and FHL can partner with the Trust for Public Land through the Army Compatible Use Buffer Program and secure easements on lands for conservation around FHL.
U.S. Army Corps of Engineers (USACE)	The USACE provides contract management, construction management, and technical support. FHL has the option to use USACE contracts as vehicles for natural resources management and to access USACE organizations. USACE also has regulatory authority over waters of the United States.
U.S. Department of Agriculture-Wildlife Services (USDA-WS)	The USDA-WS can be contracted by FHL to monitor nuisance wildlife and provide nuisance and non-native animal control.
U.S. Environmental Protection Agency (EPA)	Leads the nation's environmental science, research, education, and assessment efforts. Its activities include developing and enforcing environmental regulations included in this INRMP.
U.S. Geological Survey (USGS)	USGS can assist FHL by helping design biological, water quality, and hydrologic surveys, and by facilitating the integration of installation data into national or regional databases.
Ventana Wildlife Society	Instrumental in reintroducing bald eagles to the central coast prior to their delisting and remains key to reintroducing California condors into the wild in Los Padres National Forest north of FHL and Pinnacles National Monument to the northeast.

4.3 Integration with Other Plans

This INRMP will be reviewed by natural resources personnel to ensure that goals, objectives, and management initiatives contained within this plan do not contradict those contained within other regional and installation plans, and that plans are integrated to the best extent feasible. The information presented in this INRMP will be incorporated into the FHL Master Plan so that the growth of the installation is accomplished with respect to the protection of natural resources. The INRMP also takes into consideration regional management plans, such as USFWS Threatened and Endangered Species Recovery Plans and State Wildlife Action Plans, and cultural resources and environmental compliance plans. A full list of relevant installation and component plans specific to natural resources concerns on FHL, such as endangered species management plans and the fire management plan, can be found in **Appendix E**. These plans are also briefly discussed with their corresponding program elements in **Section 5**.

4.3.1 Cultural Resources

Cultural resources consist of landscapes, archaeological sites, structures, artifacts, flora and fauna, and geological features that are considered important to a social, ethnic, cultural, or occupational group's shared identity, existence as a community, or necessity for continuation of traditional life ways (U.S. Army 2012a). The National Historic Preservation Act, as amended in 2006 (16 U.S.C. 470 et seq.), NEPA, and AR 200-4 require the consideration of impacts on cultural resources either listed in or eligible to be listed in the National Register of Historic Places. Cultural resources on FHL are discussed, and management of the resources is prescribed in the Integrated Cultural Resources Management Plan (ICRMP), which is currently being revised (U.S. Army 2003a).

Natural resource projects that could affect cultural resources include, but are not limited to, habitat improvement and restoration, prescribed burns, invasive species control, and game management. Such actions are coordinated with the cultural resources program for potential impacts to historic properties or traditional cultural practices for Native Americans. Procedures for consultation with all agencies, groups, and individuals that represent an interest in cultural resources are identified in the ICRMP and carried out prior to project implementation.

The potential for the inadvertent discovery of unknown cultural resources during ground-disturbing activities always exists (U.S. Army 2003a). Ground disturbing activities require an environmental review and a dig permit from FHL's DPW office. Cultural resource compliance is reviewed by FHL's Cultural Resource Manager during the environmental review process. Certain areas (e.g., stream banks and bottoms, hilltops, and near rock outcrops) have a higher potential to yield cultural resources and at a greater density than others (e.g., steep slopes). Consistent with the ICRMP, FHL ensures that in the event of the inadvertent discovery of an archaeological resource, measures are taken promptly to protect the find from disturbance, assess the significance of the discovery, and implement appropriate mitigative measures for significant resources (U.S. Army 2003a).

In the event of discovery of human remains, funerary objects, sacred objects, or objects of cultural patrimony, FHL will ensure that all appropriate measures are implemented to protect the remains and any other protected cultural items. All appropriate tribes and agencies will be promptly notified of the find, and all applicable federal, tribal, and state procedures will be followed consistent with the FHL ICRMP (U.S. Army 2003a).

4.3.2 California State Wildlife Action Plan

In order to receive federal funds through the State Wildlife Grants Program, Congress charged each state with developing a statewide comprehensive wildlife action plan by 1 October 2005 through the Consolidated Appropriations Act of 2005 (Public Law 108-447). The State Wildlife Grants Program provides federal money to every state and territory for cost-effective conservation aimed at preventing wildlife from becoming endangered. The California State Wildlife Action Plan (SWAP), including nine SWAP companion plans, were updated in 2015 and identified statewide and regional conservation issues based on regional landscape types, regional habitats, and ecosystem level species needs and requirements, rather than prescribing management actions using a species-by-species approach (CDFW 2015).

4.4 NEPA Compliance and Integration

NEPA is a federal statute requiring the identification and analysis of potential environmental impacts of proposed federal actions before those actions are taken. NEPA established the Council on Environmental Quality (CEQ), which is charged with the development of implementing regulations and ensuring federal agency compliance with NEPA. The CEQ regulations mandate that all federal agencies use a systematic interdisciplinary approach to environmental planning and the evaluation of actions that can affect the environment.

This process evaluates potential environmental consequences associated with a proposed action and considers alternative courses of action. The intent of NEPA is to protect, restore, or enhance the environment through well-informed federal decisions. The process for implementing NEPA is codified in Title 40 CFR Parts 1500 to 1508, Regulations for Implementing the Procedural Provisions of the National Environmental Policy Act. The CEQ was established under NEPA to implement and oversee federal policy in this process. To this end, CEQ regulations specify that an EA be prepared to: (1) briefly provide evidence and analysis for determining whether to prepare an Environmental Impact Statement (EIS) or a Finding of No Significant Impact; (2) aid in an agency's compliance with NEPA when an EIS is unnecessary; and (3) facilitate preparation of an EIS when one is necessary.

Environmental Analysis of Army Actions (32 CFR 651) states that the U.S. Army will comply with applicable environmental laws and regulations, including NEPA. To comply with NEPA, the planning and decision-making process for actions proposed by federal agencies involves a study of other relevant environmental statutes and regulations. The NEPA process, however, does not replace procedural or substantive requirements of other environmental statutes and regulations. It addresses them collectively in the form of an EA or EIS, which enables the decisionmaker to have a comprehensive view of major environmental issues and requirements associated with the Proposed Action.

Natural resources management actions are subject to NEPA review and submitted for environmental review in compliance with environmental laws and regulations. Activities, such as restoration projects, invasive species control, and game management are reviewed through the FHL NEPA program and coordinated with environmental staff for potential impacts to other resources including, but not limited to, air, water, natural, and cultural resources.

5 Program Elements

Natural resources management at FHL strives to integrate biodiversity conservation and an ecosystem-based approach into an adaptive management framework pursuant to the DoD management philosophy. As a result, the natural resources program consists of multiple resource disciplines that are frequently interconnected and share similar objectives.

The purpose of this section is to provide an overview of the status of natural resource program elements at FHL, identify program objectives, and outline management actions that are currently implemented or will be implemented to conserve natural resources for ecosystem integrity and to support sustainable military training.

5.1 Ecosystems Management and Environmental Review

Overview: The 1994 Department of Defense memorandum, "Implementation of Ecosystem Management in the DoD" states that the DoD will use an ecological approach by continuing to "shift its focus from protection of individual species to management of ecosystems." Since then, FHL's natural resource management program strives to follow this philosophy to achieve its goal of maintaining ecosystem viability while ensuring the sustainability of desired military training conditions.

NEPA analysis is required for installation policies and regulations, management plans, construction, operations and maintenance activities, military training, leases and licenses, Federal contracts, hazardous waste use or storage, and other activities that may occur at FHL. Policies and responsibilities for implementing NEPA are set forth by 32 CFR 651.

FHL uses an environmental review procedure to coordinate NEPA compliance for the installation. This process is detailed in FHL Regulation 200-2, Directorate of Public Works, Environmental Division, Environmental Analysis Protection and Enhancement (U.S. Army 2012a). Environmental review provides PWE with information to assess when permits or consultations are required, and an opportunity to coordinate with proponents to complete those requirements. Cultural resource compliance is also reviewed as part of the environmental review process, concurrent with NEPA. A Record of Environmental Consideration per 32 Code of Federal Regulations (CFR) Part 651 is adequate for compliance with NEPA for most FHL projects and training exercises. For these projects, either minimal effects are addressed by a categorical exclusion, or effects were adequately addressed in the FHL Real Property Master Plan (U.S. Army 2012b), the Programmatic Biological Opinion (PBO) #8-8-09-F-54R (USFWS 2010) or Sikes Act review of the FHL INRMP (U.S. Army 2012a).

Objective: Develop an effective natural resources management approach that integrates all ecological components into a comprehensive management program and minimize the potential for adverse effects on sensitive resources from FHL activities through conducting the NEPA process at FHL.

Ongoing Actions:

1) Annually review the natural resources management program for funding and effectiveness.
2) Coordinate with DPTMS twice per year, in approximately October and February, to identify status of natural resources concerns related to planned training activities.
    a. Coordinate with DPW at weekly staff meetings to identify infrastructure and operations projects that may affect natural resources.
    b. Maintain up-to-date environmental coordination map to communicate sensitive resources and land-use-controls to DPW, DPTMS, and other directorates and tenant agencies.
3) Conduct environmental review to identify actions that may adversely affect sensitive resources or that require a compliance action, such as consulting with, obtaining a permit from, or notifying a regulatory agency.
    a. Coordinate with the proponent to develop and implement measures that minimize adverse effects while supporting sustainable operations and military training.
    b. Review and update the environmental review checklist / questionnaire for project proponents.
    c. Include consideration of impacts on resources protected by federal law described in AR 200-1 as well as state-listed species, state-protected vegetation communities, CNPS List 1 and 2 species, vernal pools, native oak, bunch grass stands, and other sensitive resources in the environmental review process.
    d. Continue land-use regulations (FHL Regulation. 350-2) avoid wet areas, cross at established fording sites, minimize off-road vehicle travel, and conduct high explosives training at designated areas.
    e. Implement a post-action monitoring phase of the environmental review process.
    f. Documentation should be included as part of the environmental review database and include dates of surveys, purposes, photos, GIS data as applicable, and purpose for follow-up monitoring (e.g., proximity to a listed species site or verifying project parameters).

5.2 Data Management and Integrity

Overview: In accordance with the INRMP, FHL implements several natural resource and geospatial data management practices to ensure data integrity and preservation.

Objective: Maintain accurate, usable, and informative data for ease in management planning and documentation.

Ongoing Actions:

1) Develop and maintain a library to store and catalog natural resources surveys, reports, consultations, communications, permits and other relevant documents.
2) Maintain an environmental GIS geodatabase compliant with Army standards (SDSFIE Metadata Army standards) for use by PWE staff within the installation geodatabase. Data include wetlands, special status species, soils, contours, roads, facilities, and boundaries.
3) Create data layers in WGS 1984 UTM Zone 10N.

4) Support the FHL DPW GIS Manager with annual reviews of GIS data and advise on dataset updates.

Planned Actions:

1) Develop a standardized system for recording and mapping significant resource observations (e.g., plants, wildlife, erosion, damage) when incidentally encountered.
2) Update natural resources data collection and management procedures to include datasheet (physical or electronic) record keeping and GIS data processing.
3) Enhance and adapt existing databases for natural resources data collection and acquire applicable databases from outside sources for application in GIS, as needed.

Pending Actions: Develop specific language that will be included in all contracts to ensure all spatial data produced are fully compatible with the installation GIS database

Recommended Actions: Coordinate and provide species information for inclusion in the California Natural Diversity Database (CNDDB) when appropriate.

5.3 Climate Change

Overview: Climate change is reshaping the geostrategic, operational, and tactical environments with significant implications for U.S. national security and defense (DoD 2021). Increasing temperatures; changing precipitation patterns; and more frequent, intense, and unpredictable extreme weather conditions caused by climate change are exacerbating existing risks and creating new security challenges for U.S. interests. The risks of climate change to DoD strategies, plans, capabilities, missions, and equipment, as well as those of U.S. allies and partners, are growing (DoD 2021). Army Directive 2020-08 *U.S. Army Installation Policy to Address Threats Caused by Changing Climate and Extreme Weather* and DoD Directive 4715.21: *Climate Change Adaptation and Resilience* (updated in 2018) requires commanders of Army installations to assess, plan for, and adapt to the projected impacts of changing climate and extreme weather by adding the results of climate change prediction analysis tools into all facility and infrastructure related plans, policies, and procedures.

Several recent Executive Orders put climate change as a high-level priority: EO 13985, *Advancing Racial Equity and Support for Underserved Communities Through the Federal Government*, EO 13990, *Protecting Public Health and the Environment and Restoring Science to Tackle the Climate Crisis*, EO 14013, *Rebuilding and Enhancing Programs to Resettle Refugees and Planning for the Impact of Climate Change on Migration*, EO 14027, *Establishment of the Climate Change Support Office*, and EO 14030*, Climate-Related Financial Risk*. In particular, the newly signed EO 14008, *Tackling the Climate Crisis at Home and Abroad*, elevated climate considerations to be an essential element of United States foreign policy and national security and highlights the urgency of tackling climate change to avoid the most catastrophic impacts.

To address these risks and threats, the Army Climate Resilience Handbook (ACRH; Pinson et al. 2020) was developed to take Army planners through the process of systematically assessing climate exposure impact risk and incorporating this knowledge and data into existing installation planning processes such as master plans. The ACRH defines climate resilience as the

anticipation, preparation for, and adaptation to utility disruptions and changing environmental conditions and guides through a four-step risk-informed planning process resulting in a Climate Vulnerability Assessment (Pinson et al. 2020). The four steps are identified as follows:

(1) identifying the installation's climate resilience goals and objectives.
(2) identifying how exposed the installation is to current nuisance and extreme weather events and to projected future climate impacts.
(3) identifying how sensitive infrastructure, assets, mission, and readiness are to these impacts and how difficult adapting to these threats may be.
(4) identifying a list of potential measures that can be used to improve an installation's preparedness and resilience.

A key element of the ACRH process is the Army Climate Assessment Tool, or ACAT (Gade et al. 2020). ACAT provides climate change impact information at the installation, command, and headquarters levels specifically developed for use in the screening-level assessment described in the ACRH. The Department of the Army High-level Climate Change Vulnerability Assessment (U.S. Army 2013) found that extreme temperatures, drought, and alteration of burn regimes resulting from the interaction of climate change and non-native invasive grasses will have the greatest implications for installations like FHL.

However, the ACAT also includes reports that identify those installations that have the greatest exposure to analyzed climate change impacts. Therefore, a nuanced Climate Change Vulnerability Assessment should be conducted at FHL at an installation level. Below is a summary of concerns adapted from the Department of the Army High-level Climate Change Vulnerability Assessment (U.S. Army 2013) as they pertain to the ACRH protocol from a resource management standpoint. This framework should be considered a baseline overview that could be explored in greater detail in a dedicated FHL Climate Change Vulnerability Assessment and Climate Adaptation Component Plan or addressed in existing component plans.

(1) Identify the installation's climate resilience goals and objectives

FHL should aim to integrate climate change resilience planning and mitigation within existing programs for a multifaceted management approach that meets directive needs. By anticipating future climate change conditions, FHL can reduce climate impacts to missions and operations and protect its real property investments by reducing exposure

(2) Identify how exposed the installation is to current nuisance and extreme weather events and to projected future climate impacts

The following paragraph is adapted from the Department of the Army High-level Climate Change Vulnerability Assessment (U.S. Army 2013). Significant issues for National Climate Assessment (NCA) Southwest Region Army installations include scarce water resources and competition for those resources, environmentally sensitive natural resources (including endangered species), and maintaining and sustaining lands and vegetation cover for training operations. Important climate factors identified in the NCA Southwest Region outlook include drought, heat waves, winter storms, and floods. The NCA outlook for the Southwest Region generally anticipates hotter and drier conditions across the region. Extreme temperatures,

drought, and alteration of burn regimes resulting from the interaction of climate change and non-native invasive grasses will likely have the greatest implications for NCA Southwest Region Army installations. Habitat transition or modification as a result of increased temperature, drought, altered hydrology, and alteration of fire regimes with climate change will complicate the ability of installations to maintain status of currently listed species populations and may result in increased listings of species that are currently considered at risk but not yet listed. Increased temperatures and potential changes in precipitation patterns may require modification of fire management programs. Warmer winters and longer growing seasons may relax cold constraints on the upper and northern limits of native species and invasive species, most of which originate from Mediterranean, tropical, and subtropical regions of the world.

In Monterey County specifically, annual average maximum temperatures are predicted to rise 2.1-2.7 °C (3.7–4.9°F) by the middle of the 21st century and 2.7-4.2 °C (4.9–7.5°F) by the end of the century, with similar increases in minimum temperatures (Langridge 2018). Precipitation is expected to increase slightly over the next century, but the main change in precipitation is expected to be an increase in variability (longer dry periods and fewer, more intense rainstorms; Langridge 2018).

(3) Identify how sensitive infrastructure, assets, mission, and readiness are to these impacts and how difficult adapting to these threats may be.

Increased intensity of winter storms, especially when combined with drier conditions during the rest of the year, may increase the potential for erosion of soils throughout FHL. Soil erosion at FHL can have major implications for successful military missions and coordinating effective training exercises. Habitat transition or modification as a result of increased temperature, drought, altered hydrology, and increased risk of fire with climate change will complicate the ability of installations to maintain status of currently listed species populations and may result in increased listings of species that are currently considered at risk but not yet listed. Increased fire risk also poses a risk to sensitive infrastructure and the safety of FHL staff and residents. Increased temperatures and potential changes in precipitation patterns may require modification of fire management programs. Warmer winters and longer growing seasons may relax cold constraints on the upper and northern limits of native species and invasive species, most of which originate from Mediterranean, tropical, and subtropical regions of the world.

(4) Identify a list of potential measures that can be used to improve an installation's preparedness and resilience.

Army Directive 2020-08 *U.S. Army Installation Policy to Address Threats Caused by Changing Climate and Extreme Weather* and DoD Directive 4715.21: *Climate Change Adaptation and Resilience* (updated 2018) requires commanders of Army installations to assess, plan for, and adapt to the projected impacts of changing climate and extreme weather by adding the results of climate change prediction analysis tools into all facility- and infrastructure-related plans, policies, and procedures. Climate Adaptation for DoD Natural Resource Managers (Stein et al. 2019) was developed by the National Wildlife Federation with support from DoD and is designed to help DoD installation managers prepare for and reduce climate-related vulnerabilities and risks. The guide provides an overview of how climatic changes may impact

military lands and resources and offers a structured process for incorporating climate considerations into INRMPs. A dedicated Climate Change Natural Resource Adaptations, an Appendix to this INRMP, could be created incorporating results of a FHL Climate Vulnerability Assessment and identifying potential mitigation measures FHL plans to implement. Adaptations and mitigation measures should be broken down by program element and incorporate measures FHL is already taking to improve resilience.

In 2015, FHL became one of many installations participating in a research project developed by the Strategic Environmental Research and Development Program (SERDP). The objective of the project was to determine how aquatic and riparian organisms on military lands are affected by climate change. Data collection began in 2016. In 2016, SERDP proposed an additional study within the Resource Conservation and Climate Change Program Area, "Advanced Approaches for Managing Individual Species and Ecosystems Across Jurisdictional Boundaries in a Non-stationary World." The proposed project would provide installation land managers with the knowledge and tools necessary to balance at-risk species recovery, military training requirements, and a changing environment. FHL accepted the proposal on January 4, 2017. Surveys began in April 2019. Climate change is further addressed for threatened and endangered (T&E) species in each corresponding endangered species management component document.

Objective: Consider impacts of climate change and integrate climate adaptation and resilience in installation resource management planning and decisions.

Ongoing Actions:

1) Continue coordinating with SERDP to promote climate change research, providing installation land managers with the knowledge and tools necessary to balance at-risk species recovery, military training requirements, and a changing environment.
2) Continue to ensure that FHL component plans account for potential climate change variability.
    a. The Integrated Wildland Fire Management Plan (IWFMP) should address altered wildfire regimes, a longer wildfire season, and the potential for increased suppression activities.
    b. The Endangered Species Management Components (ESMCs) should address:
        i. Increased temperature, drought, and altered hydrology that may impact rare and sensitive habitat for special status species.
        ii. Increased difficulty of maintaining status of currently listed species populations and potential for increased listings due to climate change of species that are currently considered at risk but not yet listed.

Recommended Actions:

1) Complete installation level Climate Change Vulnerability Assessment
    a. Utilize the four-step Army Climate Resilience Handbook
    b. Compile information using the Army Climate Assessment Tool.
2) Consider creating a Climate Change Adaptations Component Plant incorporating results of the Climate Change Vulnerability Assessment using the framework of the Climate Adaptation for DoD Natural Resource Managers

a. This plan should address climate change considerations from a management standpoint across all program elements.

3) Plan for potential increase in natural resources management costs due to expansion of invasive species and newly listed and at-risk species.

5.4 Soils, Erosion and Sedimentation

Overview: Soil erosion and associated sediment transport have been routinely evaluated by the FHL Land Rehabilitation and Maintenance (LRAM) program, a component of the Integrated Training Area Management (ITAM) program. LRAM has operated at FHL since 1996 and directs programming, planning, design, and execution of land rehabilitation and maintenance projects. These projects arise from training land needs based on input from the Range and Training Land Assessment (RTLA) and Training Requirements Integration (TRI) components of ITAM, as well as input from Directorate of Plans, Training, Mobilization, and Security (DPTMS) and the environmental division (PWE) at FHL. LRAM uses best management practices (BMPs) for the design and execution of projects affecting all environmental media to ensure that the rehabilitation, repair, and maintenance results are cost- and resource-effective. FHL LRAM utilizes various methods to achieve a multidisciplinary restoration approach and ecosystem level planning to provide sustainable and lasting solutions for maintaining the quality of FHL's training lands.

Soil erosion has both short-term and long-term effects on training areas, including restricted troop and vehicle movements, increased sedimentation of rivers and water features, increased susceptibility to invasion by noxious plants, and reduced tactical training value due to the creation of hazardous surface conditions. A Soil Erosion and Sedimentation Control Component (SESCC) plan is in development and will be provided as an appendix to this INRMP and details BMPs for minimization and restoration of soil erosion at FHL (U.S. Army 2022b).

FHL has two areas of maneuver corridors within the installation occurring in the Nacimiento Valley and Upper San Antonio River Valley (Milpitas). These corridors provide terrain and land use that is compatible with off-road vehicle maneuvers. This includes large and continuous land areas with side slope grades <30% for maneuver vehicle safety (Stryker rollover) threshold (U.S. Army 2018). These areas support light maneuver (the lightest weight class military vehicle category, such as jeeps or Humvees, with light to no armor emphasizing maneuverability and multi-purpose capabilities) and heavy maneuver (larger armored tactical vehicles such as tanks, trucks and multi-axled vehicles) vehicles with suitable terrain for land-intensive training for one maneuver company in highly constrained situational training exercise environments and support up to four maneuver companies simultaneously. An environmental assessment of these lands identified minor effects of the proposed areas to soil conditions based on existing BMPs (U.S. Army 2018). The following actions outline methods used to minimize soil erosion and maximize the effectiveness of training activities at FHL.

Objectives: Minimize compaction and erosion from current and future activities. Identify and restore eroded sites.

Ongoing Actions:

1) Monitor construction projects and training sites as part of the post-action monitoring phase of the environmental review process. Work with project proponents to identify potential erosion sites. Coordinate with Roads and Grounds if heavy equipment work is needed. Reseed with native seed mixtures or restore as needed.
2) ITAM will continue to monitor training-related land erosion or potential erosion sites.
3) In the event restoration work is expansive, the site is prone to invasive species, or there is not ample seed bank at the site, reseeding with native mixtures will be conducted with seeds from a local source. Minor earthwork to repair erosion and prepare sites for reseeding may also occur.
4) Use GIS topographic, surface water, and soils data for conservation planning. Update data as improved data sources become available.
5) Implement a SESCC to achieve the following:
    a. Review critical slopes at FHL.
    b. Identify highly erodible soil types present, as described in the NRCS soil survey.
    c. Analyze applicable federal, state, and local regulatory requirements for erosion and sedimentation control.
    d. Identify erosion and sedimentation BMPs applicable to FHL.
    e. Describe how to select, install, and maintain erosion-control measures and establish protocols for revegetation of disturbed areas.
    f. Outline an example erosion and sedimentation control plan for a generic project that can be tailored for use at FHL (U.S. Army 2022b).
    g. Require that all earth-moving activities comply with the SESCC.

Recommended Actions:

1) Maintain a georeferenced database of soil erosion restoration sites. This database should include information regarding the extent to which the site exhibited adverse soil conditions, BMPs employed, and the outcome of the employed BMP. This database will provide valuable historical and geospatial information that ITAM can use to evaluate the efficacy of prior BMPs.
2) When possible, collect native seeds from healthy plant populations in FHL for use in future restoration projects.

5.5 Water Resources

5.5.1 Groundwater Resources

Overview: Both drinking water wells and monitoring wells are present. The monitoring wells were established to monitor confirmed groundwater contamination with petroleum hydrocarbons from a closed landfill. The Installation Action Plan (IAP) outlines the clean-up program for FHL, in compliance with the Defense Environmental Restoration Program (DERP) and is updated annually (U.S. Army 2012a).

In 1996, water from a monitoring well downgradient of the closed landfill at FHL contained cis-1,2-dichloroethene (DCE), trans-1,2-DCE, and trichloroethylene (TCE) above maximum contaminant levels (MCLs). A hydrogen-releasing compound was injected into the subsurface in

2000 and 2002 to promote in-situ enhanced natural attenuation. TCE has not been detected above the MCL in the farthest downgradient well since October 1998, which suggests that the plume does not extend to the nearby San Antonio River (Mr. Mike Moeller, personal communication, March 2021)

The Army is testing drinking water for the presence of Per- and Polyfluoroalkyl Substances (PFAS), a group of man-made chemicals that includes perfluorooctane sulfonate (PFOS) and perfluorooctanoic acid (PFOA). PFOS and PFOA are found in many consumer and industrial products. The following information relates to PFOS and PFAS at FHL (Mr. Mike Moeller, personal communication, March 2021).

In May 2016, the United States Environmental Protection Agency (EPA) issued a Lifetime Health Advisory (LHA) level for PFOS and PFOA in drinking water of 70 parts per trillion (ppt) (or 0.07 µg/l) for each chemical; or if PFOS and PFOA both appear in a drinking water sample, the combined LHA level is also 70 ppt. As part of the Army's commitment to supplying quality drinking water to its Soldiers, Family Members, and Civilians; the Army implemented a comprehensive PFOS and PFOA testing program.

The drinking water supply for FHL was sampled on November 14, 2016, to include testing three wells that were online at that time; one well was offline for maintenance. Validated sampling results received on December 6, 2016, detected PFOS at 330 ppt, which exceeds the EPA LHA level of 70 ppt. PFOA was not detected in the water supply.

On December 6, 2016, the Director of Public Works directed the water system operator to take the affected well offline. This action isolated the potentially contaminated aquifer from the distribution system. The primary aquifer used by FHL tested negative for both chemicals. Confirmation sampling for the affected well occurred on February 7, 2017. A fourth well which was offline during the initial sampling event is still offline for maintenance and will be sampled upon return to service. Since then, the Army has conducted a preliminary assessment, a site investigation, and has awarded a remedial investigation contract to begin work in 2021. FHL will continue to work closely with subject matter experts from the Office of the Assistant Chief of Staff for Installation Management and the Army Public Health Center to ensure appropriate steps are taken regarding PFOS and/or PFOA in drinking water.

LANDFILL LAND USE CONTROLS

Landfill land use controls (LUCs) are enforced through semiannual landfill cap inspections and periodic reviews. The inspecting organization is the installation via U.S. Army Environmental Command contract. If environmental investigations determine that former site activities have impacted FHL, the recommended response alternatives include the following initiatives based on information obtained:

1) Landfill restriction—Prohibit activities that would impact the landfill cap (or cover system) and drainage system
2) Landfill restriction—Prohibit excavation on landfill cap or cover system (dig permit required)

3) Landfill restriction—The landfill cap and monitoring wells will be inspected for damage or tampering.
4) Landfill restriction—Prohibit installation of utility system lines through the site
5) Landfill restriction—Restrict construction of buildings that may interfere with the landfill cap or cover system
6) Landfill restriction—No water wells to be installed within or immediately downgradient of site
7) Media specific restriction—Prohibit, or otherwise manage excavation
8) Restrict land use—No residential use (industrial use only)

Objective: Address existing groundwater contamination and prevent further contamination.

Ongoing Actions:
1) Landfill groundwater monitoring (U.S. Army 2020c).
2) PFAS soil and groundwater studies
3) Remedial investigations, in part designed to determine if PFAS is leaving the installation boundaries
4) Continue annual updates of the IAP, including determining whether further groundwater contamination remediation is needed. This is a mandatory action led by AEC as part of the DERP.
5) Continue to implement appropriate LUCs.

Recommended Actions:
1) Monitor and remediate groundwater contamination as described in the IAP
2) Continue efforts to minimize the risk of new pollution sources to surface water (which can then seep into groundwater) as described in the Storm Water Pollution Prevention Plan (SWPPP; U.S. Army 2020c)

5.5.2 Surface Water and Pollution Prevention

Overview: The SWPPP (U.S. Army 2020c) was originally developed in 2018 as a mutually agreed solution in response to negotiations between the U.S. Army (Fort Hunter Liggett and Army Environmental Command) and the California Water Boards (State Water Resources Control Board and the Central Coast Regional Water Quality Control Board, referred to hereafter as the California Water Boards). The California Water Boards moved forward with procedural requirements to remove Fort Hunter Liggett (FHL) from the Small MS4 Permit Program in response to the development, approval, and implementation of the SWPPP.

FHL maintains detailed Geographic Information System (GIS) based maps of both the storm water and sanitary sewer systems. These maps are used to identify inlets and outlets of each system and to evaluate the systems for any potential cross-connections. Non-Storm Water Discharges (NSWDs) are defined as any discharge that does not originate from precipitation events. Examples of NSWDs included but are not limited to, discharges of process water, air conditioner condensate, non-contact cooling water, vehicle wash water, sanitary wastes, concrete washout water, solid waste dumpster drains, paint wash water, irrigation water, or pipe testing water. Under the Industrial General Permit (IGP), some types of discharge are authorized, while

others are unauthorized. As required by the IGP, FHL personnel routinely conduct dry-weather inspections to identify and detect NSWDs. If an NSWD is detected the source is investigated to determine if it is authorized or unauthorized. If the NSWD is unauthorized steps are taken to eliminate the NSWD.

Objective: Maintain high water quality in surface waters by reducing sedimentation and contamination by oil and other pollutants.

Ongoing Actions:

1) Prohibiting off-road vehicular traffic within 20 m (66 ft) of any stream, vernal pool, or lakebed without prior approval, maintaining a 100-m (328-ft) buffer between vehicle maintenance/refueling and any wetlands or waterways (FHL Regulation 350-2).
2) Restricting vehicle crossings of streams to maintained low-water crossings.
3) Submitting a Notice of Intent package for site restoration activities involving disturbance of at least one acre of soil (Potomac-Hudson Engineering, Inc. 2016).

Recommended Actions:

1) Consider water quality testing in San Antonio and Nacimiento Rivers to verify that activities at FHL are not impacting water quality.
2) Continue monitoring storm runoff and performing best practices for protecting surface waters and preventing polluted runoff during storms, as well as maintaining the wastewater treatment plant, as described in the Storm Water Pollution Prevention Plan (SWPPP).
3) Verify that the stormwater retention settling basin at the 63rd RD maintenance complex is kept free of sediment and debris and determine whether it will be large enough to handle larger rainstorms that are predicted due to climate change.

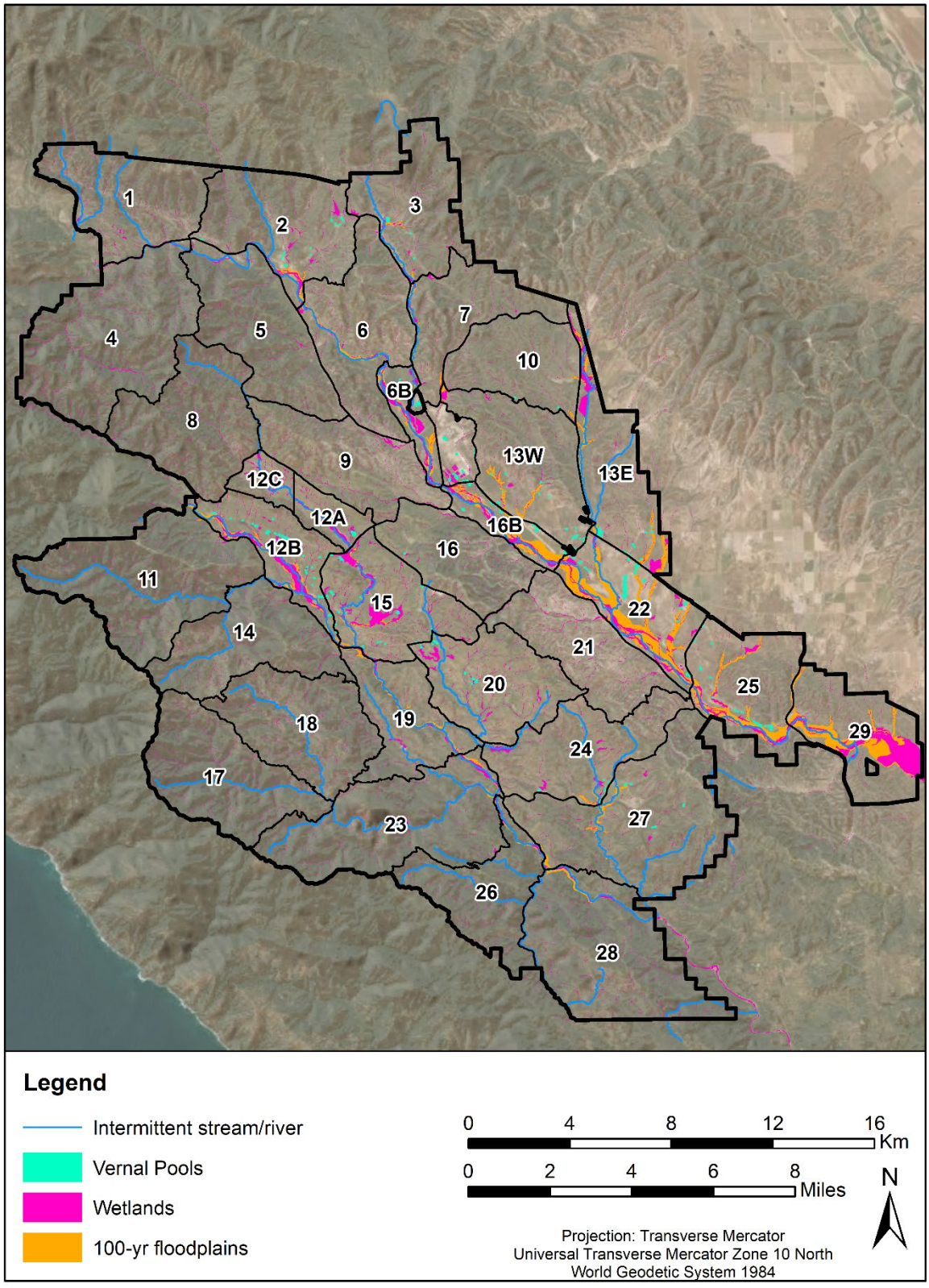

Figure 3: Fort Hunter Liggett Hydrologic Features Map

5.5.3 Wetlands and Vernal Pools

Overview: FHL contains approximately 3,488 ha (8,620 acres) of documented wetlands, including many vernal pools (USFWS 2021, National Wetland Inventory; Figure 3). These include vernal pools, swales, intermittent drainages, and other wetland types that form pools with the potential to support vernal pool fairy shrimp, tiger salamanders, or western spadefoot toads (U.S. Army 2020b). At FHL, 306 vernal pools are known to occur throughout the installation. Vernal pools are prevented from draining by a subterranean claypan, hardpan, or rock layer. Vernal pools at FHL are monitored through provisions in the ESMP for the vernal pool fairy shrimp.

Wetland delineation and monitoring at FHL is done on a case-by-case basis, with need determined through installation projects. Presently FHL does not have an annual wetland monitoring program, but such a program could identify and monitor important wetlands in frequently used training areas.

Objective: Maintain the integrity of wetlands as a vital component of overall FHL ecosystem integrity and as sensitive habitat for multiple species, including listed species.

Ongoing Actions:

1) Continue education and enforcement of restrictions on off-road travel and pesticide use around wetlands.
2) Continue monitoring vernal pools through the vernal pool fairy shrimp ESMC.
3) Implementation of ESMC recommendations, including providing environmental education materials to FHL users and restoring areas where roads have been abandoned.
4) Disturbance monitoring and California Rapid Assessment Method surveys are conducted annually on pools as part of the vernal pool fairy shrimp surveys (U.S. Army 2020b).

Recommended Actions:

1) Conduct or contract a wetlands delineation for major land use areas on the installation. In areas in or near future development, obtain jurisdictional determination for wetlands.
2) Consider the development and implementation of a wetland monitoring program for major land use areas and sensitive species habitat.
    a. A wetland monitoring program should expand on wetland monitoring already performed under vernal pool fairy shrimp surveys to include a greater number of wetlands while standardizing methods across programs within FHL.
    b. This program should follow established guidelines for the region, such as expanding the California Rapid Assessment Methods for depressional wetlands (https://www.cramwetlands.org/documents#field+books+and+sops), which has already been used at FHL, but could be adopted in non-vernal pool wetlands in areas where installation training and activities could be affecting hydrology. For sensitive habitats at the greatest risk of degradation, the more intensive level 3 assessments described by California's Wetland Monitoring Workgroup could be considered (https://mywaterquality.ca.gov/monitoring_council/wetland_workgroup/).

c. Identify vernal pools and wetlands that retain water longer throughout the season than other vernal pools or wetlands to help identify additional priority areas for management. This is especially important for ESA listed species and other species that rely on vernal pools and wetlands as part of their life history.

5.5.4 Floodplains

Overview: Most of the cantonment area is classified as having minimal flood risk according to the Federal Emergency Management Agency (FEMA), though a small portion along the Sulphur Spring Canyon Creek is likely to flood occasionally when there is sufficient rainfall (U.S. Army 2012a). Areas surrounding the San Antonio River to the south and west are also likely to flood occasionally (U.S. Army 2012a). Floodplains along rivers can provide important habitat to multiple species.

Objective:

1) Minimize risk of flood damage to property and future development projects in accordance with Cantonment Master Plan.
2) Minimize the risk of pollution (including trash) entering surface waters from inundated floodplains during rain.
3) Maintain the integrity of floodplains for reducing floodwater depth and providing natural habitat for plants and wildlife.

Recommended Actions:

1) Ensure that any equipment is clear of floodplains when heavy rains are forecasted.
2) Avoid altering floodplains (e.g., changing the topography, removing vegetation, or reducing soil infiltration capacity via compaction or paving) during any construction or other activities.
3) See also recommended actions for riparian habitat described in **Sections 5.6 and 5.7.** See Figure 3 for floodplain locations.

5.6 Vegetation and Habitat Management

5.6.1 Vegetation Communities

Overview: Vegetation communities are managed by the FHL Natural Resource Management Program in coordination with DPTMS and ITAM to sustain current and future military training as well as good land stewardship and environmental compliance. Specific management practices for sustaining the landscape (erosion control, water resources, rehabilitation, etc.), providing for sensitive species, and mitigating invasive and noxious species are described in separate sections. The vegetation communities at FHL support a diverse flora of over 1,400 species and subspecies. A full vascular plant species list can be found in **Appendix F**.

In previous FHL INRMPs (U.S. Army 2012a) habitat and plant community information were based on 1994 aerial imagery and utilized a nonstandard classification system broadly describing chaparral, oak woodlands and savannas, grasslands, riparian areas, and seasonal and perennial wetlands. This informal classification proved insufficient for military management and training

decisions (Eliassen 2014). Standardized and current training habitat classification is essential to the military mission, land assessment, ecosystem management, and landscape sustainability. Thus, the FHL Military Training Habitat Map project was completed in 2014 to support the military mission and land-use decisions as the military complies with applicable environmental laws, regulations, and policies (Eliassen 2014). The resulting map and vector-based military training habitat layer improved the accuracy and classification of the existing dataset and that meets current vegetation mapping standards (Eliassen 2014; Figure 4; Table 6).

The military training habitat GIS geodatabase classifies the training landscape based on the United States National Vegetation Classification System (NVC; FGDC 2008) and the Manual of California Vegetation Second Edition (MCVII; Sawyer et al. 2009). A description of the Primary Vegetation Classes (Figure 4) can be found below, and more details on the NVC and MCVII classifications can be found in Appendix A of the FHL Military Training Habitat Map project report (Eliassen 2014). This new military training habitat map provides more detailed information training land cover information for the 5,078 ha (12,550-acre) Upper Nacimiento Maneuver Area (UNMA; TAs 12B, 15, and 20). In addition, a tactical concealment analysis was performed utilizing current and historic imagery. Changes in concealment resources (i.e., trees) during sixty years of military training were analyzed within the UNMA to provide information on resource distribution and availability, and potential restoration sites (Eliassen 2014).

Objective: Monitor and manage FHL vegetative communities and training area habitat to support the military mission and land-use decisions as the military complies with applicable environmental laws.

Ongoing Actions:

1) Update the FHL floristic inventory list as needed, and update plant collections as new species are found. Santa Barbara Botanic Garden Herbarium provides technical expertise associated with ongoing floristic survey additions to the FHL RTLA reference plant collection and maintains a large collection of FHL voucher specimens.
2) Maintain GIS vegetation data layers and update with major land use changes
    a. Within these, identify locations most frequently used for military training, annual burn sites, and endangered species habitats.
    b. Update or develop BMP list for native vegetation management based on revised classifications.

Recommended Actions:

1) Update the Training Habitat Map (Eliassen 2014) as needed to reflect changes in vegetation communities. Analyze aerial imagery and remote sensed GIS layers and conduct ground truthing surveys to update existing military training habitat GIS geodatabase.

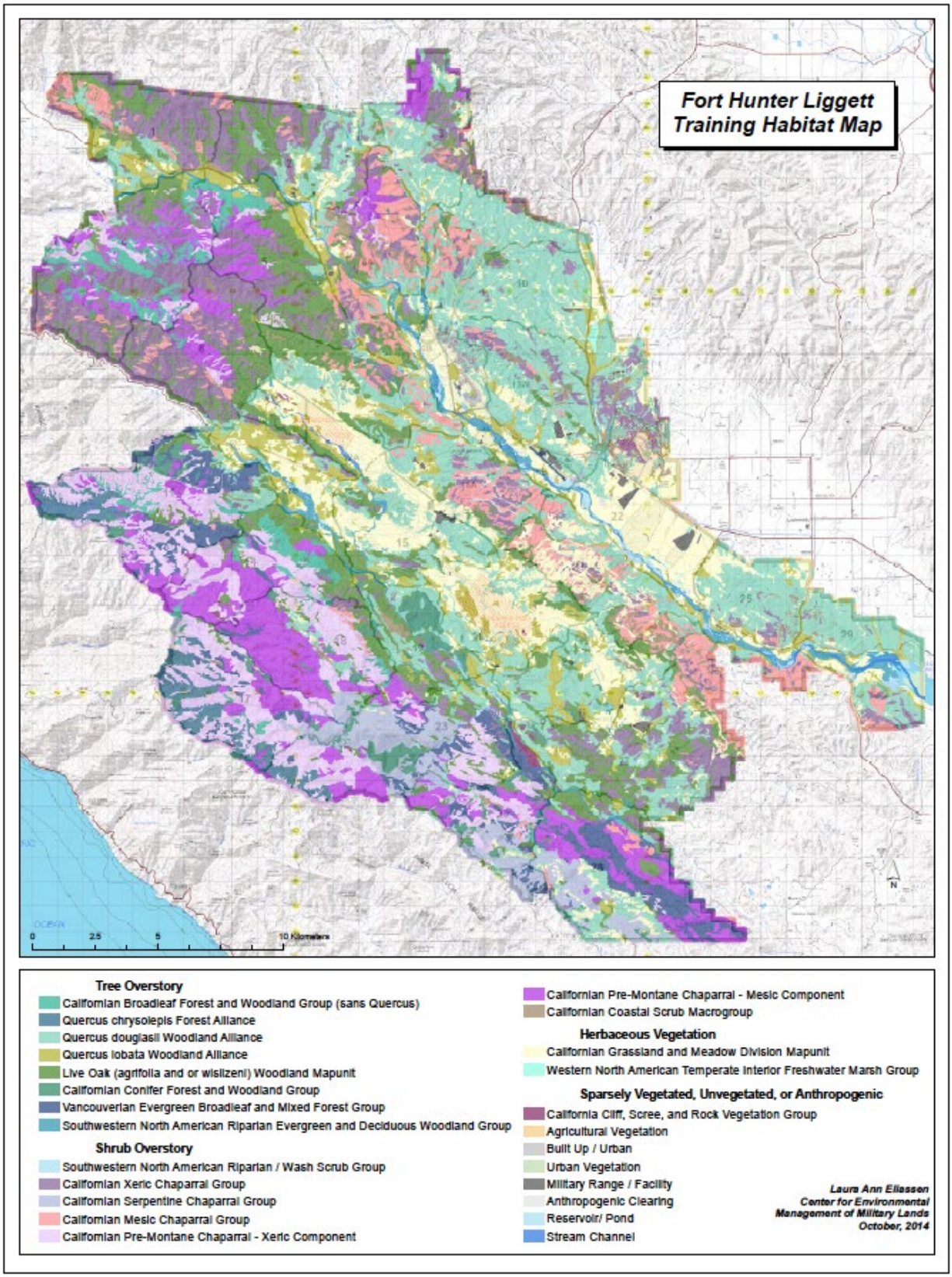

Figure 4: Final Military Training Habitat Map Showing Primary Level Mapping Classes
From Military Training Habitat Map Report (Eliassen 2014).

Table 6: 2014 FHL Training Habitat Primary Level Mapping Classes, Vegetation Community Descriptions, and Installation Percent Cover

Primary Classes*		Description Overview	Ha (Acres)*	Percent of Total*
Californian Chaparral	**Xeric**	The two most widespread chaparral types on FHL are mixed chaparral and chamise chaparral. On FHL chaparral is generally found on south-facing slopes and is the dominant vegetation type along the western mountain areas and the ridges and slopes between the San Antonio River and Nacimiento River watersheds. Californian Xeric Chaparral is dominated by chamise (*Adenostoma fasciculatum*), buckbrush (*Ceanothus cuneatus*) and/or bigberry manzanita (*Arctostaphylos glauca*) and primarily occurs on xeric western and southern facing slopes generally below 600 m.	22,854.1 (56,473.7)	34.9
	Serpentine	California chaparral generally dominated by leather oak (*Quercus durata*). Determined remotely by serpentine geology and soils (Eliassen 2014).		
	Mesic	Generally dominated by species such as scrub oak (*Quercus berberidifolia*, *Quercus john-tuckeri*), *Prunus*, *Rhamnus*, or *Fraxinus* species and primarily occurs on mesic northern and eastern slopes, generally below 600 m.		
	Pre-Montane Xeric	California Pre-montane chaparral co-dominant with or sub-dominant to chamise or *Ceanothus papillosus* and with grassland components.		
	Pre-Montane Mesic	California Pre-montane chaparral dominated by mesic shrubs, including hairy leaf ceanothus (*Ceanothus oliganthus*), and without a co-dominant chamise component.		
Blue Oak Woodland		Blue oak (*Quercus douglasii)* communities are the most prevalent of the oak communities at FHL. Blue oak can be found in pure stand woodlands to foothill woodlands where it mixes with other oak species and foothill pines, or in more open blue oak savannas with a grassland understory.	13,494.6 (33,345.9)	20.6
Californian Grassland and Meadow		Grasslands are typically found on open, level, or moderately sloped areas. Historic species composition of grasslands on FHL is not known; however, today, native grasslands are found on rocky hillsides or unusual soil types (U.S. Army 2012a). FHL grasslands are dominated by non-native grasses that thrive in California's Mediterranean climate and are more resilient to the heavy browsing pressure caused by domestic livestock. Native grasslands are estimated to compose approximately 2-5% of existing grasslands on FHL.	8,818.3 (21,790.5)	13.5
Live Oak Woodland	**Canyon Live Oak**	*Quercus chrysolepis* is dominant or co-dominant in the tree canopy. Habitats consist of stream benches and terraces in canyon bottoms near streams; upland slopes on steep, shallow, rocky, infertile soils.	7,401.9 (18,290.6)	11.3
	Coast Live Oak / Interior Live Oak	Live oak communities consist of coast live oak (*Q. agrifolia* var. *agrifolia*) and interior live oak (*Q. wislizeni* var. *wislizeni*). Habitats consist of canyon bottoms, slopes, flats. Soils are deep; sandy or loamy with high organic matter.		
Valley Oak Woodland		Valley oak (*Quercus lobata***)** is dominant or co-dominant in the tree canopy. Valley oak communities are the next most common oak community. Valley oaks are the largest of the California oak species and are frequently found growing in deep alluvial soils of valley bottoms, forming savannas with a grassland understory.	3,716.5 (9,183.7)	5.7

Primary Classes*	Description Overview	Ha (Acres)*	Percent of Total*
	Valley oak woodlands are rare on FHL and are considered a rare vegetation community by the CNDDB.		
Vancouverian Evergreen Broadleaf and Mixed Forest	FHL training habitat characterized by dominance of Madrone (*Arbutus menziesii*), Tanbark Oak (*Notholithocarpus densiflorus*), or Shreve Oak (*Quercus parvula* var. *shrevei*).	2,033.1 (5,023.9)	3.1
California Broadleaf Forest and Woodland (without oak)	Found along a portion of the installation's border that follows the coast ridge of the Santa Lucia Mountains. California Broadleaf Forest and Woodland includes communities varying widely in species composition throughout California. These communities are typically dominated by broad-leaved evergreen tree species, but coniferous evergreens are also common, and some deciduous tree species might be present. At FHL this classification excludes the California Broadleaf Forest and Woodland Oak Alliances.	1,256.3 (3,104.4)	1.9
Californian Coastal Scrub	Coastal scrub communities vary considerably in species composition. The southern form is often referred to as coastal sage scrub because California sagebrush (*Artemisia californica*) and sages (*Salvia* spp.), both strongly scented plants, are frequently dominant species. However, in some areas they could be entirely absent. Chaparral and scrub communities are managed by use of periodic prescribed burns in an attempt to prevent very large, even-aged stands that provide less valuable wildlife habitat than mixed stands and are at risk of large wildfires.	1,187.7 (2,934.8)	1.8
Californian Conifer Forest and Woodland	Coniferous forest on FHL includes closed-cone, pine-cypress forest, and yellow pine forest. Closed-cone, pine-cypress includes Sargent cypress (*Cupressus sargentii*), generally found on serpentine. Yellow pine forest is dominated by ponderosa pine (*Pinus ponderosa*) and Coulter pine (*Pinus coulteri*). Small stands of Santa Lucia fir occur in the western mountains on FHL. Santa Lucia fir is also included in the rare California series.	1,116.1 (2,758.0)	1.7
Southwestern Riparian Evergreen and Deciduous Woodland	FHL training habitat characterized by dominance of deciduous broad-leaved riparian trees (willow (S*alix* ssp.), alder (*Alnus rhombifolia*), maple (*Acer macrophyllum*), sycamore (*Platanus racemose)*). Determined primarily by using the National Wetlands Inventory (Eliassen 2014).	1,016.8 (2,512.5)	1.6
Southwestern Riparian / Wash Scrub	Characterized by dominance of deciduous or evergreen riparian shrubs (willow (S*alix* ssp.), elderberry (*Sambucus* ssp.), mule fat (*Baccharis salicifolia)*) dominant in the overstory. Determined primarily by using the National Wetlands Inventory (Eliassen 2014).	441.6 (1,091.9)	0.7
Military Range / Facility	Permanent and semi-permanent structures, including buildings and military targets and adjacent maintained lands that are primarily used for military training.	247.4 (611.3)	0.4
Stream Channel	Perennial or seasonally flooded stream channels, including temporarily exposed flats adjacent to the main channel.	242.0 (598.0)	0.4
Built Up / Urban	Permanent and semi-permanent structures including buildings and parking lots that are not primarily used for military training.	215.3 (532.0)	0.3
California Cliff Scree, and Rock Vegetation	Rock outcrops occur when granitic, sedimentary, or basic rocks protrude from the ground surface. Rocks provide a unique substrate for several obligate plant species and are often used by raptors as roost and nesting sites. Rock outcrops are more common in the Nacimiento River watershed and include such large formations as the Palisades in TA 26 and Piedras Altas in TA 27. Military activities at rock outcrops are limited to a few	150.6 (372.1)	0.2

Primary Classes*	Description Overview	Ha (Acres)*	Percent of Total*
	sites in the Palisades area and include limited use for rock climbing and rapelling for military training purposes.		
Anthropogenic Clearing	Areas where vegetation has been removed through grading or soil has been stockpiled.	104.5 (258.3)	0.2
Western Temperate Interior Freshwater Marsh	Herbaceous vegetation is dominated by mainly wetland species, including rushes, sedges, *Elymus triticoides*, or *Muhlenbergia rigens.* Primarily determined by National Wetlands Inventory (Eliassen 2014).	103.3 (255.2)	0.2
Reservoir / Pond	Perennial or seasonally flooded water bodies impounded by earthen dams.	69.9 (172.8)	0.1
Urban Vegetation	Landscape consists of areas of non-native, planted vegetation within Built Up/Urban areas, including playing fields.	4.2 (10.5)	<0.1
Agricultural Vegetation	Agricultural planted areas or fallow fields, primarily off-post.	3.2 (7.8)	<0.1
	Total	**161.674.4**	**100.0**

* As reported in Military Training Habitat Map Report (Eliassen 2014).

5.6.2 Protection of Rare Habitats

Rare vegetation communities occurring on the installation, as described by the California Natural Diversity Database (CNDDB), include sycamore alluvial woodland, valley needlegrass grassland, and valley oak woodlands (CDFW 2021a). These habitats are often more vulnerable to disturbance and yet can provide important habitat for wildlife. FHL natural resource management aims to maintain and enhance sensitive and rare community structure, functionality, and species diversity to ensure that they remain a viable and intact component of the FHL ecosystem in accordance with applicable laws and policies.

RIPARIAN

Overview: Riparian communities on FHL consist of alluvial woodlands composed of sycamore (*Platanus acemose*), cottonwood (*Populus fremontii*), and willow (*Salix* spp.) found along rivers and streams. The San Antonio River watershed contains a greater amount of riparian habitat than the Nacimiento River watershed (U.S. Army 2012a). The Nacimiento River watershed riparian corridors contain roughly equal coverage of mixed riparian woodland (44% and sycamore alluvial woodland (43%). Riparian areas are not typically used for military activities; vehicle travel is limited within 20 m (66 ft) of streams and to established crossings (FHL Regulation 350-2). Riparian areas are sensitive and rare habitats, important to a wide variety of terrestrial and aquatic species, and they require protective measures to ensure that they remain a viable and intact native community of the FHL ecosystem. Loss of riparian habitat results in degradation of stream quality through increased temperatures, erosion into and within the stream, and excessive nutrient loads.

Objective: Maintain or enhance riparian community structure, functionality, and species diversity to protect water quality, federally endangered species habitat, and maintain regulatory compliance.

Ongoing Actions:

1) Continue to monitor riparian health using the California Rapid Assessment Method (which includes photos) for monitoring stream condition.
2) Restoration requirements are identified through sensitive species surveys, ER activity monitoring, or via remote sensing.
3) Protect waterways and their associated riparian areas through land use limitations identified in FHL Regulation 350-2.

NATIVE OAK COMMUNITIES

Overview: Oak woodlands, one of the most ecologically and culturally important habitats in California, are threatened ecological communities after an estimated 30% decline since the mid-1800s (NRCS 2019). Today, native oaks are lost to fire, disease, and development. At FHL damage to oaks occurs from military training, controlled fires and wildfires, and development in the cantonment and training areas. California oak tree species found on FHL include two deciduous trees in the white oak group (blue oak [*Quercus douglasii*] and valley oak [*Q. lobata*]), three evergreen oaks in the red oak group (coast live oak [*Q. agrifolia*], interior live oak [*Q. wislizeni*], and canyon live oak [*Q. chrysolepis*]), and several scrub oaks. Scrub oaks are found primarily in scrub and chaparral communities (U.S. Army 2019c). The most notable scrub oak species on FHL include island scrub oak (*Q. berberidifolia*), Tucker's oak (*Q. john-tuckeri*), and leather oak (*Q. durata var. durata*). Oak-dominated habitats cover approximately 25,697 ha (63,500 acres) of FHL (U.S. Army 2019c). However, recruitment of mature oak trees is poor throughout California and may eventually result in the loss of the mature component of the oak population. Oaks provide habitat structure for wildlife habitat, sequester carbon dioxide, filter water, control erosion, and provide habitat as one of the most biodiverse terrestrial ecosystems (U.S. Army 2019c). At FHL, they provide tactical concealment and shade for military training.

In accordance with INRMP goals (U.S. Army 2012a) and the FHL Real Property Master Plan Digest (The Urban Collective 2012), and in recognition of oak woodland natural and cultural importance, FHL developed and completed an Oak Management Plan (U.S. Army 2019c). The purpose of this plan is to provide contractors, installation project proponents, landscapers, and maintenance personnel at FHL with protection and mitigation measures for native oak trees and woodlands. The proposed measures are designed to curtail potential impacts from projects that may result in the loss of oak trees and oak woodlands. This plan also contains measures for reducing the potential for and of spread of Sudden Oak Death (SOD). The Oak Management Plan provides detailed methodology on the actions to help prevent and mitigate significant impacts to oak woodlands (U.S. Army 2019c).

Objective: Maintain oak woodland stands and enhance oak woodland seedling regeneration to ensure long-term conservation of oak woodlands and savannas.

Ongoing Actions:

1) Implement management practices and actions from the Oak Management Plan (U.S. Army 2019c) and revise plan as needed.
2) Continue to enforce FHL 350-2 prohibition on cutting living oak trees for training purposes.

3) Collect local acorns and seeds for revegetation projects. Propagate and transplant 75-100 valley oaks annually at tactical concealment sites (ITAM) or oak mitigation sites (PWE).
4) Design construction projects to minimize oak loss and mitigate as needed.
5) Continue RTLA monitoring program to assess effects of frequent fires on valley oaks. Plant oak seedlings from locally collected acorns in affected areas.
6) Continue to monitor annually for SOD in FHL oak communities and report and record incidental observations.

Recommended Actions:

1) Use master planning documents to develop a map of where native oak tree mitigation plantings would best fit within the training areas and cantonment to maximize success of tree establishment and provide the best utility for people and wildlife.
2) Establish an appropriate funding mechanism to care for oak tree mitigation plantings until they are established and self-sustaining.

NATIVE BUNCH GRASS COMMUNITIES

Overview: Native bunch grass stands are uncommon in California, as most have been replaced with less desirable Mediterranean annual grasslands. Exotic annual grasses outcompete native species and reduce diversity and abundance of native forbs, including wildflowers.

Objective: Identify and maintain stands of native bunch grasses. Promote diverse native bunch grass grasslands.

Ongoing Actions:

1) Reseed areas disturbed during training activities (LRAM) or FHL projects (PWE) using a mixture of native grasses and forbs from a local source.
2) Include as a contract requirement for military construction projects the reseeding of disturbed areas at construction sites with native grasses and forbs.
3) Collect local native bunch grass seeds for revegetation projects.

Recommended Actions: Maintain a GIS layer of locations of notable native grassland communities based on the training habitat map (Eliassen 2014). Monitor these habitats and develop specific strategies based on the communities present.

ROCK OUTCROPS

Overview: Rock outcrops provide rare habitats and permanent landscape features that can enhance military training. Large outcrops are important for species such as California condors, peregrine and prairie falcons, and golden eagles, as well as many other raptor and bat species. These outcrops also provide habitat for rare and sensitive plant species. Aside from providing habitat, these outcrops may also be sensitive cultural resource features. Outcrops may be damaged by graffiti and physical destruction, and boulders may be displaced or stolen. Rock outcrops require protective measures to ensure that they remain a viable and intact component of the FHL ecosystem.

Objective: Maintain rock outcrops as areas of special interest due to cultural resources and unique wildlife habitat.

Ongoing Actions:

1) Prohibit activities that could degrade the Palisades rock formation and other rock formations.
2) Limit rappel activities to authorized military training at appropriate sites approved by Range Control and PWE.
3) Prohibit unauthorized destruction, removal, movement, or use of boulders and rock formations.
4) Continue coordination efforts with the FHL Cultural Resource Manager to ensure INCRMP compliance for culturally significant rock outcrop features, such as rock art sites, and include rock outcrops in cultural/environmental awareness training for military and civilian staff.

5.6.3 Sensitive Resource Management Areas

Overview: The Programmatic Biological Assessment (PBA; U.S. Army 2004) was amended (U.S. Army 2009a) to designate Sensitive Resource Management Areas (SRMAs) to highlight long-term management requirements and unique sensitive features that require additional management and protection beyond that afforded by the environmental review process (FHL Regulation 200-2). Management area boundaries should be adapted as new information is available, with changes proposed to USFWS and included in annual updates to the INRMP.

The PBA describes SRMAs 1 through 9 in relation to (i) conflicts with military training and development, (ii) sensitive resources protected, (iii) existing protections in place, and (iv) potential and need for future management and protection actions (Table 7). Current land use for each area includes the following, unless stated otherwise: vehicle traffic on existing roads, to include low water crossings, maintenance of roads and facilities, emergency traffic, foot traffic, landings by helicopters, and habitat improvement projects. All other activities require coordination with PWE.

Objective: Manage designated Sensitive Resource Management Areas and protect their sensitive features (U.S. Army 2009b).

Ongoing Actions:

1) Continue PWE coordination for all land-use activities within SRMAs unless otherwise specified.
2) Monitor SRMAs individually, or as part of annual monitoring, for special status species.

Table 7: Sensitive Resource Management Areas at FHL

SRMA	Name	Ha (Acres)	Description
1	Purple Amole Management Area	67 (166) in TA 13W	This area contains part of a large complex of purple amole sites as well as wetlands and San Joaquin kit fox habitat.
2	San Joaquin Kit Fox Management Area II	117 (289) in TA 22	This area contains San Joaquin kit fox habitat, caper-fruited tropidocarpum, and wetlands. A large wetland in the southwestern part of this area is often used by elk and waterfowl.
3	Vernal Pool Fairy Shrimp, Dwarf Calycadenia, and San Joaquin Kit Fox Management Area I	728 (1,800) in TAs 13E, 13W and 22	This area contains San Joaquin kit fox habitat, vernal pool fairy shrimp, western spadefoot, purple amole, dwarf calycadenia, yellow-flowered eriastrum, prostrate navarretia, and cultural resources.
4	San Joaquin Kit Fox Mitigation Area	86 (212) in TA 13E	This area contains San Joaquin kit fox habitat that was designated a mitigation area for range facility construction in TA 22.
5	TA 12C Regulated Area	138 (342) in TA 12C, Upper Stony Valley	This area has a high density of archaeological sites as well as San Joaquin kit fox habitat and wetlands.
6	San Antonio Mission Regulated Area	190 (469) in TA 6B	This area contains cultural resources, including the historic water system for San Antonio Mission, as well as San Joaquin kit fox habitat.
7	Historic Jolon Town Site and Gil Adobe	49 (120) in TAs 16B, 13 E, and 13W	This area contains cultural resources and San Joaquin kit fox habitat.
8	Arroyo Toad Habitat	1,643 (4,059) in TAs 6B, 16B, 22, 25, and 29	This area contains arroyo toad breeding and upland sandy soil habitat, San Joaquin kit fox habitat, vernal pool fairy shrimp, and western spadefoot.
9	Purple Amole TA 25	310 (767) in TA 25	This site contains numerous patches of purple amole and habitat for San Joaquin kit fox, vernal pool fairy shrimp, western spadefoot, and dwarf caldycadenia.

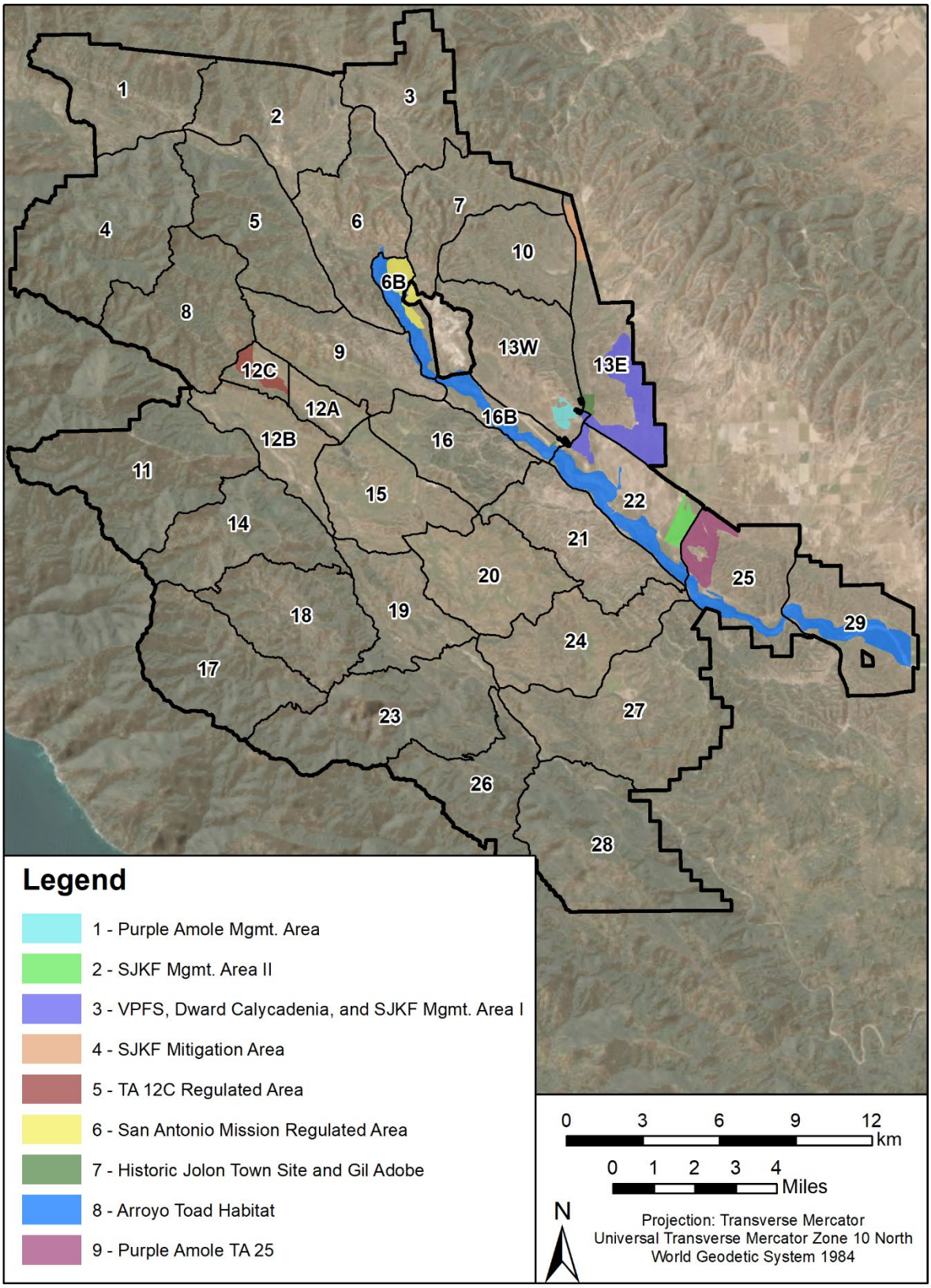

Figure 5: Combined Sensitive Resource Management Area Map at FHL
SJKF = San Joaquin Kit Fox, VPFS = Vernal Pool Fairy Shrimp

5.6.4 Habitat Restoration and Rehabilitation

Overview: Habitat restoration and rehabilitation are essential to maintaining ecosystem integrity to complete the military mission. The Army is authorized to conduct environmental restoration and rehabilitation activities which "provide for fish and wildlife management, land management, forest management, and fish- and wildlife-oriented recreation" (16 U.S.C. 670a.[b][1][a]). Additionally, the identification, investigation, research and development, and cleanup of contamination from a hazardous substance, pollutant or contaminant is also provided for under law (10 U.S.C. 270; DoD Directive 4715.7, Environmental Restoration Program).

The ITAM Program is a subcomponent of the Army's Sustainable Range Program (SRP), which is the Army's overall approach for improving the way in which it designs, manages, and uses its ranges to ensure long-term sustainability. Individual projects require environmental review to determine if action is adequately addressed by the Interdisciplinary Team Environmental Assessment (IDT EA), USFWS Programmatic Biological Opinion (PBO), State Historic Preservation Office (SHPO), and existing permits. ITAM has five components:

1) **Range and Training Land Assessment (RTLA):** The current goals of the RTLA program are to (1) assess impacts of live training and testing activities; (2) prioritize and assess land management activities external to training to maximize the capability, accessibility, and availability of land to meet the training mission; and (3) participate in training land use planning (e.g., Range Master Plan, Installation Master Plan, NEPA).
2) **Land Rehabilitation and Maintenance (LRAM):** The LRAM component directs programming, planning, design, and execution of land rehabilitation and maintenance projects. The FHL LRAM program uses native plants, a multidisciplinary restoration approach, and ecosystem-level planning to provide sustainable and lasting solutions for maintaining quality training lands (U.S. Army 2012a).
3) **Sustainable Range Awareness (SRA):** The SRA component provides a proactive means to (1) develop and distribute educational materials to users of range and training land assets, (2) integrate SRA into existing command or installation operational awareness activities and events, and (3) initiate new events that maximize outreach for the command.
4) **Training Requirements Integration (TRI):** The TRI component provides a decision support capability based on the integration of training requirements, land conditions, range facilities, and environmental management requirements.
5) **Geographical Information System (GIS):** The FHL Sustainable Range Program (SRP) GIS component creates, manages, and distributes standardized spatial information, including cartographic support of training operations and Global Positioning System (GPS) surveys of features related to training, infrastructure, and the natural environment on and immediately surrounding FHL.

Objective: Conduct long-term resources monitoring to detect changes caused by military activities and identify measures to minimize impacts and protect resources.

Ongoing Actions:

1) ITAM's RTLA and LRAM programs collect data on bivouac areas and other heavily used sites such as tactical assembly areas (TAAs) and identify land-use measures that minimize land disturbance, or restoration actions to recontour and revegetate sites as needed.
2) ITAM coordinates with Range Operations to site military missions in areas best capable of supporting those missions. PWE coordinates with project proponents through the environmental review process for best project siting to protect resources and support the mission.
3) The RTLA component of the ITAM program conducts long-term resource monitoring to detect vegetation changes caused by military activities.
4) PWE and RTLA identify invasive plant species during RTLA surveys and incidental observations. PWE and LRAM identify and implement control measures.
5) The LRAM component of the ITAM program evaluates and prioritizes active erosion sites. Subject to funding, ITAM implements an average of three projects per year from the Training Land Rehabilitation Plan.
6) Review and recommend updates to the Approved Plant list, Fill Sources, and Recommended Planting Methods for Construction and Revegetation Projects on FHL.

Recommended Actions:

1) Coordinate and implement actions as described in the FHL Soil Erosion and Sediment Control Component.
2) Consider adding pollinator-supporting plants to seed mixes used for training area restoration.

5.6.5 Wildland Fire Management

Overview: The Army Installation Wildland Fire Program Implementation Guidance Memorandum (US Army 2021) provides guidance on appropriate funding streams (aka, Management Decision Packages, MDEPs) for wildland fire activities. Environmental funding (VENQ) covers prescribed fire for ecosystems management, T&E species conservation, post-fire land rehab and monitoring, IWFMP development cost, and NEPA review and analysis for all aspects of the wildland fire program. Municipal Services funding (QMUN) covers initial establishment of firebreaks, fuel reduction, fire prevention, fire response, fire control, and the maintenance of established firebreaks. Integrated Training Area Management (TATM) should fund prescribed fire and post fire rehabilitation activities with the primary purpose of enabling military training. Emergency Management Services (QEMS) funds wildfire suppression and associated equipment (including vehicles and personal protective equipment) and training. Conservation Reimbursable and Fee Collection Program (CRFCP) monies (collected at FHL through hunting and fishing access fees) can fund prescribed fire where the primary purpose is to improve game species habitat.

The latest Integrated Wildland Fire Management Plan (IWFMP), developed in 2014 and currently being updated, was developed in accordance with Army Regulation (AR) 200-1, *Environmental Protection and Enhancement*; AR 420-1, *Facilities Engineering Fire and Emergency Services*; Department of Defense (DoD) Instruction 4715.03, *Natural Resources*

Conservation Program; provisions of the Sikes Act (16 United States Code [U.S.C.] 670a et seq.); DoDI 6055.6 (*DoD Fire and Emergency Services Program* 2000); and in AR 420-1, (*Facilities Engineering Fire and Emergency Services* 2012) and all other applicable DA and DoD policies, directives, and instructions. The IWFMP is an Operational Component Plan intended to implement specific fire management goals of the FHL INRMP (U.S. Army 2012a). The IWFMP provides FHL with a description of the wildland fire program and presents various management practices designed to provide for firefighter and community safety while minimizing impacts on resources present at FHL (U.S. Army 2014a). These recommendations are balanced against the requirements of FHL to accomplish its military mission with the highest efficiency.

The IWFMP provides a detailed overview of FHL's wildland fire history, both prescribed and wildland fires. Wildland fires have been mapped in GIS by the FHL ITAM program or PWE since 1998 (U.S. Army 2014a). The Fire Department also maps fire using the Wildland Fire Mapping Application (WFMAP) developed by Colorado State University. In addition to the perimeter of the wildfires and prescribed fires, the following attributes were also collected as attributes: fire type, burn pattern, tree damage, incident number, burn date, GPS/survey date and other notes.

An area of increasing concern in California and across the western U.S. is the wildland-urban interface (WUI), where houses meet or intermingle with undeveloped wildland vegetation (Radeloff et al. 2005; Bento-Gonçalves and Vieira 2020). Most of the land surrounding FHL consists of U.S. Forest Service property, rangelands, vineyards, and farms. Residential communities comprising the WUI near FHL include, but are not limited to, the FHL cantonment area, Lockwood to the east, Pine Canyon to the north, and Bryson-Hesperia to the south. Some of these communities are considered to be in high-risk WUI settings (FRAP 2006; CAL FIRE 2010).

FHL does not have an Army Forestry program; the cutting of wood is not a necessary activity related to the accomplishment of any mission or environmental purpose on the installation. For many years, the cutting and collection of downed wood for personal use was permitted for Monterey County residents, but the program was suspended in 2015 because it was not part of an Army Forestry program (FHL 2010). Non-consumptive use of dead and downed wood is permitted for military training and the cutting of live or dead standing trees is permitted for maintenance activities reviewed by PWE. Use of this wood and no-fee permits issued by PWE for official garrison-sanctioned events is described in FHL Policy #25.

Objective:

1) Continue to support a Wildland Fire Management Program to protect high-value natural resources areas from catastrophic wildfire while conserving resources and military operational flexibility.
2) Assess the impact of fire on vegetation communities and animal and plant populations of interest. Use fire as a tool to achieve natural resource management and training goals and objectives.

Ongoing Actions:

1) Implement the FHL IWFMP, periodically reviewing and updating the plan as necessary. Annual IWFMP review must be signed by the Garrison Commander.
2) Evaluate fire history and vegetation communities using GIS to determine major shifts in vegetation communities, such as conversion of oak savannas to grasslands.
3) PWE and the ITAM program assist the Fire Department in developing and reviewing annual burn plans, while PWE oversees mapping the extent of annual prescribed wildfires.
4) PWE and the ITAM program coordinate with the FHL Fire Department to use prescribed fire to manipulate vegetation to achieve natural resource and training goals and objectives.
5) The Fire Department develops and implements an annual prescribed burn plan in accordance with applicable permits and FHL environmental review.
6) The Fire Department fights wildfires as appropriate to reduce wildland and facility damage and prevent injury.

Recommended Actions:

1) In the face of an expanding WUI, implementation of a collaborative approach is needed, especially in the development of strategies to prevent and reduce fire risk in these areas (Bento-Gonçalves and Vieira 2020). The IWFMP should reflect a collaborative discussion with adjacent stakeholders in the FHL WUI for mutual benefit.
2) FHL should study the potential impacts of controlled burning on the Elk population. Specifically, if the frequency and amount of burning causes elk to leave FHL in search of more food. If this is the case, then rotational burning might be more beneficial to elk.

5.6.6 Grounds Management

Overview: The cantonment area contains developed space as well as natural open space areas. Developing a park-like atmosphere in the cantonment will benefit people and the natural environment.

Objective: Maintain an aesthetically pleasing cantonment landscape that conserves natural ecosystem functions as feasible.

Ongoing Actions:

1) Support DPW-Master Planning Division in developing Area Development Plans and an Installation Design Guide that makes best use of existing native trees; conserves floodplains, drainages, and topography; and enhances aesthetic and structural standards fitting to the area and local historic structures.
2) Support DPW Roads and Grounds with use of native species in cantonment landscaping (see **Appendix G** for list of approved plants).
3) Prohibit planting of non-approved plants, such as ad-hoc planting of ornamental Christmas trees.
4) Review and update approved plant list, fill sources, and recommended planting methods for construction and revegetation projects on FHL adapted from Suggested Plant

Materials and Fill Sources for Use in Construction Projects on FHL provided by the ITAM program.

5) Prioritize the cantonment for siting of native oak tree mitigation plantings from projects or training activities at FHL that displace native oak trees.
6) Identify areas to plant a pollinator garden for education and awareness.

5.7 Special Status Species

Overview: It is an Army goal to systematically conserve biological diversity on Army lands within the context of its mission. Actively managed species at FHL are those designated under the ESA, MBTA, Bald and Golden Eagle Protection Act (BGEPA), DoD Species at Risk (SAR), state-listed or candidate species under the California Endangered Species Act (CESA), state species of special concern, California Native Plant Society (CNPS) Lists 1 and 2, or USFWS Birds of Conservation Concern. There are many ways that SAR can be defined, and Garrisons have autonomy to develop and maintain their own lists. FHL SAR includes those species that are not federally listed under ESA, but that are either candidates for listing or are regarded by NatureServe as critically imperiled (G1/T1) or imperiled (G2/T2) throughout their range.

FHL conducts monitoring and/or management programs for priority species of concern listed in Table 8. These species are considered during environmental review and in developing land management actions and priorities. The following sections will provide additional details on the management programs and monitoring efforts for these species.

Table 8: Priority species of concern for FHL

Common Name	Scientific Name	ESA Status	State Status	Other Status
Amphibians and Reptiles				
Arroyo toad	*Anaxyrus californicus*	FE	SCC	-
California red-legged frog	*Rana draytonii*	FT	SCC	-
Foothill yellow-legged frog	*Rana boylii*	Under Review, proposed rule designating DPS as endangered	SE	DoD SAR
Tiger salamander (hybrid)	*Ambystoma* sp.	-	-	-
Southwestern pond turtle	*Actinemys pallida (Emys pallida*)	Under Review	SSC	DoD SAR
Western spadefoot	*Spea hammondii*	Under Review	SCC	DoD SAR
Birds				
Bald eagle	*Haliaeetus leucocephalus*	Delisted 2007	SE (review)	BGEPA, MBTA, BCC
California condor	*Gymnogyps californianus*	FE	SE	MBTA
California spotted owl	*Strix occidentalis occidentalis*	Under Review	SSC	MBTA, BCC
Golden eagle	*Aquila chrysaetos*	-	Fully Protected	BGEPA, MBTA, BCC
Least Bell's vireo	*Vireo bellii pusillus*	FE	SE	MBTA

Common Name	Scientific Name	ESA Status	State Status	Other Status
Tricolored blackbird	*Agelaius tricolor*	Listing Not Warranted (2019)	ST	MBTA, DoD SAR (G1)
Western burrowing owl	*Athene cunicularia hypugea*	-	SSC	MBTA, BCC
Mammals				
Greater bonneted bat	*Eumops perotis*	-	SSC	-
Little brown bat	*Myotis lucifugus*	Under Review (Northeast, Region 5 only)	-	-
Pallid bat	*Antrozous pallidus*	-	SSC	-
Mountain lion	*Puma concolor*	-	State Candidate (Southern/Central Coast)	-
San Joaquin kit fox	*Vulpes macrotis mutica*	FE	ST	-
Townsend's big-eared bat	*Corynorhinus townsendii*	-	SSC	-
Western red bat	*Lasiurus blossevillii*	-	SSC	-
Invertebrates				
California floater	*Anodonta californiensis*	-		USFS: S
Crotch's Bumble bee	*Bombus crotchii*	-	State Candidate	DoD SAR (G2)
Monarch butterfly	*Danaus plexippus*	Candidate	SSC (CA overwintering pop.)	DoD SAR
Vernal pool fairy shrimp	*Branchinecta lynchi*	FT	-	-
Western Bumble bee	*Bombus occidentalis*	Under Review	State Candidate (subspecies *B. o. occidentalis*)	DoD SAR
Western ridged mussel	*Gonidea angulate*	Under Review		
Plants				
Caper-fruited tropidocarpum	*Tropidocarpum capparideum*	-	-	CNPS: 1B.1 DoD SAR (G1)
Chorro Creek bog thistle	*Cirsium fontinale* var. *obispoense*	FE	SE	CNPS: 1B.2
Purple amole	*Hooveria purpurea var. purpurea*	FT	-	CNPS: 1B.1
San Antonio collinsia	*Collinsia antonina*	-	-	CNPS: 1B.2 DoD SAR (G2)
San Benito pentachaeta	*Pentachaeta exilis* spp. *aeolica*	-	-	CNPS: 1B.2 DoD SAR (T2)
Santa Lucia mint	*Pogogyne clareana*	-	SE	CNPS: 1B.2 DoD SAR (G2)
Santa Lucia monkeyflower	*Erythranthe hardhamiae*	-	-	CNPS: 1B.1 DoD SAR (G1)
Yellow flowered eriastrum	*Eriastrum luteum*	-	-	CNPS: 1B.2 DoD SAR (G2)

Key for Table 8:

FE = Federally Endangered
FT = Federally Threatened
BCC = Birds of Conservation Concern
DoD SAR= Department of Defense Species at Risk
SE = State Endangered
ST = State Threatened
SSC = State Species of Special Concern
SCE = State Candidate Endangered
CRB = California Rare Plant Rank
CNPS 1B.1 = Plants rare, threatened, or endangered in California and elsewhere; seriously threatened in California
CNPS 1B.2 = Plants rare, threatened, or endangered in California and elsewhere; moderately threatened in California
MBTA = Migratory Bird Treaty Act
BGEPA = Bald and Golden Eagle Protection Act
USFS = United States Forest Service

Global Conservation Status:
G1: critically imperiled.
G2: imperiled.
G3: vulnerable.
G4: apparently secure.
G5: secure.

5.7.1 Endangered Species Act Threatened and Endangered Species

Overview: AR 200-1 requires that installations prepare and implement an Endangered Species Management Plan (ESMP) as a component of the INRMP consistent with current policy and guidance. For any ESMCs that are being revised or developed, FHL seeks USFWS involvement to ensure both parties agree with actions described within. The ESA (16 U.S.C. 1531 et seq.) requires federal agencies to manage federally listed T&E species and their habitat in a manner that promotes conservation of those species and is consistent with species recovery plans. Section 7 of the ESA requires federal agencies to enter consultation with the USFWS or National Marine Fisheries Service (NMFS) when a proposed action may affect a listed T&E species.

The Programmatic Biological Assessment (PBA) of the Effects of Activities Conducted at FHL, Monterey County, California, on Federal Endangered and Threatened Species (FHL 2004) that was submitted to USFWS to initiate consultation contains species- and activity-specific minimization measures to protect federally listed species. The minimization measures are subject to modification during the consultation process through coordination between FHL and USFWS; the measures are finalized at the conclusion of consultation. The result of this consultation is a Biological Opinion, or in FHL's case, a Programmatic Biological Opinion first issued in 2005 PBO (1-8-02-F-29R). PBAs were updated in 2005, 2006-7, and 2009 (amendments), PBOs were updated in 2007 and 2010. Currently, FHL operates under PBO 8-8-09-F-54R (2010). This document transmits the USFWS biological opinions based on the Service's review of the FHL INRMP and its effect on federally listed species.

Under ESA, "take" of federally listed wildlife is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, collect, or attempt to do so. Harm includes the destruction of habitat. AR 200-1 mandates protection of species that are candidates for ESA listing, and installations are to avoid activities that would result in the listing of these species.

There are five species federally listed as endangered, four species federally listed as threatened and one federal candidate species that occur or have the potential to occur within or near FHL, including the San Joaquin kit fox (*Vulpes macrotis mutica*), endangered; California condor (*Gymnogyps californianus*), endangered; least Bell's vireo (*Vireo bellii pusillus*), endangered; arroyo toad (*Anaxyrus californicus*), endangered; Chorro Creek bog thistle (*Cirsium fontinale* var. *obispoense*), endangered; California red-legged frog (*Rana draytonii*), threatened; California tiger salamander (*Ambystoma californiense*), threatened; vernal pool fairy shrimp (*Branchinecta lynchi*), threatened; Santa Lucia purple amole (*Hooveria purpureum* var. *purpureum*), threatened; and the Monarch butterfly (*Danaus plexippus*), candidate (see Table 8). Two "delisted species," the peregrine falcon and the bald eagle, were previously listed under the ESA but have recovered to the point that they no longer require protection under the ESA.

5.7.1.1 Arroyo Toad

The arroyo toad (*Anaxyrus californicus*) was listed as endangered on December 16, 1994 (9 FR 64859 64867) and is classified as a species of concern by the State of California (CDFW 2021). This species inhabits very restricted areas in southern California and Baja California, Mexico (USFWS 1999). The arroyo toad is a medium-sized species that inhabits streams where water levels fluctuate, and natural disturbance is common during flooding events (U.S. Army 2012a). Primary threats to this species include habitat loss due to urbanization, agriculture, and dam construction. Additional threats include water management and diversion activities; road construction, maintenance, and use; predation by exotic species; loss of habitat to exotic plants; livestock grazing; mining; and recreational activities. Arroyo toads are limited to 22 drainages in California, to include the San Antonio River on FHL where breeding and upland habitat occurs in the cantonment area and TAs 6B, 16B, 22, 25, and 29. In these areas, arroyo toads breed, forage, and aestivate in sandy soils along the San Antonio River and may forage in adjacent non-sandy upland terraces (FHL 2010a). Annual surveys for arroyo toads are conducted at FHL in accordance with the Endangered Species Management Component for the Arroyo Toad (*Anaxyrus californicus*) at Fort Hunter Liggett, California (U.S. Army 2018; 2020a). Survey efforts include breeding and distribution, habitat composition and assessment, potential impacts from installation activities, and presence of invasive fauna (U.S. Army 2018; 2020a).

Objective: Implement an arroyo toad management plan that promotes the conservation and recovery of the endangered species and allows for FHL base operations and military training to meet current and future missions.

Ongoing Actions:

1) Monitor populations and breeding success.
2) Monitor for disturbance around human activity areas.
3) Implement protection measures as needed to minimize adverse effects of FHL activities, such as placing signage at river crossings and closing unauthorized river crossings.

4) Comply with CWA and EISA Section 438 to protect hydrology and water quality of arroyo toad breeding habitat.
5) Implement SWAMP (surface water and ambient monitoring program) or similar stream condition surveys to assess water quality in the San Antonio River.

Recommended Actions:

1) Implement pilot studies for arroyo toad habitat restoration projects in the San Antonio River (Gulf South Research Corporation 2015).
2) Reduce exotic species such as bullfrogs (*Rana catesbeiana*) and tamarisk (*Tamarix parviflora*). These two species are threats to the federally endangered arroyo toad on FHL.

5.7.1.2 California Condor

The California condor (*Gymnogyps californianus*) was listed as federally endangered on March 11, 1967 (32 FR 4001) and is also a CESA endangered species. It is the largest bird in the United States, with a wingspan of more than 3 m (9 ft). The reintroduction of captive-bred individuals into the wild, which began in 1992, continues today and contributes to the increase in current population estimates (U.S. Army 2012a). Habitat for condors includes foothill rangeland and woodlands in remote areas where the birds can roost and nest in tall trees and on cliffs. Rocky outcrops in the Nacimiento River Valley provide suitable foraging habitat for California condors (NPS 2007). No nesting habitat is known on the installation, but the area continues to provide a forage base of carcasses from deer, elk, coyote, trespass cattle, and other medium to large animals (U.S. Army 2009b).

California condors are periodically sighted at FHL, and the Ventana Wildlife Society triangulates tagged condors on the installation. Releases of captive-bred young California condors continue in Los Padres National Forest to the north and Pinnacles National Monument to the northeast of FHL. Therefore, sightings could increase as more birds are released in Monterey County. To date, no specific monitoring program has been implemented for the California condor on FHL. Free-flying California condors continue to have lead poisoning, which is believed to be the result of scavenging on game and non-game carcasses killed with lead ammunition. The hunting program on FHL banned lead bullets for hunting on July 1, 2007, and lead shot July 1, 2008; the installation requires that ammunition does not contain more than one percent lead (U.S. Army 2009b). California Assembly Bill 711, which requires the use of non-lead ammunition statewide for the taking of all wildlife, was fully implemented for the state of California in 2019.

Objective: Protect California condors on FHL from human disturbance and accidental harm and harassment.

Ongoing Actions: California condors are flushed from live-fire ranges or airfields when present prior to military activity. Non-invasive activities, such as handclapping, waving, or yelling, are used to flush condors in a safe direction with a clear escape path without risk of collision. Wing tag numbers of flushed condors are reported to the USFWS.

Recommended Actions:

1) Coordinate with USFWS and Ventana Wilderness Society regarding California condor activities and requirements in the FHL area.
2) Develop management strategies in coordination with USFWS as needed to address potential conflicts between condors and FHL activities, roads, and military overflights.

5.7.1.3 California Red-legged Frog

The California red-legged frog (*Rana draytonii*) was listed as federally threatened on May 23, 1996 (61 FR 25813 25833; USFWS 2014b, 2021), and is a California State Species of Concern (CDFW 2021b). Breeding habitat includes streams, deep pools, backwaters within streams and creeks, ponds, marshes, sag ponds, dune ponds, and lagoons with deep, slow-moving water with or without dense vegetation. The range of the California red-legged frog (CRLF) has diminished by 70% due to habitat loss and alteration. Non-native bullfrogs predate upon CRLF. CRLFs occur in Monterey County, but surveys conducted for the CRLF since 2003 have not detected them on the installation (U.S. Army 2020b). Breeding, wintering, and foraging habitat occurs on the installation along the San Antonio and Nacimiento Rivers (U.S. Army 2020b). In 1948, three specimens were collected in the Nacimiento River near the southwestern border of Training Area 8. The nearest populations occur >2.5 km (1.6 mi) north and >5 km (3 mi) south of FHL. Surveys for CRLFs are periodically conducted and incidental sightings during other aquatic surveys would be documented.

Objective: Detect populations of CRLF on FHL and minimize the potential for damage or degradation to red-legged frog habitat.

Ongoing Actions: Conduct CRLF surveys periodically and in response to FHL activities that may adversely affect suitable habitat.

Recommended Actions: Consider research potential for translocation and reintroduction efforts in consultation with USFWS.

5.7.1.4 California Tiger Salamander

The Central California distinct population segment of the California tiger salamander (*Ambystoma californiense*) was listed as a threatened species in 2004 (69 FR 47212 47248;USFWS 2009, 2014a) and is also a CESA threatened species. The California tiger salamander is a large terrestrial salamander with a rounded snout. It is black with white to pale yellow spots or bars. The California tiger salamander inhabits vernal and seasonal pools in grassland, oak savanna, and coastal scrub communities. Populations of California tiger salamander have declined due to habitat degradation and loss caused by urban and agricultural development (USFWS 2014a). All tiger salamanders on FHL are considered hybrids, a combination of the native California tiger salamander and the non-native barred tiger salamander (*Ambystoma tigrinum mavortium*) with low frequencies of native alleles (U.S. Army 2012a; Fitzpatrick and Shaffer 2007) and were likely introduced from the Salinas Valley (Johnson et al. 2010).

Per USFWS, hybrid tiger salamanders are considered a threat to native California tiger salamanders. There are no known native populations of tiger salamander adjacent to FHL, but there are abundant ephemeral pools and streams that support native frogs, toads, and crustaceans. Tiger salamanders occur in at least 16 locations on the installation (FHL 2004). Due to the hybrid nature of occurrences on FHL, there is no formal protection for the populations. Because of the enormous effort and cost and general infeasibility of eradicating hybrid salamanders from FHL, management instead focuses on supporting populations of hybrids where they fulfill the same ecological niche as the native species (i.e., ephemeral wetlands and vernal pools; Fitzpatrick et. al 2010). Species presence and breeding activity are documented concurrently with vernal pool fairy shrimp monitoring (U.S. Army 2020b).

Objective: Conserve native tiger salamander habitat in tandem with other species management actions while providing research opportunities to support recovery plan efforts.

Ongoing Actions: Conserve ephemeral pools.

Recommended Actions:

1) Coordinate with other agencies and researchers to make the FHL population available for research and teaching purposes.
2) Investigate any associated effects hybrid salamanders may be having on other natives such as western spadefoot to determine if additional management of hybrids may be necessary.

5.7.1.5 Least Bell's Vireo

The least Bell's vireo (*Vireo bellii pusillus*) was listed as federally endangered on May 2, 1986 (51 FR 16474 16482) and is also a CESA endangered species. The least Bell's vireo was once abundant in the Central Valley; however, populations have declined significantly due to loss and degradation of riparian habitat and the expansion of the range of the nest-parasitizing brown-headed cowbird (*Molothrus ater*). A lone singing male was observed on El Piojo Creek in TA 24 in 1988 (Roberson and Tenney 1993) and a vagrant Bell's vireo was detected in 2017 (Jacquelyn Hancock, personal communication, March 2021). FHL began annual surveys for the species in suitable breeding habitat in 1999 along Mission Creek, the San Antonio River, Nacimiento River, and other scattered drainages on FHL. Although the species has not been detected, potential for colonization exists with the continuing recovery of the least Bell's vireo range in California (Howell et al. 2010).

Objective: Using a cost-effective method, detect if least Bell's vireos are present or breeding at FHL and monitor suitability of their habitat conditions.

Ongoing Actions:

1) Annual listening surveys are conducted along established point transects in riparian communities suitable for least Bell's vireo forage and nesting activities.
2) Presence-absence surveys following USFWS guidelines (2001) are conducted following Bell's vireo sightings for a minimum of one year.
3) Investigate oppurtunities for use of audio recording units within riparian habitat to help detect least Bell's vireo and other sensitive riparian species in cooperation with a CESU.

Recommended Actions: Alter listening transects periodically to maintain focus on best available habitat.

5.7.1.6 San Joaquin Kit Fox

The San Joaquin kit fox (*Vulpes macrotis mutica*) was listed as federally endangered on March 11, 1967, (32 FR 4001) and is also a CESA threatened species. The species inhabits grasslands, scrublands, oak woodlands, and vernal pool areas in the California Central Valley floor and the interior coastal ranges. It is the smallest canid in North America. Den sites are dug in sandy loam on hillsides. The California ground squirrel (*Otospermophilus beecheyi*) is an important prey species for kit fox on FHL. Coyotes compete with the kit fox for prey on FHL. Potential habitat for kit fox can be found in portions of the San Antonio River Valley (cantonment and TAs 7, 10, 13, 16B, 22 and 25), and the Nacimiento River Valley (TAs 12, 15, 16, 19, 20, 21, 24, and 27).

FHL monitors for the federally endangered San Joaquin kit fox annually (Kilber 2019). The most recent kit fox sighting on or near FHL was in 2000 in the San Antonio River Valley near TA 22. Preactivity surveys are regularly conducted prior to construction or use of rodenticide in potential habitat; however, no active San Joaquin kit fox dens have been found since the late 1990s.

Objective: Implement San Joaquin kit fox management actions that (i) minimize the potential for take of kit foxes while allowing for FHL base operations and military training to meet current and future missions, (ii) establish a protocol for monitoring for presence of kit foxes at FHL.

Ongoing Actions:

1) Conduct spring and autumn remote camera trap surveys to improve chances of detection of San Joaquin kit foxes
2) Monitor predator indices of abundance in kit fox habitat biannually by means of scent stations.
3) Conduct DNA analysis of canid scat collected at camera or scent stations to determine species.
4) If a kit fox is sighted within the past 12 months, conduct preactivity surveys prior to ground-disturbing activities in the valley in which the sighting occurred.
5) Conduct preactivity surveys prior to ground squirrel pest management.
6) Update GIS data for kit fox observations.
7) Attend local resource agency meetings and coordinate with USFWS and adapt management and monitoring as needed to address new information.

Recommended Actions:

1) Train personnel on identification of San Joaquin kit fox and gray fox on FHL.
2) Stay informed of kit fox movement and sightings outside of FHL boundaries and adapt management and monitoring as needed.

5.7.1.7 Vernal Pool Fairy Shrimp

The vernal pool fairy shrimp (*Branchinecta lynchi*) was listed as threatened in 1994 (59 FR 180, September 19, 1994). Vernal pool fairy shrimp occur in vernal pools in the Central Valley, Coast Ranges, and a limited number of other sites. Threats to the species include destruction of vernal pools from urban and agricultural development, flood control, and highway and utility projects. Activities of most concern at FHL include off-road vehicle travel, road/firebreak maintenance, construction, and pesticide application. Additionally, most pools at FHL are artificial and were created by soil compaction, such as those adjacent to roads (road pools are exempt from protection) and in abandoned soil borrow sites (U.S. Army 2012a). At FHL, vernal pool fairy shrimp have been confirmed only in the cantonment area of the San Antonio Valley and TAs 13, 16B, 22, and 25; a single pool in the Nacimiento Valley in TA 20 was recorded as positive in 1995, but the species has not been detected since. FHL monitors federally threatened vernal pool fairy shrimp annually in accordance with the FHL ESMC for Vernal Pool Fairy Shrimp in coordination with USFWS (U.S. Army 2003b).

Wet season disturbance monitoring of vernal pools in 2018 found recent disturbance to twelve pools (four of which were occupied by vernal pool fairy shrimp). At least some of the reported disturbance was due to vehicles; however, these appeared to be random incidents rather than a recurring problem (U.S. Army 2020b).

Objective: Implement a vernal pool fairy shrimp management plan that promotes conservation and recovery of the federally threatened species and allows for FHL base operations and military training to meet current and future missions.

Ongoing Actions: Annually monitor pools that support fairy shrimp for presence of vernal pool fairy shrimp, potential for or evidence of disturbance, adequacy of protection measures, exotic species encroachment, and evidence of succession.

Recommended Actions: Identify restoration opportunities to mitigate for loss of vernal pools due to natural succession.

5.7.1.8 Chorro Creek Bog Thistle

The Chorro Creek bog thistle (*Cirsium fontinale* var. *obispoense*) was listed as federally endangered on December 15, 1994 (59 FR 64613 64623) and is also a CESA endangered species. The species inhabits inland seeps associated with serpentine soils (USFWS 2014c). The closest known population to FHL is adjacent to San Simeon Creek in western San Luis Obispo County, approximately 20 km from FHL's most southern border. Serpentine soils occur on FHL in TAs 17, 19, 23, 26 and 28. Biologists did not detect the species during surveys of serpentine soils in TA 28 in 2013, 2015 and 2017; additional surveys will be conducted during future growing seasons and may include initial assessments using aerial imagery (U.S. Army 2020b).

Objective: Detect populations of Chorro Creek bog thistle on FHL and minimize the potential for harm to potential habitat.

Ongoing Actions: Reconnaissance surveys are conducted as feasible in suitable areas.

5.7.1.9 Purple Amole

Purple amole (*Hooveria purpurea var. purpurea*) was federally listed as threatened on March 20, 2000 (65 FR 14878 14888, CNPS 2019). Purple amole is a small perennial member of the agave family that flowers from April through June. It is threatened by habitat fragmentation and conversion, non-native plants, foot traffic, vehicles, and military activities and is potentially threatened by grazing (CNPS 2019). Purple amole is known only from limited areas (i.e., approximately 15 occurrences) almost entirely on FHL and Camp Roberts in Monterey and San Luis Obispo counties in the Nacimiento and San Antonio River watersheds. On FHL it occurs primarily in the San Antonio Valley in portions of the cantonment area and TAs 13, 16B, 22, and 25, with an additional small site that intersects TAs 23, 24, and 27 in the Nacimiento Valley (U.S. Army 2012a).

Annual surveys are conducted at 14 transects to count the number of purple amole plants present, the number of those plants that successfully produced seed, and the numbers of seeds produced. The majority of purple amole is currently found in TAs 13 and 25. Displacement from non-native grasses is the primary threat to conservation of purple amole on FHL (USFWS 2020a). The current ESMC is being revised for this species in cooperation with the USFWS and Purple Amole Recovery Plan recommendations (USFWS 2022). This document will include a monitoring plan to determine the stability of the purple amole population at FHL (USFWS 2022).

Objective: Implement a purple amole management plan that promotes the conservation and recovery of the federally threatened species and allows for FHL base operations and military training to meet current and future missions.

Ongoing Actions

1) Implementation of protection measures as needed to minimize adverse effects of FHL activities.
2) Annual surveys to document disturbance, recovery, and potential threats to purple amole.

Recommended Actions:

1) Coordinate purple amole monitoring so it is comparable across the species range.
2) Delineate purple amole management units based on location and land use.
3) Collect seed and deposit accessions into the permanent conservation seedbank.
4) Consider experimental research projects, such as prescribed fire to benefit purple amole.

5.7.2 ESA Candidate and Petitioned Species

Overview: Seven species that occur or potentially occur on FHL are in review for listing under the ESA: foothill yellow-legged frog, southwestern pond turtle, western spadefoot, California

spotted owl, monarch butterfly, western bumble bee, and western ridged mussel (Table 8). The USFWS determined that substantial information warranted listing of these species; candidacy for ESA listing was determined for the monarch butterfly (85 FR 81813 81822). The current findings and status for these species are discussed below.

5.7.2.1 Foothill Yellow-legged Frog

The foothill yellow-legged frog (*Rana boylii*) is a small to medium-sized frog with warty, brown–olive colored skin with a white abdomen and yellow tinge on the hind legs. They are stream-dwelling anurans that require shallow, flowing water with some cobble substrate for breeding (Thomson et al. 2016). The foothill yellow-legged frog was listed under the CESA as endangered (Southwest/South Coast Clade) March 10, 2020. The USFWS received a petition from the Center for Biological Diversity on July 12, 2012, to list this species as endangered or threatened, and during the 90-day review concluded that substantial information supported Factors A and E for listing (80 FR 37568). In the 12-month finding issued by the USFWS on December 28, 2021, the agency proposes to list four of six distinct population segments (DPSs) of the foothill yellow-legged frog under the ESA. After a review of the best scientific and commercial information available, USFWS found that listing the South Sierra and South Coast DPSs as endangered and the North Feather and Central Coast DPSs as threatened is warranted. Yellow-legged frogs are known to occur in <4.5 km (2.8 mi) of Los Burros and North Fork creeks in training areas 17, 18, and 23 at FHL and would fall under the Proposed Endangered South Coast DPS (Coast Range from Monterey County south to Los Angeles County). The remote location protects this population from most installation activities. A firebreak bisects the population on the training area borders; grading of this break or vehicle activity may negatively affect developing clutches occurring within the break. Introduced fish, crayfish, or bullfrogs have not been detected at this location. Annual surveys for foothill yellow-legged frogs consist of reconnaissance for breeding activity and range distribution. However, required installation activities may change due to USFWS requirements if yellow-legged frogs are listed. For example, a formal ESMC may be necessary for the management of this species. In the meantime, FHL management strategies should consider the best management strategies provided by the USFWS and within the CDFW Considerations for Conserving the Foothill Yellow-legged Frog (2018).

5.7.2.2 Southwestern Pond Turtle

The western pond turtle is a California species of special concern due to population reductions. It is small to medium sized with a brown to olive carapace and mottled skin. It is the only native semi-terrestrial turtle found in California and is distributed along the coast from Washington to Baja California. Pond turtles spend most of their lives in or adjacent to a variety of aquatic habitats but may overwinter in burrows >500 m from water (Rosenberg et al. 2009). It can migrate up to one kilometer between its home range and its nesting site (USFWS 2019). The USFWS received a petition from the Center for Biological Diversity on July 11, 2012, to list this species as endangered or threatened, and during the 90-day review concluded that substantial information supported Factor A for listing (80 FR 19259). The western pond turtle has been split into two separate species, northwestern pond turtle (*Actinemys marmorata, Emys marmorata* in CNDDB) and southwestern pond turtle (*Actinemys pallida, Emys pallida* in CNDDB) (Spinks et

al. 2014). The southwestern pond turtle occurs on FHL. Southwestern pond turtles have been sighted in all major ponds and streams within both watersheds of FHL. Visual encounter surveys are conducted at FHL reservoirs and incidental sightings are recorded and maintained in a GIS database. Sightings will continue to be documented and data will be reviewed following the USFWS 12-month status review. Little is known about how installation activities may impact or threaten its livelihood; however, the Western Pond Turtle Range-wide Management Strategy can serve as a roadmap for threat investigation and coordination with range-wide efforts (USFWS 2020c).

5.7.2.3 Western Spadefoot

Western spadefoot (*Spea hammondii*) is a toad-like amphibian and a California species of special concern. They are greenish gray with irregular markings, have vertical pupils, and a single black spade on each hind foot, which is used to burrow into sandy to very hard soil. Spadefoot are nocturnal and terrestrial, entering the water only to breed. Spadefoot breeding is opportunistic and occurs following heavy rainfall (Ervin and Cass 2007). They lay eggs attached to vegetation in turbid rain pools or other ephemeral wetlands; larvae (tadpoles) metamorphose at 4–11 weeks, depending on available water. USFWS received a petition from the Center for Biological Diversity on July 11, 2012, to list this species as endangered or threatened, and during the 90-day review concluded that substantial information supported Factor A for listing (80 FR 37568). This species has been documented in the San Antonio River Valley on FHL. Surveys are conducted annually for spadefoot during the late winter and spring at known and potential breeding locations to establish a more thorough understanding of habitat use, species range, and reproductive effort on FHL. Recently, the DoD through its Partners in Amphibian and Reptile Conservation network developed best BMPs for the Western spadefoot (DoD PARC 2022). The management practices described in this document were developed specifically for DoD installations to help plan, prioritize, and implement conservation and management actions that provide a conservation benefit to the Western Spadefoot, while also providing information to comply with regulatory processes. FHL will revisit its management activities to reflect these new recommendations.

5.7.2.4 California Spotted Owl

The California spotted owl (*Strix occidentalis occidentalis*) is a subspecies of spotted owl that occurs throughout the Sierra Nevada Mountain range in California and Nevada; in southern and coastal California in the Coastal, Transverse, and Peninsular Mountain ranges; and in Sierra San Pedro Martir in Baja California Norte, Mexico. The California spotted owl is a rare and local resident of dense, multi-layered forested canyons of the Nacimiento River and along the Coast Ridge, west and northwest of FHL (Roberson and Tenney 1993). The USFWS received a petition from the Wild Nature Institute and the John Muir Project of the Earth Island Institute on 9 January 2015 to list this species as endangered or threatened. Nighttime calling surveys for California spotted owls are conducted at FHL. Roosting and habitat mapping, to determine the extent of California spotted owl habitat, is ongoing.

5.7.2.5 Monarch Butterfly

The monarch butterfly (*Danaus plexippus*) is a species of butterfly globally distributed throughout 90 countries, islands, and island groups (USFWS 2020b). These butterflies are well known for their phenomenal long-distance migration in the North American populations. In December 2020, the USFWS released the 12-Month finding for the species, indicating that "the monarch butterfly meets the criteria to be listed under the ESA but will not be listed just yet because priority will be given to other species." This leaves the monarch as "a candidate species" for possible listing under the ESA in the future, meaning its status will be reviewed each year until it is either listed or the populations recover.

The western monarch butterfly population has declined by more than 99 percent since the 1980s. This extreme population decline is due to multiple stressors across the monarch's range, including the loss and degradation of overwintering groves; pesticide use, particularly insecticides; loss of breeding and migratory habitat; climate change; parasites and disease. FHL is within the Priority 1 early breeding zone of California, therefore, enhancing and maintaining breeding and migratory habitat for monarch butterflies and avoiding the use of pesticides near breeding and migratory habitat when monarchs are present is critical.

Monarch butterflies are known to breed on FHL. Breeding occurs during the summer and eggs are laid exclusively on milkweed (*Asclepias* spp.), their larva host plant. Milkweed is common on FHL, and adults and larvae are most abundant during summer and fall months. Damage to dense milkweed stands within the off-road maneuver corridor may negatively impact the species at FHL. Surveys are conducted annually to identify primary breeding habitat for the species and to identify areas of conflict. Sightings of both monarchs and milkweed are recorded in the installation GIS database as well as uploaded into the Western Monarch Milkweed Mapper (2021) to support USFWS annual status reviews.

5.7.2.6 Western Bumble Bee

Historically broadly distributed in western North America, the Western bumble bee (*Bombus occidentalis*) occurs along the Pacific coast and western interior of North America, from Arizona, New Mexico and California north through the Pacific Northwest and into Alaska. Eastward, the distribution stretches to the northwestern Great Plains and southern Saskatchewan. *Bombus occidentalis* is currently understood to include two subspecies, *B. o. mckayi* and *B. o. occidentalis*. Subspecies *mckayi* has a moderate range and area of occupancy, and the number of occurrences is stable or slightly decreasing, but subspecies *occidentalis* has undergone drastic declines (NatureServe 2021). Overall, the species appears to be secure in about 25-30% of its entire range (NatureServe 2021).

On September 21, 2015, USFWS received a petition dated September 15, 2015, from Defenders of Wildlife requesting that the Western bumble bee be listed as threatened or endangered and critical habitat be designated for this species under the ESA. In a 90-day finding in 2016, the USFWS found this petition presented substantial information indicating that the petitioned action to list may be warranted and they plan to initiate a status review (81 FR 14058 14072). The western bumble bee is a CESA candidate endangered species.

The species was observed on the installation in the vicinity of Nacimiento-Fergusson Road in 1953 (CNDDB record). Western bumble bees require meadow or grassland habitats with abundant floral resources and are known to frequent open flowers with short corollas, such as thistles, buckwheat, and penstemons (Xerces Society for Invertebrate Conservation et al. 2018).

5.7.2.7 Western Ridged Mussel

Western ridged mussel (*Gonidea angulata*) is a freshwater bivalve that burrows deep into sediment of streams and rivers. They release larvae (glochidia) in the spring and summer months, which encyst on host fish for approximately 2 weeks before dropping into the substrate. The species historically occurred throughout California, Nevada, Oregon, Idaho, Washington, and into the Canadian province of British Columbia, but has been lost in 43% of this range and is currently experiencing large-scale die-offs in many rivers of the U.S. (Blevins et *al*. 2020). USFWS received a petition from the Xerces Society for Invertebrate Conservation on 18 August 2020 to list this species as endangered or threatened, and during the 90-day review concluded that substantial information supported Factors A and C for listing (86 FR 40186). Western ridged mussel are known to occur in Los Burros Creek on FHL; this is the only known extant population south of the Klammath River in northern California. Annual surveys are conducted to investigate and document the distribution of all freshwater mussels on FHL; future surveys will include eDNA sampling, host fish study, population demographics, and habitat stressors to establish a more thorough understanding of habitat and conservation needs on the installation.

CANDIDATE AND PETITIONED SPECIES MANAGEMENT

Objective: Manage candidate and petitioned species**,** enhance habitat conditions for foothill yellow-legged frog, southwestern pond turtle, western spadefoot, monarch butterfly, western bumble bee, and western ridged mussel. Minimize the potential for adverse effects from military training, invasive weeds, exotic predators, drought, and habitat degradation.

Ongoing Actions:

1) Conduct surveys, concurrent with existing surveys (e.g., migratory bird surveys prior to prescribed burns, breeding bird surveys), to determine the presence of any sensitive species. Develop management actions for maintaining species population or habitat.
2) Develop adaptive management strategies to maintain stable populations that are consistent with mission requirements.
    a. Identifying actions that will minimize effects of FHL actions on the species and associated habitats.
3) Continue to record incidental sightings.
4) Foothill yellow-legged frog—Continue annual surveys to determine stability of the breeding population of Foothill yellow-legged frog.
5) Western spadefoot—Continue annual surveys to determine essential habitat and the stability of the breeding population of western spadefoot.
6) California Spotted Owl — Continue annual surveys for California spotted owls to provide continuous data on their presence, abundance, and distribution on FHL

a. Determine the extent of habitat on FHL of California Spotted owl through roosting and habitat mapping.

7) Monarch butterfly — Conduct visual encounter surveys and habitat surveys for monarch butterfly to determine distribution of butterflies and their habitat, record and report sightings of both monarch butterflies and milkweed into the FHL installation GIS database and the Western Monarch Milkweed Mapper.

Recommended Actions:

1) Foothill yellow-legged frog—Await the finalization of the proposed USFWS ruling of the South Coast DPS as Endangered to determine further management actions necessary for ESA compliance, such as the completion of an ESMC.
    a. Coordinate management activities with BMP provided by USFWS and CDFW Considerations for Conserving the Foothill Yellow-legged Frog (2018):
    b. Consider recommended visual encounter survey (VES) protocol by conducting one or two surveys for adult frogs followed by a tadpole survey, then a second survey for juveniles/subadults.
    c. Consider measures to avoid incidental take that are developed on a site- and project-specific basis. For example, measures may vary based on the type and extent of disturbance, duration and timing of disturbance, and influence of environmental factors.
2) Western spadefoot— Consider additional recommended BMPs developed by the Partners in Amphibian and Reptile Conservation network (2022)
    a. Identify and protect Western spadefoot breeding habitat/pools. Review aerial photography and installation GIS data to identify potentially suitable vernal pools and other ephemeral water sources. Post as necessary with official signage along roads and other human travel corridors to inform personnel about the actual or potential presence of spadefoot toads, particularly at road pools or ruts. If possible, direct traffic around these pools.
    b. Explicitly prohibit collection of Western Spadefoots on military sites, even if collection has not yet become a well-documented problem.
    c. Establish long-term monitoring stations at known breeding pools to allow for the collection of two datasets: the establishment of a baseline (abundance, success of breeding attempts, breeding phenology) of Western Spadefoot at known locations; and the ability to compare data of the population over time.
    d. Conduct upland habitat use and natal pool dispersal studies. Little is known about upland habitat use and natal pool dispersal in Western Spadefoots. Given the protected status of land on military installations, conducting studies of individuals leaving natal pools or utilizing upland habitat could be conducted on military installations with few complications (land-use, public interference, etc.) Radiotelemetry and systematic pit-fall trap surveys could accomplish this data collection and surveys could be conducted by military natural resource personnel, university/college students or paid, third-party consultants
    e. Protect and maintain upland aestivation habitat and connectivity between breeding locations.
    f. Avoid the use of all vehicles in breeding pool habitats used by Western Spadefoots. Avoid ditching and draining of ephemeral water sources

g. Control or Remove Invasive and Non-native Species.
h. Vernal pools are known and well documented on military bases in California where Western Spadefoots are known or may potentially be present. These areas could be expanded, or new vernal pools could be established, using mechanical equipment that allows for altering the physical structure of the habitat and/or with chemical removal/reduction of non-natives/invasive plant species in areas where vernal pools were previously documented.

3) Southwestern pond turtle—Develop surveys and studies to obtain population information, such as density, demographics, and habitat components using approved protocol such as the USGS visual survey protocol and trapping protocol (USGS 2006a, 2006b). Protect nest sites from human disturbance, locations of hatchlings or juvenile turtles may provide general location of breeding grounds.
    a. Coordinate efforts with those presented in the USFWS Western Pond Turtle Range-wide Management Strategy (USFWS 2020) such as:
    b. Determining the effects of invasive species and invasive species removal on western pond turtle populations.
    c. Determining what habitat features or population characteristics contribute to maintaining western pond turtle populations in the presence of introduced aquatic predators Implementing a survey/capture program for non-native turtles (e.g., red-eared sliders).
4) Monarch butterfly—Protect and enhance habitat by:
    a. Conducting monarch butterfly habitat modeling and mapping to assess the threat of training impacts and to identify priority areas for conservation and management.
    b. Conducting landscape maintenance activities to avoid bloom periods of plants whenever possible.
    c. Not applying herbicide on blooming plants, unless those plants are invasive species. Herbicide application should be targeted and not broad application. Implement mechanical plant removal rather than herbicide use whenever possible.
5) Western bumble bee—Conduct searches in appropriate habitat during peak flight season for Western bumble bee.
6) Western ridged mussel—Conduct surveys to determine distribution and stability of breeding population on FHL.

5.7.3 Bald Eagle and Golden Eagle Protection Act

Bald eagles (*Haliaeetus leucocephalus*) and golden eagles (*Aquila chrysaetos*) are protected by the provisions of the Migratory Bird Treaty Act of 1918 (16 United States Code [U.S.C.] §§703–711) and the Bald and Golden Eagle Protection Act (16 U.S.C. §§668–668c). The bald eagle was listed as endangered by the USFWS in 1967 (USFWS 1967), downlisted to threatened in 1995 (USFWS 1995) and delisted in 2007 (USFWS 2007). In 1996, biologists at Fort Hunter Liggett (FHL) documented the first occupied bald eagle nest in Monterey County since the 1930s (Roberson and Tenney 1993; FHL 2004). Since 1996, FHL has surveyed for and monitored bald eagle nests annually on the installation in accordance with the INRMP. To fully comply with federal law, annual monitoring for golden eagle nests was added in 2010 (Bachiero 2011).

Objective: Implement a bald and golden eagle protection plan that minimizes the potential for take of bald and golden eagles while allowing for FHL base operations and military training to meet current and future missions, establishes a protocol for monitoring eagle productivity, and responds to changes in the USFWS eagle permitting program for incidental take to comply with MBTA and BGEPA.

Ongoing Actions:

1) Conduct monitoring surveys, and report incidental and Breeding Bird Survey sightings of bald and golden eagles at FHL.
2) Identify locations of overwintering bald and golden eagles.
3) Identify bald and golden eagle nesting territories.
4) Monitor active bald and golden eagle nests.
5) Determine reproductive success.

Recommended Actions:

1) Remove roadkill from main roads to limit vehicle strikes.
2) Record and map roadkill locations to determine high-risk areas for eagle-vehicle strikes (see **Section 5.8.6**).

5.7.4 Migratory Bird Treaty Act

Overview: The MBTA protects migratory birds and implements the United States' commitment to international conventions for the protection of migratory birds. MBTA is the domestic law that governs the taking, killing, possession, transportation, and importation of migratory birds, their eggs, parts, and nests. FHL is subject to the provisions of the MBTA, statutory and regulatory requirements associated with the Migratory Bird Permits and Take of Migratory Birds by the Armed Forces (DoD/MBTA rule; 72 Federal Register 8931).

In addition to the migratory birds listed previously as special status species, there are numerous migratory birds present at FHL. The breeding season for migratory birds generally occurs from 1 February through 30 August; migrating populations transiting the region may be present on FHL throughout the year. Birds frequently observed include the western meadow lark (*Sturnella neglecta*), western scrub jay (*Aphelocoma californica*), California quail (*Callipepa californica*), mourning dove (*Zenaida macroura*), turkey vulture (*Cathartes aura*), acorn woodpecker (*Melanerpes formicivorus*), and red-tailed hawk (*Buteo jamaicensis*) (U.S. Army 2012a). A full species list of observed bird species at FHL can be found in **Appendix D**.

Avian surveys, breeding bird surveys and pre-activity nest surveys are conducted at FHL to monitor the status and trends of North American bird populations and to avoid unintentional take of migratory birds (U.S. Army 2012a). FHL participates in the Monitoring Avian Productivity and Survivorship (MAPS) program that was created by The Institute for Bird Populations (IBP) in 1989 to assess and monitor the vital rates and population dynamics of more than 120 species of North American landbirds to provide critical conservation and management information on their populations (IBP 2002). The installation collects cloacal and feather samples for the Center for Tropical Research at University of California Los Angeles UCLA, which collaborates with

IBP on various research projects to address conservation concerns and challenges facing North American migratory land birds (UCLA 2021).

If DoD determines that a proposed or ongoing military readiness activity could result in a significant adverse effect on a population of a migratory bird species, then coordination must occur with USFWS to develop appropriate and reasonable conservation measures to minimize or mitigate such potential adverse effects (see 72 Federal Register 8931). The USFWS and DoD MOU (2006) identifies specific activities where cooperation between the parties will contribute substantially to the conservation of migratory birds and their habitats in accordance with Executive Order 13186. This order, *Responsibilities of Federal Agencies to Protect Migratory Birds*, requires the support of various conservation planning efforts already in progress; the incorporation of bird conservation considerations into agency planning, including NEPA analyses; and on the annual reporting of the level of take of migratory birds.

TRICOLORED BLACKBIRD

The tricolored blackbird (*Agelaius tricolor*) is listed as Threatened under the CESA (CDFW 2020). Males are glossy black with dark red shoulder patches tipped with white. Females are sooty-brown and streaked with no red shoulder patches. The bird is mainly found in California and is typically associated with farmlands and marshes. The primary reason for population declines is habitat destruction (U.S. Army 2009a). Tricolored blackbirds have been documented at wetland locations in both watersheds of FHL and breeding activity is monitored annually as part of avian surveys (**Section 5.8**). In August 2019, the USFWS found that listing the tricolored blackbird was not warranted, in part due to the protection afforded at the state level to manage the species (84 FR 41694 41699). However, the species remains a DoD SAR due to its G1 NatureServe Critically Imperiled Ranking.

Objective: Enhance habitats for migratory birds and minimize adverse effects from military training, invasive weeds, and habitat loss or degradation.

Ongoing Actions:

1) Through NEPA review process, identify any actions that may adversely impact migratory birds.
2) Conduct surveys for nesting birds in areas proposed for disturbance; when feasible, request activity postponement until the nesting and fledging process is complete, otherwise apply protection measures of buffers for active nests.
3) Conduct annual avian and breeding bird surveys.
    a. Continue annual surveys for tricolored blackbirds to provide continuous data on their presence, abundance, and distribution on FHL.
    b. Continue participation in national surveys such as the nightjar and Breeding Bird Survey that support FHL's land stewardship and community outreach goals.
    c. Continue conducting surveys for oak savanna, grassland, and chaparral bird species for a minimum of 15 years to establish a trend in the abundance and composition.

5.7.5 California Fully Protected Species and Species of Special Concern

There is no waiver of sovereign immunity for state endangered and threatened species so state laws regarding state listed endangered species are not applicable. DoD/DA policy is that garrisons/installations should provide for the protection and conservation of state protected species when practicable. That is to say, it should provide similar conservation measures for state-listed species as are provided to species listed under the ESA, as long as such measures are not in direct conflict with the military mission. When conflicts do occur, consultations should be conducted with the appropriate state authority to determine if any conservation measures can be feasibly implemented to mitigate impacts. (DoDI 4715.03, Enclosure 3[3][d] and AR 200-1, 4-3[5][w])

Species that are not federally listed under the ESA but are either CESA listed species, California "Fully Protected" species, or California Species of Special Concern are considered in management. Table 8 lists the species with state designations. Species not previously discussed as federally protected in the preceding sections are described herein.

5.7.5.1 Greater Bonneted Bat, Townsend's Big-eared Bat, Western Red Bat and Little Brown Bat

Several species of bats forage, roost, and breed on FHL, particularly in abandoned buildings and other man-made structures. Acoustic surveys for bats were conducted during four seasons in 2016 on FHL. The Greater Bonneted Bat, Townsend's Big-eared Bat and Western Red Bat are all California Species of Special Concern. Although the Little brown bat is not currently afforded protection, identifying and protecting bat roosts (all species) is a natural resources management goal for FHL. The following preliminary issues and actions were identified in association with obtaining this goal.

Objective: Determine presence of bat species at FHL as well as roosting sites.

Recommended Actions

1) Monitor bat populations and primary roosting sites
2) Continue to update bat species list at FHL.
3) Identify artificial roost sites (i.e., man-made structures, buildings, and abandoned structures) and document in GIS database so that protection or mitigation actions may be applied as needed and determined through the FHL environmental review process.
4) Implement protection measures for identified habitat and mitigate for habitat loss and disturbances.
5) Include bat species, ecological importance, and safety precautions as part of environmental awareness training.

5.7.5.2 Mountain Lion

Mountain lions (*Puma concolor*) in the Southern and Central Coast regions of California are a CESA candidate (California Fish and Game Commission Notice of Findings, April 21, 2020). Mountain lions are a large, slender cat species with a long tail. They have a tawny brown coat

and black tipped ears and tail. They are the most wide-ranging cat species in the world and occur throughout California. The Southern and Central Coast regions of California comprise an evolutionarily signific unit (ESU) of mountain lion subpopulations. The lions within this ESU are genetically distinct and are threatened by low effective population sizes resulting from habitat loss and fragmentation (Yap and Rose 2019). The CDFW began capturing and tracking mountain lions on FHL in 2018 as part of a larger state-wide population inventory and genetics study. Home ranges for at least 7 lions overlap on FHL. While this subpopulation is robust, the Central Coast population is considered vulnerable to development and habitat loss, and essential to the viability of neighboring populations experiencing restricted gene flow (Dellinger et *al*. 2020).

Objective: Maintain a stable mountain lion population and support state-wide scientific research and population monitoring to inform big game management and habitat conservation.

Ongoing Actions: Collaborate with CDFW on state-wide mountain lion research by coordinating access for radio-telemetry projects and assisting with data collection.

Recommended Actions: Integrate mountain lion population monitoring into deer and elk management.

5.7.5.3 Santa Lucia Mint

Santa Lucia mint (*Pogogyne clareana*) was listed as state-endangered in November 1979. Santa Lucia mint is an annual herb that blooms from April to July and is endemic to FHL. It is usually found in riparian woodlands, cismontane woodlands, and chaparral. Santa Lucia mint on FHL is threatened by non-native plant species and factors that may lead to changes in hydrology, such as road maintenance and drought. Santa Lucia mint is limited in distribution to the Santa Lucia Range within creek beds, swales, and vernal pools along four drainages on FHL (Los Burros, Los Bueyos and two unnamed Nacimiento River tributaries in Training Areas 14, 17, 18, 19, 23, and 26). Yearly point surveys are conducted to monitor Santa Lucia mint.

Objective: Maintain a stable or expanding population and distribution of Santa Lucia mint. Minimize the potential for disturbance to Santa Lucia mint during road maintenance activities and minimize non-native species encroachment.

Ongoing Actions:

1) Monitor Santa Lucia mint sites for yellow star-thistle encroachment and disturbance from human activities or flooding and erosion of stream banks where populations occur.
2) Continue annual photo-point monitoring.
3) Implement protection measures as needed.

Recommended Actions: Investigate resilience with climate change and develop adaptive management strategies to conserve the population.

5.7.5.4 Crotch's Bumble Bee

Crotch's Bumble Bee (*Bombus crotchii*) is listed with a NatureServe Global Rank of G2 (imperiled) and a State Rank of S1 in California (critically imperiled). Crotch's bumble bee was historically common in the southern two-thirds of California, but now appears to be absent from most of it, especially in the center of its historic range (Hatfield et al. 2014); analyses suggest sharp declines (85%) over the last ten years (NatureServe 2021). North American bumble bee species are generally threatened by habitat loss, pesticides, and climate change. Increasing aridity is a likely threat for this species, which has a very narrow climatic specialization compared to most bumble bees (NatureServe 2021). Nests are underground; males perch and chase moving objects in search of mates (Williams et al. 2014). The species is found in open grassland and scrub (Williams et al. 2014). This bee can persist in semi-natural habitats surrounded by intensely modified landscapes and may overwinter in soft, disturbed soil or under leaf litter (Love 2010). Flight period is March–September. The CDFW initiated a 12-month status review following the Fish and Game Commission's decision to accept for consideration the petition to list the species under the California Endangered Species Act (CESA) at its June 12, 2019 meeting; as a result, the Crotch's Bumble Bee is now a CESA Candidate.

Objective: Determine presence or absence of Crotch's bumble bee at FHL.

Recommended Actions

1) Conduct searches in appropriate habitat during peak flight season and provide information to CDFW to contribute to 12-month finding results.

5.7.6 California Native Plant Society Inventory of Rare Plants

FHL manages specific priority plants that are listed on the California Native Plant Society (CNPS) Lists 1 or 2 (Table 8). Species not described in the prior INRMP sections as federally protected, DoD SAR, or California state protected are described here. All the priority CNPS sensitive plant species are listed as 1B.1 or 1B.2.

1) CNPS 1B.1 = Plants rare, threatened, or endangered in California and elsewhere; seriously threatened in California.
2) CNPS 1B.2 = Plants rare, threatened, or endangered in California and elsewhere; moderately threatened in California.

5.7.6.1 Caper-fruited Tropidocarpum

Caper-fruited tropidocarpum (*Tropidocarpum capparideum*) was formerly presumed extinct since the 1950s until it was found on FHL in 2000. Fort Hunter Liggett monitors known occurrences annually during March–April in Training Areas 20, 22, 24, and 27. Survey objectives are to: i) determine presence/absence of the species; ii) identify any disturbance or threats; and iii) identify and map additional occurrences.

5.7.6.2 San Antonio Collinsia, San Benito Pentachaeta, and Yellow Flowered Eriastrum

San Antonio collinsia (*Collinsia antonina*), San Benito pentachaeta (*Pentachaeta exilis* ssp. *aeolica*), and yellow-flowered eriastrum (*Eriastrum luteum*) all have the potential to be petitioned for state or federal listing for protection due to their limited geographic ranges. The following information was obtained from the California Native Plant Society (CNPS 2019) and the Consortium of California Herbaria (2013). San Antonio collinsia was first documented on FHL in 1961, is limited to Monterey County, and is currently known to occur in Training Areas 9, 10, 25, 27, and 29. San Benito pentachaeta is known to occur in Monterey, San Benito, and Santa Clara Counties, was first documented on FHL prior to 1970, and is known to occur in isolated patches in Training Areas 1, 2, and 6. Yellow-flowered eriastrum is limited in distribution between Monterey and San Luis Obispo Counties, was first documented "near Jolon" in 1901, and is known to occur in Training Areas 13B, 15, 19, 20, 25, and 27. Fort Hunter Liggett monitors the presence/absence of these species' occurrences annually April–June, as time permits, and documents any disturbance. Unmapped sites of each species are mapped when encountered.

5.7.6.3 Santa Lucia Monkeyflower

Santa Lucia monkeyflower (*Erythranthe hardhamiae*) was described as a new species by N. S. Fraga in 2012 and was included in the CNPS Inventory of Rare and Endangered Plants of California (1B.1) as of July 2013. It is endemic to the Coast and Coast Ranges of Monterey and San Luis Obispo counties, occurring at eight known locations, five of those within FHL boundaries. Monitoring of Santa Lucia monkeyflower occurs periodically as time permits.

RARE PLANT MANAGEMENT

Objective: Monitor and manage priority rare-plant species and their habitat on FHL.

Ongoing Actions:
1) Continue annual presence surveys.
2) Continue annual disturbance monitoring.
3) Continue population mapping.
4) Implement protection measures when necessary.

Recommended Actions: Consider coordinating with external stakeholders and volunteers to alleviate staffing time constraints.

5.7.7 Department of Defense Species at Risk

Overview: The DoD and the Army are moving away from official DoD SAR lists and are actively developing a more holistic approach to preservation by prioritizing forward-thinking management of habitat, often across installation boundaries. The Recovery and Sustainment Partnership / Conservation Policy Initiative (CPI) / Pilot projects have superseded agency-wide SAR lists as the DoD and Army pursue species conservation from a broader perspective. Under

CPI, mission requirements are given more consideration through development of Species Action Plans and Defined Conservation Commitments.

There are many ways that SAR can be defined, and Garrisons have autonomy to develop and maintain their own lists. The process is ongoing, and should be informed by planning level survey data, proactive monitoring of state and federal proposed, candidate, and currently protected spp. lists, and dialogue with state / federal regulators.

FHL SAR include those species that are not federally listed under ESA, but that are either candidates for listing or are regarded by NatureServe as critically imperiled (G1/T1) or imperiled (G2/T2) throughout their range. The priority SAR are included in Table 8 and will be described below. Plant SAR were discussed in **Section 5.7.6.** Crotch's bumble bee and the Western Bumble bee subspecies were discussed in **Section 5.7.4**, as they are currently also candidate species for the CESA.

In addition to the priority SAR (Table 8), FHL conducted a 2018 review of G1/T1 and G2/T2 species known to occur, or with the potential to occur, on FHL; there are 31 additional SARs known to occur and 1 additional SARs with the potential to occur on FHL (Table 9). No specific management or monitoring is currently in place for these species; however, they should be considered, if applicable, in the environmental review process.

Table 9: Additional DoD SAR found or with the potential to occur at FHL

Common Name	Scientific Name	2004 Global Conservation Status	2018 Global Conservation Status
Arthropods			
California fairy shrimp	*Linderiella occidentalis*	G2	G2G3
Kern primrose sphinx moth	*Euproserpinus euterpe*	n/a	G1G2
Plants			
Santa Lucia fir	*Abies bracteata*	n/a	G2G3
Hickman's onion	*Allium hickmanii*	G2	G2
Indian Valley centrostegia	*Aristocapsa insignis*	n/a	G2?
Hoover's baccharis	*Baccharis plummerae* ssp. *glabrata*	T1	G3T1
Late-flowered mariposa lily	*Calochortus weedii* var. *vestus*	T1	G3G4T3
Small-flower calycadenia	*Calycadenia micrantha*	n/a	G2
Dwarf rosinweed	*Calycadenia villosa*	G2	G3

Common Name	Scientific Name	2004 Global Conservation Status	2018 Global Conservation Status
Santa Cruz Mountains pussypaws	*Calyptridium parryi* var. *hesseae*	n/a	G3G4T2
Hardham's evening-primrose	*Camissonia hardhamiae*	G1	G2
One-awned chorizanthe	*Chorizanthe rectispina*	G1	G2
Jolon clarkia	*Clarkia jolonensis*	n/a	G2T2
Umbrella larkspur	*Delphinium umbraculorum*	n/a	G3
Ojai fritillary	*Fritillaria ojaiensis*	n/a	G2?
San Benito fritillary	*Fritillaria viridea*	n/a	G2
Cone peak bedstraw	*Galuim californicum* ssp. *luciense*	T2	G5T3
Hardham's bedstraw	*Galium hardhamiae*	G2	G3
Santa Lucia dwarf rush	*Juncus luciensis*	n/a	G3
Pale-yellow tidy-tips	*Layia heterotricha*	G1	G2
Abbott's bush-mallow	*Malacothamnus abbottii*	G1	G1
Davidson bush-mallow	*Malacothamnus davidsonii*	G1	G2
Carmel valley bush-mallow	*Malacothamnus palmeri* var. *involucratus*	T2	T2
Palmer's monardella	*Monardella palmeri*	n/a	G2
Prostrate pincushion plant	*Navarretia prostrata*	n/a	G2
Hooked popcorn flower	*Plagiobothrys uncinatus*	n/a	T1
California scrub oak	*Quercus dumosa*	n/a	G2
Hickman's checker-mallow	*Sidalcea hickmanii* ssp. *hickmanii*	T2	T2
Most beautiful jewelflower	*Streptanthus albidus* ssp. *Peramoenus*	T2	T2
Three Peaks jewelflower	*Streptanthis morrisonii* ssp. *Elatus*	n/a	T2
Cook's triteleia	*Triteleia ixiodes* ssp. *cookii*	n/a	T2

5.8 Fish and Wildlife

Scientists have recorded more than 300 animal species inhabiting FHL including many special-status species (U.S. Army 2012a). Special-status species include proposed, candidate, listed (federal or state) and sensitive species (**Section 5.7**). The variety of plant communities provides a wide range of habitats for non-game wildlife. Species lists for mammals, birds, reptiles, and amphibians are stored and maintained in PWE files, and are shown in **Appendix F**. Non-game wildlife species are protected on FHL and may not be hunted, except for coyote (U.S. Army 2012a).

Typical mammal species include the California ground squirrel, tule elk (*Cervus canadensis nannodes*), California black-tailed deer (*Odocoileus hemionus californicus*), American badger (*Taxidea taxus*), coyote (*Canis latrans*), bobcat (*Lynx rufus*), raccoon (*Procyon lotor*), black-tailed jackrabbit (*Lepus californicus*), desert cottontail (*Sylvilagus audubonii*), deer mouse (*Peromyscus maniculatus*), pocket mouse (*Perognathus californicus*), and kangaroo rat (*Dipodomys* spp.).

5.8.1 Inventory and Monitor Wildlife

Overview: Informed planning and resource management requires information about status, trends, and changes in fish and wildlife populations, and their habitats. FHL has initiated inventories to keep species lists up to date. These surveys include avian, freshwater mussel, fish, reptile and amphibian, and bat inventories. Bat inventories are discussed in further detail in **Section 5.7.5.1**. Fisheries management is discussed in greater detail in **Section 5.8.4** and native and invasive freshwater mussel management in **Sections 5.7.7 and 5.9.2** respectively. Many of the current inventories are conducted as part of annual surveys for other sensitive species. In the future, if time and funding allow, FHL could consider dedicated surveys outside of annual species monitoring. FHL could also consider monitoring small mammal and medium to large mammal populations using camera traps or Sherman traps. These types of monitoring activities yield important data for overall management and planning actions. Inventorying small mammals could facilitate better-informed integrated pest management and ecosystem management. Camera traps are a low-cost and time-efficient way to monitor wildlife for multiple management objectives, e.g., detecting rare species, outbreaks of wildlife disease (e.g., mange), or overpopulation of deer.

Objective: Inventory mammal, avian, reptile, amphibian, fish, invertebrate, and crustacean species occurrence on FHL.

Ongoing Actions:

1) Continue conducting reptile and amphibian surveys.
2) Continue conducting bat acoustic surveys and roosting site identification.
3) Continue avian monitoring as part of annual breeding bird surveys.
4) Continue monitoring invasive and native freshwater mussel presence.
5) Continue native fish inventories and management.

Recommended Actions:

1. Consider small mammal inventories using Sherman trap arrays.
2. Consider using remote camera traps to ascertain locations and activity hotspots for large and medium-sized mammals. Scent attractants may be used to improve detection probability of mesocarnivores

5.8.2 Hunting

Overview: FHL has an active hunting and fishing program. Deer, elk, pig, coyote, jackrabbit, cottontail, tree squirrel, dove, quail, pigeon, turkey, duck, geese, and other game may be hunted at FHL. The FHL Hunting and Fishing Program is conducted in accordance with the SAIA. Hunters and anglers are required to abide by California State law and FHL regulations and policies (U.S. Army 2020b). Annual hunting permits are sold to the public. PWE has full management responsibility for the hunting and fishing program, including selling and issuing permits through iSportsman, registering users into training areas, and customer service. All tags for FHL hunts are issued through CDFW. Conservation fee funds from hunting and fishing permit sales are used for habitat conservation projects, harvest and composition data collection, and management of the hunting and fishing program in compliance with the Sikes Act (U.S. Army 2020b).

Objective:

1) Providing optimum hunting opportunities within limitations inherent with training activities, hunter safety considerations, and maintaining productive and self-sustaining populations.
2) Promoting productive harvest yields.
3) Conducting all hunting activities on FHL within applicable laws, policies, and regulations.
4) Support CDFW in their wildlife management responsibilities.
5) Update and maintain the FHL Deer Management Plan.
6) Managing FHL small game species and their habitats to promote healthy and sustainable populations.

Ongoing Actions:

1) Establish desired hunter and harvest quotas based on population recruitment and mortality estimates, desired hunter density in the field, and access restrictions due to military training activities.
2) Coordinate with Directorate of Emergency Services (DES) to provide sufficient law enforcement effort to deter violations of applicable laws, policies, and regulations.
3) Conduct spotlight surveys for deer and daytime composition counts for deer and elk for an index of population status.
4) Conduct antlerless hunts based on the previous year's population status.
5) Conduct check station data collection to determine herd health.
6) Conduct waterfowl/waterbird surveys to determine waterfowl presence and abundance at FHL.
7) Provide CDFW with annual population and harvest data for big game annually in December.

Recommended Actions:

1) Develop and implement an elk management component for FHL
2) Coordinate with CDFW to reevaluate the population goal of 300 set in the 1995 Elk Management Plan, as population presently exceeds that goal.
3) Implement cooperative agreements with various conservation agencies for FHL's hunting and fishing program.

5.8.3 Game Species

DEER

Deer are found in every training area on FHL, although in varying numbers. Few deer are found in old, dense stands of chaparral; more are found in areas with diverse habitats. The CDFW considers deer on FHL as part of the Santa Lucia herd for management purposes. The Santa Lucia herd occurs west of the Salinas River from the Pacific Ocean to the San Luis Obispo County line. Land ownership in the area includes private, Bureau of Land Management, military, and U.S. Forest Service lands, and includes the Ventana Wilderness Area. FHL is in the southern part of this region.

Annual spotlight surveys are the basis of deer population status monitoring. Surveys are performed on six permanent routes in representative habitats, with each route surveyed five times. Deer herd health is monitored using harvest check station data. Harvested deer are weighed, aged, and overall health indices are calculated using a brisket fat index. Acorn mast surveys are conducted each fall to monitor feed sources for deer and other wildlife. FHL has exceeded the current management goal of a minimum 15:100 buck/doe ratio and 20:100 fawn/doe ratio for over 20 years (Jaquelyn Hancock, personal communication, May 2021).

TULE ELK

Tule elk were nearly extirpated in California after the gold rush but were maintained on one ranch in Kern County. Elk were then relocated to several sites, often unsuccessfully, and from 1940 to 1970, there were three established herds. In December 1978, 22 elk were relocated onto FHL, and 2 bulls were added in 1979. In 1981, there were 14 illegal harvests, and only 4 cows remained. In 1981, 26 additional elk were relocated onto FHL and monitored until 1983. The relocation was a success, and the herd has since grown into a viable population. Elk use grasslands and oak savannas during the winter and spring seasons, and oak woodlands and riparian zones during summer and fall. In late spring, elk calve in chaparral within 0.5 km (0.31 mi) of water. During the breeding period, from late July to mid-October, elk form several herds (U.S. Army 2020b).

Tule elk are monitored annually during fall and winter using daytime composition counts. During this time, elk congregate in large herds, and personnel survey for each herd during the same survey effort to avoid duplication of monitoring efforts. The elk population on FHL has rebounded from the 2012–2016 drought. The population estimate increased from 250–350 animals in 2016 to 300–400 animals in 2018 (U.S. Army 2020b).

FERAL PIGS

Pigs are a popular game animal hunted on FHL. On September 22, 2022, a bill was signed into California law that reclassifies wild pigs from 'game mammal or non-game mammal' to 'exotic game mammal' (SB 856, 2022). Feral pigs compete with native wildlife species, prey upon amphibians and ground-nesting birds, and cause damage to native plants in some areas (U.S. Army 2012a). Pigs are uncommon in the steep, western portion of the installation and are most common in areas near the San Antonio River (U.S. Army 2012a).

Feral pigs are difficult to monitor. They are nomadic and have varying reproductive rates, depending on habitat conditions. Monitoring pig numbers directly at FHL is not feasible. Pigs are regularly taken by hunters at FHL, but harvest rates are insufficient to substantially affect population levels. In 2018, for example, 36 pigs were harvested according to hunter-submitted reports (U.S. Army 2020a).

Recommended Actions: Investigate options to manage pigs and their effects on species and habitats. Managing pigs, especially in sensitive areas, may contribute to protecting populations of listed plants and animals from pig rooting and predation.

OTHER MAMMALIAN GAME

The following species are hunted, but not monitored beyond harvest reporting: tree squirrels, cottontails, black-tailed jack rabbit, and coyote.

UPLAND BIRDS

California quail are a popular game species on FHL. California quail are found primarily in scattered shrub, open woodlands, and transition zones between dense vegetation and open areas and use brush piles and thickets for escape cover. They are dependent on summer water sources until the first fall rains. They feed on insects when young, then seeds of grasses and annual broad-leafed plants, such as filaree, clovers, and legumes; acorns are an important food source in dry years. California quail are common in lower elevation areas of FHL. Mountain quail inhabit live oak woodland and mixed chaparral on steeper slopes. Mountain and California quail are found together in some areas of FHL. Quail season normally runs from the third Saturday in October through the last Sunday in January. Use of bird dogs is allowed. However, dogs must be always leashed or under voice control.

Mourning doves are a popular game species on FHL, particularly for opening weekend. Mourning dove season is 1–15 September and from the second Saturday in November for an additional 45 days. The bag limit is 10 birds per day. Though migratory, their breeding and wintering range overlap along the southern half of the U.S. They typically nest either in trees or on the ground in open areas, and both males and females share in incubation. Mourning doves feed on forb and grass seeds and agriculture crops.

Band-tailed pigeon (*Columba fasciata*) season is open from the third Saturday in December for 9 consecutive days. The bag limit is two pigeons per day.

WILD TURKEY

Wild turkey (*Meleagris gallopavo*) was stocked on FHL in the late 1970s and initially protected to allow the population to become established. In 1987, two to three weekends of hunting were allowed during the spring gobbler season. In 1990, the spring gobbler season was opened, and, in 1996, the fall gobbler and hen season was opened. Population surveys are not conducted. Wild turkeys are often seen in TAs 6, 7, 9, 10 and 16, and other areas. The fall season is open statewide from the second Saturday in November for about 30 days. The spring bag limit is one bearded turkey per day and three per season. The season begins on the last Saturday in March and continues for 37 consecutive days.

WATERFOWL

Mallards (*Anas platyrhynchos*) and wood ducks (*Aix sponsa*) are the most harvested species. In addition, large numbers of Canada geese (*Branta canadensis*) winter around San Antonio Lake. Duck breeding habitat is present along areas of the Nacimiento and San Antonio Rivers and at many small ponds and reservoirs on FHL.

Duck hunting is minor at FHL, except when the San Antonio Lake water level is high and water inundates the upper reaches of the lake, which has not happened in recent years. Season dates and bag limits for waterfowl are determined by CDFW using federal guidelines. Seasons and bag limits vary from year to year. More than 100 wood duck nesting boxes are annually monitored and maintained. The boxes are monitored during the breeding season, when hens are banded in conjunction with the California Waterfowl Association. Repair and maintenance is conducted in the fall. Volunteer effort is important for duck box maintenance and monitoring. Duck boxes are moved as needed in response to changing water levels and use patterns.

5.8.4 Fisheries Management

Overview: Warmwater fish are the primary seasonal inhabitants of the San Antonio and Nacimiento Rivers. Native minnows, such as California roach (*Lavinia symmetricus*), hitch (*Lavinia exilicauda*), Sacramento squawfish (*Ptychocheilus grandis*), and speckled dace (*Rhinichthys osculus*), as well as several gamefish species could be present throughout most of the river systems when adequate flows are present (winter periods).

Fish populations at FHL vary seasonally. As the river flows diminish during summer, some fish become stranded and die. Other fish seek permanent shelter in small, isolated pools, where they remain throughout the dry summer and fall. These isolated populations do not support sustainable river fishing. Fishing is prohibited in FHL's rivers and streams to protect cultural resources, sensitive species, the safety of anglers, and the limited populations of native fish that persist in isolated pools.

In ponds, bass (*Micropterus)*, sunfish (*Lepomis*), and bluegill (*Lepomis macrochirus*) natural reproduction is good; however, FHL continues to restock to maintain fishable populations. Each year, rainbow trout (*Oncorhynchus mykiss)* and other species (e.g., bass (*Micropterus)*, catfish (*Ictalurus punctatus*), and bluegill (*Lepomis macrochirus*)) are stocked in various ponds and

reservoirs for sport fishing. Stocking of ponds with fish obtained from offsite locations (i.e., outside FHL) requires a permit from CDFW

Water quality and invasive aquatic mussel species presence at 13 reservoirs is monitored monthly while reservoirs are inundated. Measurements include dissolved oxygen, temperature, and water level, and changes that indicate decreasing water quality are looked for (U.S. Army 2020b). Invasive mussels will be discussed in further detail in **Section 5.10**.

Objective: Maintain ponds to support viable fish populations in conjunction with TES goals.

Ongoing Actions:

1) Monitor pond and reservoir water quality monthly. Use monitoring results to guide management actions that reduce occurrences of summer fish kills.
2) Monitor algae growth and prevent blooms with barley straw treatment as feasible to limit natural fish kills in ponds.
3) Initiate dam repairs and investigate deepening of reservoir shorelines.
4) Relocate fish between established fishing reservoirs to restore depleted or expired fisheries.
5) Improve native trout populations in the Nacimiento River by relocating non-native bass from the river to FHL's fishing ponds.

5.8.5 Recreational Use

Overview: Recreational use of FHL's diverse and unique natural resources is desired and requested by many people. Currently, the only recreational activities authorized FHL's training areas are hunting and fishing. Hunting and Fishing Regulation (FHL Regulation 420-26) prohibits use of all-terrain vehicles, motorcycles, and off-road vehicle travel. AR 200-1 requires that the INRMP evaluate recreational activities involving off-road recreational vehicles.

Objective: Implement sustainable recreation (hunting and fishing) while conserving natural and cultural resources and ensuring environmental compliance.

Ongoing Actions:

1) Identify off-road vehicle trespassing by hunters or other public, and close and restore trails.
2) Review any future EAs for use of motorized off-road vehicles.

5.8.6 Habitat Improvement

Overview: The form and function of California ecosystems are adversely affected and modified by human activity. As a result, many areas deviate from their original conditions, reducing native diversity and abundance. For example, only 5% of California's historical grasslands and forested wetlands remain (U.S. Army 2012a). Summer water sources for wildlife are scarce in the dry season, resulting in stress and mortality to game and non-game species.

FHL has 47 wildlife guzzlers and more than 60 natural springs, of which 26 are developed with tanks and/or troughs. PWE maintains and repairs these resources as needed. For example, in 2018 PWE repaired/maintained 11 developed springs and 33 guzzlers. Wood duck nest boxes are maintained and monitored in conjunction with the California Waterfowl Association's Wood Duck Program. In addition to wood ducks, bees (*Apis* sp.), wood rats (*Neatoma* sp.), mice (*Peromyscus* sp.), and western screech owl (*Otus kennicottii*) eggs were observed within the boxes (U.S. Army 2020b).

Objectives:

1) Improve habitats on FHL to support healthier, more diverse biological communities.
2) Maintain existing artificial water sources and conserve remaining undeveloped natural springs and seeps. Construct new artificial water sources if needs arise.

Ongoing Actions:

1) Continue to provide and maintain wood duck nest boxes in conjunction with California Waterfowl Association's Wood Duck Program.
2) Identify and remove abandoned or unnecessary cattle fencing.
3) Investigate the need to alter fencing to improve wildlife movement. Install wildlife-friendly fence modifications where appropriate.
4) Conduct annual spring and guzzler maintenance and identify potential new guzzler locations. Establish escape cover (e.g., brush piles) around guzzlers in open terrain areas and ensure safety features are functioning to prevent accidental drownings.
5) Maintain a GIS layer of artificial and natural water sources.

Recommended Actions:

1) Investigate need for other nesting enhancement (e.g., artificial burrowing owl burrows and blue bird boxes).
2) Remove derelict concertina wire, capping derelict wells, and other wildlife hazards.
3) Require Range Operations staff to haze wildlife from firing ranges prior to firing.

5.8.7 Wildlife Collisions

Overview: Collisions between wildlife and aircraft or motor vehicles, "wildlife strikes," pose major economic and safety concerns. Conservative estimates of annual economic losses from wildlife strikes with civil aircraft exceed $1.2 billion worldwide (Allan 2002). In the United States (US), wildlife strikes cost the US civil aviation industry, on average, a minimum of 108,495 hours of aircraft downtime and $187 million in monetary losses each year ($154 million in direct costs and $33 million in other costs from 1990–2018; Dolbeer et al. 2019). According to the United States Air Force (USAF) Birdstrike Database, between 1985 and 1998 an average of $35 million in damage and loss of aircraft was attributed to wildlife strikes annually (Zakrajsek 2005; AFI 91-202 2020; AFI 91-204 2020).

While wildlife collisions with aircraft are of concern for the DoD, vehicle collisions also pose economic and safety concerns. In their 2008 Wildlife-Vehicle Collision Reduction Study: Report to Congress, The U.S. Department of Transportation, Federal Highway Administration estimated one to two million collisions between cars and larger animals every year in the United Sates

(Huijser et al. 2008). The best estimate of the total annual cost associated with wildlife-vehicle strikes was calculated to be about $8 billion, with deer collisions constituting the single largest collision category involving human and vehicle costs (Huijser et al. 2008).

While many wildlife strikes result in no injury, research has shown that large mammal species are the most hazardous wildlife to aircraft and vehicles in terms of occupant safety, damage reported, and the level of damage incurred. Large mammal species such as deer and elk occur on FHL and therefore pose safety concerns. Currently, wildlife strike incidents are reported at FHL, but there is no centralized program or database to track these events. Tracking wildlife strikes, particularly the species, location, damage severity and any potential injury, is paramount to initiating prevention measures as part of an organized program.

Objectives: Reduce the potential for wildlife-vehicle collisions (wildlife strikes) for safety and economic reasons.

Ongoing Actions: Monitor vehicle collisions with wildlife, installing cautionary wildlife crossing signage where appropriate.

Recommended Actions:

1) Create a wildlife strike monitoring program to track wildlife strike incidents across FHL.
2) Create a geodatabase to specifically track wildlife strike occurrences to identify trends.
3) Sharing FHL's vehicle collision data with the California Roadkill Observation System to support regional planning for roadkill mitigation projects to the recommendations.
4) Promote awareness and outreach related to wildlife incidents and prevention.
5) Educate Range Operations staff about wildlife strikes and mitigation measures (e.g., hazing) for roadways and airfields

5.9 Invasive Species Management

The Federal Noxious Weed Act and EO 13112 require federal agencies to control noxious and invasive species on federal lands. EO 13112 establishes federal agency responsibility for the identification and management of invasive species. Invasive species are defined as any "alien (not native to the local ecosystem) species (plant or animal) whose introduction does or is likely to cause economic or environmental harm or harm to human health." At FHL, there are several plant species that are considered noxious or invasive, and control is mandatory for those found on the federal list. EO 13112 requires that federal agencies prevent the introduction of invasive species, detect and control populations of invasive species, and restore native species and habitat conditions in ecosystems that have been invaded. The Invasive Species Management Plan (U.S. Army 2014c) contains general guidance for invasive species management at FHL.

5.9.1 Invasive Plant Species

Overview: Invasive plant species on FHL include, but are not limited to, mustard (*Hirschfeldia incana* and *Brassica nigra*), cheatgrass (*Bromus tectorum*), tamarisk (*Tamarix parviflora*), and yellow star-thistle (*Centaurea solstitialis*). Russian thistle (*Salsola tragus*), stinkwort (*Dittrichia*

graveolens), and medussahead (*Taeniatherum caput-medusae*) are species of growing concern on FHL.

RUSSIAN THISTLE

Russian thistle (*Salsola tragus*) is a large, bushy summer annual. It has been identified at FHL during monitoring surveys for other species and can be found throughout California, including in agricultural areas, desert, roadsides, and other disturbed areas. Russian thistle can impede traffic, create fire hazards, and is a host of the beet leafhopper, an agricultural insect pest (Cal-IPC 2021). At FHL, Russian thistle is often identified during purple amole transect monitoring.

STINKWORT

Stinkwort (*Dittrichia graveolens*) is a rapidly expanding and poorly studied annual invasive plant that is becoming a focus of resource managers in California. Stinkwort degrades forage quality, can be toxic to livestock, and can cause contact dermatitis in susceptible people. FHL experienced a large increase in distribution and abundance of stinkwort, a plant species listed as invasive by the California Invasive Plant Council (Cal-IPC 2021). Stinkwort continues its sprawl into disturbed areas across the cantonment and was also identified in new parts of the training areas. Past management techniques included hand-pulling and hoeing of individuals; at its current rate of expansion, chemical control might be needed in the future.

MEDUSAHEAD

Medusahead (*Taeniatherum caput-medusae*) is a slender annual grass that has been identified at FHL. The one- to three-inch awns are straight and compressed when green, but upon drying, the awns twist and spread erratically in a manner reminiscent of the snake-covered head of the mythic Medusa. Medusahead can often be recognized by its color, which stands out against surrounding grasses. It matures from two to four weeks later than most other annual grasses, displaying distinctive patches of green in an otherwise brown grassland. Medusahead outcompetes native grasses and forbs, and, once established, can reach densities of 1,000 to 2,000 plants per square meter. After seed set, the silica-rich plants persist as a dense litter layer that prevents germination and survival of native species, ties up nutrients, and contributes to fire danger in summer.

TAMARISK

Tamarisk (*Tamarix parviflora*) is a non-native shrub originating in southeastern Europe. The plant occurs in patches along the San Antonio River between the San Antonio Mission and the San Antonio Reservoir (U.S. Army 2012a). It has also been used as an ornamental shrub in portions of the cantonment area but has since been removed. Tamarisk can form dense, low-growing thickets that displace native vegetation and negatively alter riparian soil chemistry.

YELLOW STAR-THISTLE

Yellow star-thistle (YST; *Centaurea solstitialis*) is a non-native annual/biennial member of the aster (Asteraceae) family of flowering plants with Eurasian origins. Yellow star-thistle is now

estimated to occupy approximately 8,100 ha (>30,000 ac) of FHL predominantly in lowlands of the San Antonio and Nacimiento Valleys, with smaller patches in outlying areas (U.S. Army 2014a). It is extremely dense in areas historically cultivated or highly disturbed, such as the San Antonio and Nacimiento Valley floors. Yellow star-thistle adversely affects the integrity of native ecosystems and reduces the quality of training lands for military training (U.S. Army 2014a). Training is impeded by dense stands of yellow star-thistle that obscure ditches, creating a hazard for off-road vehicle maneuvers. Yellow star-thistle provides fuel to intensify wildfires, which halt training activities until the fire is controlled (U.S. Army 2014b). It also tears parachutes in drop zones, which ruins the chutes (U.S. Army 2014b). It encroaches on rare native plants, such as purple amole, Santa Lucia mint, and caper-fruited tropidocarpum; the last of these was presumed extirpated until 2000 when it was found at a star-thistle control site and a Land Condition Trend Analysis plot (U.S. Army 2014b). Yellow star-thistle reduces upland habitat quality for arroyo toads, tiger salamanders, San Joaquin kit foxes, and other native wildlife.

In 2014, a Yellow Star-thistle Control Plan (YSTCP) was prepared by the Department of the Army in support of the FHL INRMP (U.S. Army 2014b). This YSTCP describes how to reduce, control, and prevent the further spread of YST in a cost-effective manner. The YSTCP complies with Executive Order (EO) 13112, as well as all other applicable laws, DoD policies, and Army regulations. The tools and methods recommended in the 1999 YSTCP were reviewed and incorporated into this report along with new and innovative tools and methods that are now available for control of yellow star-thistle. Additionally, the YSTCP addresses roadside infestations that are not currently being controlled. The YSTCP is based on an ecosystem management approach and includes an implementation chapter that lists and prioritizes programs and projects and estimates the cost and person-hours necessary to implement each program or project.

Objective: Reduce invasive vegetation through integrated habitat restoration.

Ongoing Actions:

1) Apply proven habitat restoration practices to promote native vegetation in previously disturbed areas.
2) Implement the Yellow Star-thistle Control Plan for the control of yellow star-thistle.
3) Implement actions according to the Invasive Species Management Plan.
4) Develop and implement a plan for salt cedar removal, with particular emphasis on arroyo toad habitat restoration.
5) Monitor and continue releases of biocontrol agents to sustain sufficient populations to reduce yellow star-thistle reinfestations and reduce yellow star-thistle in areas where it cannot be sprayed or otherwise controlled. Coordinate closely with USFWS, USDA, and CDFA prior to releases of bio-control agents to prevent harm to native species.

Recommended Actions:

1) Update Invasive Species Management Plan and Yellow Star-thistle Control Plan as necessary to incorporate new data and management goals.
2) Develop and implement action plans for controlling or eliminating new/increasingly problematic invasive plant species (e.g., hand pulling as soon as an invasive has been identified [highly effective for small patches]).

5.9.2 Invasive Animal Species

AMERICAN BULLFROGS

The American bullfrog (*Lithobates catesbeianus*; bullfrog) is an aquatic frog, a member of the family Ranidae. The bullfrog is ranked high due to its invasiveness and potential impacts on protected species. This species does not impact training; however, it can severely impact populations of listed and sensitive species (e.g., arroyo toad; U.S. Army 2014c). Bullfrog distribution and sightings are recorded during aquatic threatened and endangered species surveys. Bullfrogs are known to occur in artifical ponds throughout FHL and in most major streams in both the Nacimiento and San Antonio River valleys. Bullfrogs are abundant within the arroyo toad and western pond turtle ranges but are absent from the foothill yellow-legged frog range.

CRAYFISH AND GREEN SUNFISH

Red swamp crayfish (*Procambarus clarkii*) is widely distributed in California and other east and west coast states. Crayfish compete with native predators and will feed on larvae and juveniles of native fish and amphibians (Nagy et al. 2021). Burrowing in mud banks contributes to erosion and destroys important habitat for other native species. This species has been detected at FHL and are most abundant in training area 6B. The green sunfish (*Lepomis cyanellus*) has also been detected at FHL. Their large mouth allows them to compete with larger fish for prey items, and to prey on eggs and young of other fishes (Fuller et al. 2021). Green Sunfish and other introduced predatory centrarchids are likely responsible for the decline of native ranid frogs in California, as well as California tiger salamander populations.

Crayfish and Bullfrog Management

Objective: Reduce invasive/exotic animal species through integrated habitat restoration and direct or indirect control methods.

Ongoing Actions: Continue documenting bullfrog, crayfish, and sunfish occurrences during listed and sensitive species surveys.

Recommended Actions:

1) Establish distribution model of bullfrogs on FHL using habitat, sightings, and eDNA samples.
2) Research and implement control methods for invasive aquatic predators and identify environmental conditions where control actions would be most effictive, such as during drought conditions.

INVASIVE MUSSEL SPECIES

Zebra mussels (*Dreissena polymorpha*) are rapid reproducers and quickly coat surfaces, clog pipes, and smother native species. They will clump together and cover rock, metal, rubber, wood, docks, boat hulls, native mussels, crayfish, and even aquatic plants. Quagga mussels (*D.*

rostriformis bugensis) are rapid reproducers and quickly coat surfaces, clog pipes, and smother native species. Unlike zebra mussels, quagga mussels can colonize on both hard and soft surfaces from the water surface to depths of more than 123 m (400 ft). The mussels have environmental impacts across the Western states they have invaded. Impacts include destruction of habitat, reduction of native mussels, impaired water quality and potentially the accumulation of toxic materials (USGS 2019). Additionally, both species cause infrastructure damage, the fouling of boats and equipment, and clogging of water intakes, resulting in the expenditure of millions of dollars. They also increase costs to hydropower operations and municipal water utilities (USGS 2019).

Recreational vessels typically used for fishing at FHL include small john boats, canoes, kayaks, and other inflatable rafts. Only recreational vessels powered by electric, wind, or manual means are permitted on the reservoirs and all vessels must be certified as mussel free (U.S. Army 2012a).

Objective: To prevent the establishment of zebra mussels and quagga mussels on FHL.

Ongoing Actions: Prohibit recreational boating until a mussel inspection program can be initiated.

Recommended Actions:

1) Establish a formal Invasive Mussel Prevention Program Plan which includes enforcement and environmental education of the following:
    a. Boats should be thoroughly inspected for zebra and quagga mussels when moving from water body to water body. A thorough inspection includes careful observation of a boat's hull, drive unit, trim plates, trolling plates, prop guards, transducers, centerboards, rollers, axles, anchor, anchor rope, and trailer. Any trash or weeds must be removed, and any suspected mussels must be scraped off regardless of size.
    b. While on land, drain water from motor, livewell, bilge and transom wells, and any other water from boat and equipment before leaving water body.
    c. Leftover bait should be disposed of on land, away from water. Leftover live aquatic bait that has contacted infested waters should not be taken to uninfested waters.
    d. Use a hard spray from a garden hose or pressurized hose to thoroughly rinse boat hull, drive unit, livewells and livewell pumping system, bilge, trailer, bail buckets, engine cooling system, and other boat parts.
    e. Boats, motors, and trailers should be allowed to dry thoroughly in the sun for at least 5 days before boating again.

5.9.3 Amphibian Disease

Overview: With aquatic invasive species at FHL comes the threat of amphibian diseases. Invasive bullfrogs and crayfish, for example, are known to carry and likely spread amphibian diseases such as Chytridiomycosis, caused by the fungal pathogen *Batrachochytrium dendrobatidis* (Bd) and Ranavirus (Yap et al. 2018; Brunner et al. 2019). If California red-legged

frog reintroductions are considered a research or conservation opportunity, knowing the status of amphibian diseases in proposed habitat is critical. Additionally, due to the presence of California tiger salamander (hybrid) at FHL, the possibility for *Batrachochytrium salamandrivorans* (Bsal), which causes salamander chytridiomycosis, is an ever-present threat. Bsal is not yet present in in the United States (USGS 2021). However, the USGS Amphibian Research and Monitoring Initiative (ARMI) conducts sampling to monitor for the presence of Bsal in North American salamander populations in targeted locations with high biodiversity and increased risk of exposure to the Bsal pathogen (USGS 2021). Bd has been detected at FHL in several ponds, however refugia remain for native species that are currently Bd negative (Jacquelyn Hancock, personal communications, March 2021). FHL does not currently implement an annual monitoring program for amphibian diseases, however sampling as part of a federal or university research study could be considered

Objective: Detect presence and/or prevent introduction and spread of amphibian diseases at FHL.

Ongoing Actions:

1) Continue protocols for existing and proposed surveys to identify ways to reduce the potential for infections, e.g., boot and hand cleaning between survey areas and minimizing activities in breeding or wet areas (The Declining Amphibian Task Force Code of Practice, USFWS 2004). Measures in **Appendix B**, "Recommended Equipment Decontamination Procedures" of the USFWS's August 2005 "Revised Guidance on Site Assessments and Field Surveys for the California Red-legged Frog" could be included in protocols.

Recommended Actions:

2) Identify potential for threatening diseases at FHL by identifying which diseases are most likely to occur there, how they are transmitted, and species potentially affected. Consider a federal or university research study for this effort.
3) Consider periodic testing at Bd negative habitats to monitor the status of these vital refugia.

5.9.4 Snake Fungal Disease

Snake fungal disease (SFD), caused by the fungus *Ophidiomyces ophiodiicola*, is an emerging infectious disease of wild snakes in North America (Wildlife Research Center 2019). *Ophidiomyces ophiodiicola* is widely distributed in eastern North America and is considered the main cause of fungal skin infections of wild snakes in that region (Wildlife Research Center 2019). The disease often causes mild infections, but severe morbidity and mortality with consequent population declines have also been observed in wild snakes, including in some threatened species.

FHL participates in the DoD Snake Fungal Disease Survey, a DoD Legacy Resource Management Program project first conducted in 2018 (Project Number 17-838). This survey's objectives are to determine the occurrence and species associations of *Ophidiomycosis*. Outreach materials and sampling protocols with supplies were provided to volunteers at 68 military

installations across the U.S., including Puerto Rico. Samples were returned from 56 installations, including 5 from FHL. DNA extraction and amplification were conducted using quantitative PCR on returned samples and results were analyzed for the prevalence of ophidiomycosis. So far, the pathogen has not been detected at FHL.

Objective: Detect presence and/or prevent introduction and spread of snake fungal diseases at FHL.

Recommended Actions:

1) Continue participation in the Department of Defense (DoD) Snake Fungal Disease Survey, a DoD Legacy Resource Management Program
2) Encourage research opportunities for CESU/University collaborations.

5.10 Integrated Pest Management

Overview: The installation's Integrated Pest Management Plan (IPMP; U.S. Army 2019d) identifies and prioritizes pests and their destructive effects to determine levels of protection. Integrated pest management (IPM) is used at FHL, and typically a combination of IPM techniques is required to resolve a problem on a sustained basis. The IPM comprehensive approach to pest control or prevention, using methods of pest control in a compatible manner, avoids damage and minimizes adverse side effects on non-target organisms and the environment. Only pest-control activities that could impact sensitive species or habitats are addressed; many other pest-control methods are used that have no effect on natural resources (i.e., cultural controls to prevent attracting pest animals).

FHL recognizes six general categories of pests that cause significant damage and require control or management:

1) Disease vectors and medically important pests (e.g., deer mice [hantavirus], mosquitoes, black widow spiders, fleas, and bees and wasps).
2) Real property pests (e.g., termites and carpenter ants).
3) Undesirable vegetation (e.g., weeds in cantonment and range areas, particularly yellow star-thistle).
4) Vertebrate pests (e.g., swallows, gophers, mice, ground squirrels, northern Pacific rattlesnakes, feral cats, coyotes, skunks, and raccoons).
5) General household and nuisance pests (e.g., cockroaches, crickets, ants, and beetles).
6) Other requirements (e.g., carcass removal, odor control).

Objective: Control those plant and animal species that adversely affect natural resources management (e.g., reduce ecosystem functionality, displace native species) or affect the military mission or facilities on FHL per the FHL IPMP.

Ongoing Actions:

1) PWE coordinates with DPW Operations and Maintenance (O&M) to update the FHL IPMP to ensure that the plan reflects changes in pest populations and current management issues.
2) DPW O&M implements pest management controls from the IPMP and other pest-related guidance and plans. DPW tracks usage of active ingredients per reporting requirements.
3) DPW O&M conducts surveys of pests that pose a potential health risk to humans or natural resources.

6 Implementation

The most recent policy on INRMP implementation is contained in DoD *Natural Resources Management Plan Implementation Manual* (2018). According to the manual, an INRMP is considered implemented if an installation is (DoD 2018):

1) Actively requesting and using funds for natural resources management projects, activities, and other requirements in support of goals and objectives identified in the INRMP.
2) Ensuring that enough professionally trained natural resources management personnel are available to perform the tasks required by the INRMP.
3) Coordinating annually with all cooperating offices, inviting annual feedback from the appropriate USFWS and State fish and wildlife agency offices on the effectiveness of its INRMP.
4) Documenting specific INRMP action accomplishments undertaken each year.
5) Evaluating the effectiveness of past and current management activities and adapting those activities as needed to implement future actions.

The following sections describe the natural resource program and project implementation at FHL in accordance with the parameters above.

6.1 Funding

6.1.1 Funding Sources and Mechanisms

DoD cannot commit funding before Congress makes it available (DoD 2018). To program for future expected expenses, DoD employs the Planning, Programming, Budget, and Execution System (PPBES) budget process. The PPBES is an ongoing process and is continuously reviewed and refined. Environmental budget requirements are identified by the installation staff, submitted to its Major Command, and then included in the Program Objectives Memorandum (POM), which is modified and forwarded to the Chief of Staff, to the Secretary of the Army, the Secretary of Defense, and to the President. The PPBES is summarized as follows:

1) The PPBES process consists of long-range planning to anticipate and secure funding requirements to meet security threats and accomplish program goals.
2) These requirements are estimated and programmed for the next six years (the subsequent fiscal year and five years out) in the Future Year Defense Plan (FYDP).
3) The FYDP resources are analyzed in the Programming Process, where funding requirements are reevaluated and reprioritized for the next budget year, plus the subsequent five fiscal years. The POM process begins in the fall and is finalized the following spring, for development of the President's annual budget that will be submitted to Congress in the spring of each year.

The time scale of an INRMP fits well into the DoD PPBES forecasting process. One full cycle of the DoD budget process includes the next budgeted fiscal year and projections for the following 5 fiscal years. One full cycle of the INRMP, with upper command reapproval, covers a 5-year period. This means that by relying on an INRMP that is updated regularly, installations should be able to project relatively accurate funding requirements for natural resources management for 5-year periods, at a minimum (U.S. Army 2012a).

Project priority within this INRMP is initially determined by funding classification, as defined in Department of Defense Instruction 4715.03, *Natural Resources Conservation Program*. The revised 4715.03 discusses recurring and non-recurring conservation management requirements.

Environmental funding for Natural Resource Conservation Management Requirements is prioritized as follows:

1) Recurring:
    a. Administrative, personnel, and other costs associated with managing the DoD Natural Resources Conservation Program that are necessary to meet compliance requirements in applicable laws, regulations, E.O.s, and DoD policies, or in direct support of the military mission.
    b. DoD components shall give priority to recurring natural resources conservation management requirements associated with the operation of facilities, installations, and deployed weapons systems.

2) Non-Recurring:
    a. Current Compliance:
        i. ESA compliance projects, to include minimization measures and monitoring required by the project description and terms and conditions of a biological opinion.
        ii. Meeting requirements with applicable laws, regulations, standards, E.O.s, or DoD policies.
        iii. Environmental analyses for natural resources conservation projects and monitoring and studies required to assess and mitigate potential impacts of the military mission on conservation resources.
        iv. Natural resources planning-level surveys.
        v. Reasonable and prudent measures included in incidental take statements of biological opinions, biological assessments, surveys, monitoring, reporting of assessment results, or habitat protection for listed, at-risk, and candidate species so that proposed or continuing actions can be modified in consultation with the USFWS.
        vi. Nonpoint source pollution or watershed management studies or actions needed to meet compliance dates cited in approved state coastal non-point source pollution control plans.
        vii. Wetlands delineation critical for the prevention of adverse impacts to wetlands.

b. Maintenance Requirements:
    i. Includes those projects and activities needed to meet an established deadline beyond the current program year and maintain compliance.
c. Enhancement Actions Beyond Compliance:
    i. Includes those projects and activities that enhance conservation resources or the integrity of the installation mission or are needed to address overall environmental goals and objectives, but are not specifically required by law, regulation, or E.O., and are not of an immediate nature.

The Garrison Commander is responsible for ensuring that FHL has sufficient staff to implement the INRMP (U.S. Army 2012a). The PWE is responsible for annual coordination with USFWS and CDFW, requesting funds for INRMP implementation, and documenting implementation actions. However, the Commander is not responsible for whether funding is allocated for a specific project. Consequently, the projects and schedules proposed in this updated INRMP are targets to facilitate natural resources program planning (U.S. Army 2012a). When requested funds are not received, natural resource management prescriptions and the programming schedule may be reexamined. In addition, plans may be adapted to account for the revised project schedule and the proposed budget may be adjusted to account for available funding.

6.1.2 Secondary Funding Sources

Additional funding sources available to DoD installations are described in **Table 10**.

Table 10: Secondary Funding Sources for INRMP Program Implementation.

Program	Description
Agricultural Reimbursement Authority Funds	Money collected through the leasing of Army-owned property for agricultural/grazing use is directed back into the natural resources program and reallocated by the DA.
Fish and Wildlife Conservation Funds	The SAIA allows installations, in cooperation with state and federal agencies, to establish fees for hunting, fishing, or trapping. The SAIA provides installation commanders with the authority to collect, spend, administer, and account for the fees. Fees are collected from installation hunting or fishing permits.
Forestry Reimbursement Authority Funds	Forestry revenues are first used to reimburse commercial forestry expenses. Then, as directed by DoD Financial Management Regulation 7000.14-R Volume 11A, 40% of installation net proceeds for the fiscal year are distributed to the state that contains the installation. The funding is used to support road systems and schools. Once the commercial forestry expenses are reimbursed and a portion of the proceeds are distributed among the state counties, any remaining amount is transferred to a holding account known as the DoD Forestry Reserve Account.
ITAM Funds	The ITAM Program is managed by the Headquarters Department of Army proponent (TRADOC Proponent Office (TPO) ranges), which funds the installation DPTMS for the ITAM core capabilities (i.e., RTLA, TRI, LRAM, SRP, GIS, and SRA components at FHL). A standard funding model is used based on an installation's priority category determined by the installation's mission.
National Public Lands Day Grants	Installations are eligible to receive DoD Legacy funds in support of National Public Lands Day. Projects eligible for funds include habitat restoration, wetland restoration, and stream cleanup.

Program	Description
The Legacy Resource Management Program Funds	The Legacy Resource Management Program (Legacy) is a special congressionally mandated initiative to fund military conservation projects. Legacy can provide funding for a variety of conservation projects, such as regional ecosystem management Legacy resource initiatives, habitat preservation efforts, archaeological investigations, invasive species control, monitoring and predicting migratory patterns of birds and animals, and national partnerships and initiatives, such as National Public Lands Day.

6.2 Natural Resources Staff and Training

Overview: Professional training for FHL natural resources staff is critical to stay up to date with current technology and studies and maintain an effective and professional program.

Objective: Maintain professional natural resources staff that are sufficiently trained to implement the INRMP.

Ongoing Actions:

1) Encourage membership in professional societies and provide opportunities for continuing education, training courses, and workshops to allow managers to stay up to date with the latest research findings and application techniques, to communicate with fellow professionals, and to maintain professional standards. Examples of professional societies include: The Wildlife Society, Society of Range Management, National Military Fish and Wildlife Association, Society for Ecological Restoration, the CNPS, and the Society for Conservation Biology.
2) Encourage natural resources staff to attend conferences as funding permits. Examples include attending the annual conferences for the National Military Fish and Wildlife Association, and the western section of The Wildlife Society meeting.
3) Update as necessary any information regarding sensitive resources in the Leader's Handbook and on the Web page.

6.3 Environmental Awareness, Education and Community Engagement

Overview: Effective communication methods and conservation education programs are the keystone of successful environmental management and a requirement of EMS. Educating FHL military and civilian users of environmental programs on the installation is imperative to maintain compliance with environmental laws and minimize impacts on natural and cultural resources.

Objective:

1) Create a conservation ethic in land users to minimize potential damages to natural resources.
2) Provide people on the installation and in the surrounding community with an understanding of the FHL natural resources program.

3) Provide opportunities for people to study and learn about the natural history of the installation.
4) Foster community and external stakeholder relationships.

Ongoing Actions:

1) Establish an education program for military and civilian personnel who might have contact with sensitive resources to minimize inadvertent impacts. Environmental education information will include at minimum the following:
    a. Environmental review requirements and procedures.
    b. Endangered species protection measures.
    c. Erosion and sedimentation BMPs and wetland protection issues.
2) Provide input as needed for ITAM educational materials to troops.
3) Provide annual natural and cultural resources program briefings to Roads and Grounds and the Fire Department.
4) Participate in Earth Day activities at FHL, and, as requested, provide briefings to school-age class groups.
5) Support research activities for species occurring on FHL, particularly for university and government research projects, as access to TAs permits.
6) Reach out to local community groups for volunteers to assist with natural resources management objectives (e.g., engage local birding groups to count migratory bird species).
7) Educate the local community, as well as installation personnel and tenants, about the installation natural resources program and continue circulation of existing outreach and education materials.
8) Periodically review outreach and education materials to ensure that each is still current and meeting the goals of outreach and education programs.

Recommended Actions:

1) Investigate and implement methods to improve communication with the FHL community and the public that promotes environmental awareness (e.g., maintaining an informative website, creating pamphlets and standard operating procedures, developing informational posters).
2) Provide environmental briefings to unit leaders prior to large training exercises.
3) FHL should consider using CDFW "Keep Me Wild" materials. There are several standalone brochures that can be downloaded from our website on species such as kit fox, deer, mountain lion, turkey, and coyote.
4) Identify areas to plant a pollinator garden for education and awareness.

6.4 Conservation Law Enforcement

Overview: DoD Instruction 5525.17 *Conservation Law Enforcement Program* (CLEP) establishes policy, assigns responsibilities, and provides direction for the CLEP in accordance with the authority in DoD Directive 5124.02; and defines the organization and authorities of CLEP. Natural or cultural resources may be damaged by illegal activities such as trespassing, vandalism, and resources theft. Unintentional harm to resources may result from conducting activities in a way that is inconsistent with environmental laws (U.S. Army 2012a). Conservation

Law Enforcement conserves the use of natural and cultural resources in accordance with the INRMP and ICRMP for the installation and ensures installation public users remain in compliance with appropriate environmental, natural, and cultural resources laws and regulations. At FHL, Conservation Law Enforcement Officers provide specialized law enforcement expertise regarding natural and cultural resources matters and protections of government property, improving interjurisdictional conservation law enforcement among the Military Departments, federal, state, tribal, and local law enforcement and land management agencies; and collect and track data on violations. At FHL there are two Conservation Law Enforcement Officers hired by the FHL Directorate of Emergency Services in 2018.

Objective: Develop a high compliance rate of FHL users with applicable natural and cultural resource related laws and regulations.

Ongoing Actions:

1) Coordinate law enforcement effort for natural and cultural resource program needs among Law Enforcement and PWE staff.
2) FHL DES to employ Conservation Law Enforcement Officers or Game Wardens to support the hunting and fishing program.

6.5 Agency Coordination

Overview: The FHL INRMP will be afforded agency and public review. After the INRMP is finalized, the Army will prepare an annual report to USFWS and CDFW that describes prior-year implementation status of the plan, and future-year projected funding and implementation. The annual report will be provided to the agencies by March 15th of each year and may also address reporting requirements from biological opinions issued under ESA, if applicable. For brevity, the report should reference and not reiterate the INRMP.

Objective: Develop and maintain coordination procedures to ensure an effective and viable ecosystems management approach.

Ongoing Actions:

1) Prepare a Natural Resources Management annual report to include, at minimum, management of special status species and migratory birds. Deliver reports to CDFW and USFWS and solicit agency feedback.
2) The letter to the agencies will include a request for review and comment on implementation status and the general information presented in the report. The report should include the following information:
    a. ESA incidental take reporting, personnel contributing to natural resources management, and a weather summary.
    b. Summaries of environmental reviews, military training, and operations and maintenance activities.
    c. Summaries of natural resources program activities.
    d. Biological opinion terms and conditions implemented, and problems or recommendations.

FHL will invite USFWS and CDFW for an annual meeting to be held in May of each year to identify funding priorities and adapt INRMP actions as needed.

6.6 Five Year Implementation Plan

The INRMP implementation table of projects with an associated implementation schedule is presented in **Appendix D**. The projects in **Appendix D** are meant to enhance natural resources on FHL while supporting other installation plans and activities. Achieving these recommendations will require development to be conducted in a sustainable and thoughtful manner (e.g., following master plans) and require cooperation of the various directorates in the garrison. Future changes in mission, training activity, or technology should be analyzed to assess their impacts on natural resources. As new installation plans and DA guidance and regulations are developed, they should be integrated with the goals and management actions resulting from this INRMP. All requirements set forth in this INRMP requiring the expenditure of FHL funds are expressly subject to the availability of appropriations and requirements of the Anti-Deficiency Act (31 USC section 1341). No obligation undertaken by FHL under the terms of this INRMP will require or be interpreted to require a commitment to expend funds not obligated for a particular purpose.

7 List of Preparers

This INRMP was prepared by the Desert Research Institute (DRI) under the direction of FHL natural resources staff. The individuals who contributed to this document's preparation are listed below.

Gabrielle Boisrame, Ph.D.
Assistant Research Professor, Environmental Engineer
Ph.D. Environmental Engineering
M.S. Environmental Engineering
B.A. Applied Mathematics
Years of Experience: >9 years in environmental engineering with an emphasis on interactions between vegetation and water resources in arid ecosystems.

Dominic Gentilcore, Ph.D.
Assistant Research Professor, Botanist
Ph.D. Biological Sciences
M.S. Natural Resources & Environmental Science
B.S. Biology
Years of Experience: >15 in planning vegetation and soil management, floristic inventories, rare plant surveys and vegetation mapping.

Mark Hausner, Ph.D.
Associate Research Professor, Hydrology
Ph.D. Hydrogeology
M.S. Hydrologic Sciences
B.S. Civil and Environmental Engineering
Years of Experience: >21 years in environmental consulting and research, covering both the private and public sectors.

Tiffany Pereira, M.S.
Assistant Research Scientist, Field Biologist/Range Ecologist
M.S. Biological Sciences, Ecology and Evolutionary Biology
B.A. Environmental Studies
Years of Experience: >10 years specializing in natural resource management, including vegetation, wildlife, protected and sensitive species, exotic species and springs and seeps.

Brad Sion, Ph.D.
Assistant Research Professor, Geomorphology
Ph.D. Hydrology
M.S. Hydrology
B.S. Geology
Years of Experience: >10 years of interdisciplinary geoscience research experience in geomorphology, soil science, hydrology, and geochemistry.

Additional technical support was provided by DRI Seasonal Botanical and Biological Technicians: Nicholas Filannino, Michele Beadle, Tsvetelina Stefanova, Carrie Clark, Joellyn Moine, and Jacob Wozny.

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Appendix A: Acronyms and Abbreviations

°C	Degrees Celsius
°F	Degrees Fahrenheit
ACAT	Army Climate Assessment Tool
ACRH	Army Climate Resilience Handbook
ANG	Air National Guard
AR	Army Regulation
ARMI	Amphibian Research and Monitoring Initiative
BGEPA	Bald and Golden Eagle Protection Act
BMPs	Best Management Practices
CA MIL	California Management of Fish and Wildlife on Military Lands
Cal-IPC	California Invasive Plant Council
CBC	California Biodiversity Council
CDFA	California Department of Food and Agriculture
CDFW	California Department of Fish and Wildlife
CDWR	California Department of Water Resources
CEQ	Council on Environmental Quality
CESA	California Endangered Species Act
CESU	Cooperative Ecosystem Studies Unit
CFR	Code of Federal Regulations
CNDDB	California Natural Diversity Database
CNPS	California Native Plant Society
CPI	Conservation Policy Initiative
CRLF	California Red-legged Frog
CTS	California Tiger Salamander
CWA	Clean Water Act
DA	Department of Army
DERP	Defense Environmental Restoration Program
DES	Directorate of Emergency Services
DoD	Department of Defense
DPTMS	Directorate of Plants, Training, Mobilization and Security
DPW	Directorate of Public Works
EA	Environmental Assessment
EIS	Environmental Impact Statement
EMS	Environmental Management System
EO	Executive Order
EPA	U.S. Environmental Protection Agency
EQCC	Environmental Quality Control Committee
ESA	Endangered Species Act
ESMC	Endangered Species Management Component
ESMP	Endangered Species Management Plan
ESU	Evolutionarily Significant Unit
EU	Ecological Unit
FEMA	Federal Emergency Management Agency
FHL	United States Army Garrison Fort Hunter Liggett
GIS	Geographic Information System
GPS	Global Positioning System
ICRMP	Integrated Cultural Resources Management Plan
IGP	Industrial General Permit
ILO	Installation Legal Office
INRMP	Integrated Natural Resources Management Plan
IPM	Integrated Pest Management
IPMP	Integrated Pest Management Plan

ITAM	Integrated Training Area Management
IWFMP	Integrated Wildland Fire Management Plan
Legacy	Legacy Resource Management Program
LHA	Lifetime Health Advisory
LUCs	Land Use Controls
JAG	Judge Advocate General
LRAM	Land Rehabilitation and Maintenance
MAPS	Monitoring Avian Productivity and Survivorship
MBTA	Migratory Bird Treaty Act
MOU	Memorandum of Understanding
Navy	U.S. Navy
NCA	National Climate Assessment
NEPA	National Environmental Policy Act
NMFS	National Marine Fisheries Service
NRCS	Natural Resources Conservation Service
PAO	Public Affairs Office
PBO	Programmatic Biological Opinion
PFAS	Per- and Polyfluoroalkyl Substances
PFOA	Perfluorooctanoic Acid
PFOS	Perfluorooctane Sulfonate
PIF	Partners in Flight
PLSs	Planning Level Surveys
PWE	DPW Environmental Division
PRFTA	Parks Reserve Forces Training Area
RMEF	Rocky Mountain Elk Foundation
ROTC	Reserve Officers Training Corps
RTLA	Range and Training Land Assessment
SAIA	Sikes Act Improvement Act
SAR	Species at Risk
SERDP	Strategic Environmental Research and Development Program
SESCC	Soil Erosion and Sediment Control Component
SJKF	San Joaquin Kit Fox
SOD	Sudden Oak Death
SPCCP	Spill Prevention, Control, and Countermeasure Plan
SRA	Sustainable Range Awareness
SRP	Sustainable Range Program
SWAP	California State Wildlife Action Plan
SWPPP	Storm Water Pollution Prevention Plan
TAs	Training Areas
T&E	Threatened and Endangered
TNC	The Nature Conservancy
TRI	Training Requirements Integration
TTB	Tactical Training Base
USACE	U.S. Army Corps of Engineers
USAF	U.S. Air Force
USDA	U.S. Department of Food and Agriculture
USAR	The U. S. Army Reserve
USARC	U.S. Army Reserve Command
USC	United States Code
USCG	U.S. Coast Guard
USDA-WS	U.S. Department of Agriculture – Wildlife Services
USFWS	U.S. Fish and Wildlife Service
USMC	U.S. Marine Corps
WFMAP	Wildland Fire Mapping Application
WUI	Wildland-Urban Interface

Appendix B: Summary of INRMP Changes

The following table summarizes new information and updates recommendations provided in this INRMP. New information and updates include document organization, land use changes, and recommended actions for program elements as necessary and appropriate.

Category or Program Element	Section	2022 INRMP Update
Amphibian Disease and Snake Fungal Disease	5.9.3 & 5.9.4	Consider federal or university research opportunities for these efforts.
California red-legged frog	5.7.1.3	Consider research potential for translocation and reintroduction efforts in consultation with USFWS.
California Spotted Owl	5.7.2.4	Determine the extent of habitat on FHL of California Spotted owl through roosting and habitat mapping.
Climate Change	5.3	Updated recommendations based on Army Directive 2020-08 U.S. Army Installation Policy to Address Threats Caused by Changing Climate and Extreme Weather and DoD Directive 4715.21: Climate Change Adaptation and Resilience (updated 2018). Suggestion to complete a Climate Change Vulnerability Assessment and a create a dedicated FHL Climate Change Resilience Adaptation Component.
Crotch's Bumble Bee and Western Bumble Bee	5.7.5.4 & 5.7.2.6	Conduct searches in appropriate habitat during peak flight season and provide information to CDFW to contribute to 12-month finding results.
Data Management	5.2	Coordinate and provide species information for inclusion in the California Natural Diversity Database (CNDDB) when appropriate.
Ecosystem Management	5.1	Updated management strategies to reflect the DoD ecosystem management approach.
FHL Bat Species	5.7.5.1	Identify artificial roost sites and document in a GIS data layer so that protection or mitigation actions may be applied as needed and determined through the FHL environmental review process. Include bat species, ecological importance, and safety precautions as part of environmental awareness training.
Foothill yellow-legged frog	5.7.2.1	Await the finalization of the proposed USFWS ruling of the South Coast DPS as Endangered to determine further management actions necessary for ESA compliance, such as the completion of an ESMC. Coordinate management activities with BMP provided by USFWS and CDFW. Consider recommended VES protocol by conducting one or two surveys for adult frogs followed by a tadpole survey, then a second survey for juveniles/subadults. Consider measures to avoid incidental take that are developed on a site- and project-specific basis.
Game Management	5.8.2 & 5.8.6	Develop and implement an elk component for the FHL Remove derelict concertina wire, capping derelict wells, and other wildlife hazards. Require Range Operations staff to haze wildlife from firing ranges prior to firing.

Category or Program Element	Section	2022 INRMP Update
Groundwater Resources	5.5.1	Monitor and clean up groundwater contamination as described in the Installation Action Plan. Ensure annual updates of the IAP, including determining whether further groundwater contamination remediation is needed. Do not perform any activities at the closed landfill that are incompatible with its designation as “non-irrigated open space”.
Implementation	6	Substantial changes to INRMP 5-year project implementation table to add additional projects and consolidate redundant items to accommodate an ecosystems management approach.
Invasive mussels	5.9.2	Establish a formal Invasive Mussel Prevention Program Plan which includes enforcement and environmental education of the following: Inspect - Boats should be thoroughly inspected for zebra mussels when moving from water body to water body. A thorough inspection includes careful observation of a boat’s hull, drive unit, trim plates, trolling plates, prop guards, transducers, centerboards, rollers, axles, anchor, anchor rope, and trailer. Any trash or weeds must be removed, and any inspected mussels must be scraped off regardless of size. Drain – While on land, drain water from motor, livewell, bilge and transom wells, and any other water from boat and equipment before leaving water body. Dump – Leftover bait should be disposed of on land, away from water. Leftover live aquatic bait that has contacted infested waters should not be taken to uninfested waters. Rinse – Using a hard spray from a garden hose or pressurized hose to thoroughly rinse boat hull, drive unit, livewells and livewell pumping system, bilge, trailer, bail buckets, engine cooling system, and other boat parts. Dry – Boats, motors, and trailers should be allowed to dry thoroughly in the sun for at least 5 days before boating again.
Invasive Plants	5.9.1	Update invasive species management to track emerging problematic species that are of increasing concern on FHL.
Monarch Butterfly	5.7.2.5	Conduct visual encounter surveys and habitat surveys for monarch butterfly to determine distribution of butterflies and their habitat, record and report sightings of both monarch butterflies and milkweed into the installation GIS database and the Western Monarch Milkweed Mapper. Conduct dedicated target survey to record the distribution and density of milkweed at FHL. Conduct monarch butterfly breeding habitat modeling and mapping based on milkweed presence to assess the threat of training impacts could be conducted in the future if funding is available.
Purple amole	5.7.1.9	Conduct pre- and post-training activity surveys to ensure sensitive areas are marked for avoidance and to address disturbances promptly. Investigate effects of low-impact training activities that may have the potential to enhance and improve purple amole habitat. Conduct comprehensive purple amole surveys during October of each year to document other disturbances and if warranted, consider conservation actions. Coordinate purple amole monitoring so it is comparable across the species range. Delineate purple amole management units based on location and land use. Collect seed and deposit accessions into the permanent conservation seedbank. Consider experimental research projects, such as prescribed fire to benefit purple amole.
Rare Plant Species (CNPS)	5.7.6	Consider a rare-plant monitoring program that coordinates with external stakeholders and volunteers to alleviate staffing time constraints.

Category or Program Element	Section	2022 INRMP Update
Restoration and Rehabilitation	5.6.4	Implement actions as described in the FHL Soil Erosion and Sediment Control Component in coordination with ITAM.
Rock Outcrops	5.6.2	Ensure INCRMP compliance for culturally significant rock outcrop features, such as rock art sites, and include rock outcrops in cultural/environmental awareness training for military and civilian staff.
Soils, Erosion and Sedimentation	5.4	Implement BMPs suggested in the FHL Soil Erosion and Sedimentation Control Component.
Soils, Erosion and Sedimentation	5.4	When possible, collect native seeds from healthy plant populations in FHL for use in future restoration projects.
Soils, Erosion and Sedimentation	5.4	Maintain a georeferenced database of soil erosion restoration sites. This database should include information regarding the extent to which the site exhibited adverse soil conditions, BMPs employed, and the outcome of the employed BMP. This database will provide valuable historical and geospatial information that ITAM can use to evaluate the efficacy of prior BMPs.
Southwestern pond turtle	5.7.2.2	Develop surveys and studies to obtain population information, such as density, demographics, and habitat components using approved protocol such as the USGS visual survey protocol and trapping protocol (USGS 2006a, 2006b). Protect nest sites from human disturbance, locations of hatchlings or juvenile turtles may provide general location of breeding grounds. Coordinate efforts with those presented in the USFWS Western Pond Turtle Range-wide Management Strategy (USFWS 2020) such as: Determining the effects of invasive species and invasive species removal on western pond turtle populations. Determining what habitat features or population characteristics contribute to maintaining western pond turtle populations in the presence of introduced aquatic predators. Implementing a survey/capture program for non-native turtles (e.g., red-eared sliders).
Surface Water and Pollution Prevention	5.5.2	Verify that the storm water retention settling basin at the 63rd RD maintenance complex is kept free of sediment and debris and determine whether it will be large enough to handle larger rainstorms that are predicted due to climate change.
Vegetation Management	5.6	Maintain and periodically update GIS vegetation data layers if major land use changes arise. Within these, identify locations most frequently used for military training, (such as tactical assembly areas) annual burn sites, and endangered species habitats. Update or develop BMP list for native vegetation management based on revised classifications. Identify management and monitoring requirements in the management units, such as exotic species control, propagating and replanting oaks, and assessing effects of frequent fire.
Vernal Pool Shrimp	5.7.1.7	Identify restoration opportunities to mitigate for loss of vernal pools due to natural succession. Revise and update ESMC in coordination with USFWS.
Western Ridged Mussel	5.7.2.7	Conduct surveys to determine distribution and stability of breeding population on FHL.

Category or Program Element	Section	2022 INRMP Update
Western Spadefoot	5.7.2.3	Consider additional recommended BMPs developed by the Partners in Amphibian and Reptile Conservation network. Identify and protect Western spadefoot breeding habitat/pools. Review aerial photography and installation GIS data to identify potentially suitable vernal pools and other ephemeral water sources. Post as necessary with official signage along roads and other human travel corridors to inform personnel about the actual or potential presence of spadefoot toads, particularly at road pools or ruts. If possible, direct traffic around these pools. Explicitly prohibit collection of Western Spadefoots on military sites. Establish long-term monitoring stations at known breeding pools to allow for the collection of two datasets: the establishment of a baseline (abundance, success of breeding attempts, breeding phenology) of Western Spadefoot at known locations; and the ability to compare data of the population over time. Conduct upland habitat use and natal pool dispersal studies. Protect and maintain upland aestivation habitat and connectivity between breeding locations. Avoid the use of all vehicles in breeding pool habitats used by Western Spadefoots. Avoid ditching and draining of ephemeral water sources. Control or Remove Invasive and Non-native Species. Vernal pools are known and well documented on military bases in California where Western Spadefoots are known or may potentially be present. These areas could be expanded, or new vernal pools could be established, using mechanical equipment that allows for altering the physical structure of the habitat and/or with chemical removal/reduction of non-natives/invasive plant species in areas where vernal pools were previously documented.
Wetlands and Vernal Pools	5.5.3	Consider developing and implementing an annual wetland monitoring program for specific wetlands of interest or high use areas on the installation.
Wetlands and Vernal Pools	5.5.3	Suggest monitoring impacts on wetlands from training activities by conducting site visits after major training exercises and/or at the end of the summer training sessions
Wildland Fire	5.6.5	Expand WUI considerations and collaboration with external stakeholders.
Wildland Fire	5.6.5	FHL could study the potential impacts of controlled burning on the elk population. Specifically, if the frequency and amount of burning causes elk to leave FHL in search of more food. If this is the case, then rotational burning might be more beneficial to elk.
Wildlife Collisions	5.8.7	Create a wildlife strike monitoring program to track wildlife strike incidents across FHL. Create a geodatabase to specifically track wildlife strike occurrences to identify trends. Sharing vehicle collision data with the "CA Roadkill Observation System" (https://roadecology.ucdavis.edu/research/projects/california-roadkill-observation-system-cros) to support regional planning for roadkill mitigation projects to the recommendations. Promote awareness and outreach related to wildlife incidents and prevention. Educate Range Operations staff about wildlife strikes and mitigation measures (e.g., hazing) for roadways and airfields.

Appendix C: List of Relevant Environmental Laws, Regulations, Policies and Guidelines

Federal Laws, Regulations, and Executive Orders

American Indian Religious Freedom Act of 1978 (42 U.S.C. 1996)

Anadromous Fish Conservation Act (16 U.S.C. 757)

Animal Damage Control Act (7 U.S.C. 426 et seq.)

Anti-Deficiency Act (31 U.S.C. 1341 et seq.)

Antiquities Act of 1906 (16 U.S.C. 431 et seq.)

Archaeological Resource Protection Act Regulations (18 CFR 1312)

Archeological and Historical Preservation Act of 1974 (16 U.S.C. 469 et seq.)

Archeological Resources Protection Act of 1979 (16 U.S.C. 470 et seq.)

Bald and Golden Eagle Protection Act (16 U.S.C. 668 et seq.)

Base Closure and Realignment Act (Part A of title XXIX of Public Law 101-510; 10 U.S.C. 2687)

Clean Air Act, as amended (42 U.S.C. 7401 et seq.)

Clean Water Act (33 U.S.C. 1251 et seq.)

Climate-Related Financial Risk (Executive Order 14030)

Coastal Barrier Resources (16 CFR 3501)

Coastal Barriers Resources Act (16 U.S.C. 1451 et seq.)

Coastal Zone Act Reauthorization Amendments (16 U.S.C. 1451 et seq.)

Coastal Zone Management Act of 1972 (16 U.S.C. 1451-1456)

Comprehensive Environmental Response, Compensation and Liability Act of 1980 (42 U.S.C. 9601 et seq.)

Conservation and Rehabilitation Program on Military and Public Lands (16 U.S.C. 670 et seq.)

Conservation and Rehabilitation Programs on Military and Public Lands (Public Law 93- 452)

Cooperative Conservation (Executive Order 13352)

Council on Environmental Quality Regulations on Implementing NEPA Procedures (40 CFR 1500-1508)

Curation of Federally Owned and Administered Archaeological Collections (36 CFR 79)

Defense Environmental Restoration Program (10 U.S.C. 2701)

Department of Defense Appropriation Act of 1991 (PL 102-393)

Determination of Eligibility for Inclusion in the National Register of Historic Places (36 CFR 63)

Dredge and Fill Nationwide Permit Program (33 CFR 330)

Endangered and Threatened Wildlife and Plants (50 CFR 17)

Endangered Species Act of 1973, as amended (16 U.S.C. 1531 et seq.)

Entering Military, Naval, or Coast Guard Property (18 U.S.C. 1382)

Environmental Effects in the United States of Department of Defense Actions (32 CFR 188)

EPA Guidelines for Resource Recovery Facilities (40 CFR 245)

EPA National Drinking Water Regulations (40 CFR 141-143)

EPA National Pollutant Discharge Elimination System Permit Regulations (40 CFR 122)

EPA Regulations Designating Areas for Air Quality Planning (40 CFR 81)

EPA Regulations for Ambient Air Monitoring Reference and Equivalent Methods (40 CFR 53)

EPA Regulations for Pesticide Programs (40 CFR 150-186)

EPA Regulations Implementing the Resource Conservation and Recovery Act (40 CFR 260-270)

EPA Regulations on Criteria and Standards for the National Pollutant Discharge Elimination System (40 CFR 125)

EPA Regulations on Discharge of Oil (40 CFR 110)

EPA Regulations on Disposal Site Determination under the CWA (40 CFR 231)

EPA Regulations on Implementation of NEPA Procedures (40 CFR 6)

EPA Regulations on Insecticide, Fungicide, and Rodenticide Use (40 CFR 162)

EPA Regulations on Land Disposal Restrictions (40 CFR 268)

EPA Regulations on National Primary and Secondary Ambient Air Quality Standards (40 CFR 50)

EPA Regulations on Regional Consistency under the Clean Air Act (40 CFR 56)

EPA Requirements for Preparation, Adoption, Submittal, Approval, and Promulgation of Implementation Plans (40 CFR 51-52)

EPA Requirements for Water Quality Planning and Management (40 CFR 130)

EPA Special Exemptions from Requirements of the Clean Air Act (40 CFR 69)

Erosion Protection Act (33 U.S.C. 426)

Establishment of the Climate Change Support Office (Executive Order 14027)

Estuary Protection Act (16 U.S.C. 1221)

Farmland Protection Act (7 U.S.C. 4201 et seq.)
Federal Compliance with Pollution Control Standards (42 U.S.C. 4321)

Federal Consistency with Approved Coastal Management Programs (15 CFR 930)

Federal Facilities Compliance Act of 1992 (42 U.S.C. 6961)

Federal Insecticide, Fungicide, and Rodenticide Act, as amended (7 U.S.C. 136 et seq.)

Federal Land Policy and Management Act (43 U.S.C. 1701)

Federal Noxious Weed Act (7 U.S.C. 2801 et seq.)

Federal Plant Pest Act (7 U.S.C. 150aa et seq.)

Federal Water Pollution Control Act (Clean Water Act) (33 U.S.C. 1251 et seq.)

Fish and Wildlife Conservation Act (16 U.S.C. 2901 et seq.)

Fish and Wildlife Coordination Act (16 U.S.C. 661 et seq.)

Fish and Wildlife Service List of Endangered and Threatened Wildlife (50 CFR 17)

Fishery Conservation and Management Act of 1976 (16 U.S.C. 1801 et seq.)

Floodplain Management (Executive Order 11988, as amended by Executive Order 12148 and 13286)

Forest Resources Conservation and Shortage Relief Act (16 U.S.C. 620 et seq.)

Historic Sites Act of 1935 (16 U.S.C. 461 et seq.)

Hunting and Fishing on Federal Lands (10 U.S.C. 2671 et seq.)

Implementation of Section 311 of the Federal Water Pollution Control Act of October 18, 1972, as amended, and the Oil Pollution Act of 1990 (Executive Order 12777, as amended by Executive Order 13286)

Interagency Cooperation Endangered Species Act of 1973(50 CFR 402)

Invasive Species (Executive Order 13112) Lacey Act (16 U.S.C. 701) and Lacey Act Amendments of 1981 (16 U.S.C. 3371– 3378)

Land and Water Conservation Act of 1965 (16 U.S.C. 4601 et seq.)

Legacy Resource Protection Program Act (PL 101–511)

Magnuson-Stevens Fishery Conservation and Management Act (16 U.S.C. 1801)

Marine Mammal Protection Act of 1972 (16 U.S.C. 1361 et seq.)

Marine Protected Areas (Executive Order 13158)

Marine Protection, Research, and Sanctuaries Act of 1972 (33 U.S.C. 1401 et seq.)

Migratory Bird Conservation Act (16 U.S.C. 715 et seq.)

Migratory Bird Treaty Act (16 U.S.C. 703–711)

Migratory Birds List (50 CFR 10.13)

Military Construction Authorization Act of 1956 – Leases; non-excess property (10 U.S.C. 2667)

Military Construction Authorization Act of 1956 – Sale of Certain Interests in Lands; Logs (10 U.S.C. 2665)

Military Construction Authorization Act of 1975 (10 U.S.C. 2665)

Military Reservation and Facilities: Hunting, Fishing and Trapping (10 U.S.C. 2671)

Multiple-Use Sustained Yield Act (16 U.S.C. 528)

National Defense Authorization Act for Fiscal Year 1999 (PL 105-261)

National Defense Authorization Act for Fiscal Year 2003 (PL 107-314)

National Defense Authorization Act for Fiscal Year 2004 (PL 108-136)

National Environmental Policy Act of 1969, as amended (42 U.S.C. 4321 et seq.)

National Heritage Policy Act of 1979 (16 U.S.C. 470)

National Historic Landmarks Program (36 CFR 65)

National Historic Preservation Act of 1966 (16 U.S.C. 470 et seq.)

National Historic Preservation Act Regulations for the Protection of Historic Properties (36CFR 800)

National Oceanic and Atmospheric Administration Coastal Zone Management Program Development and Approval Regulation (15 CFR 923)

National Register of Historic Places (36 CFR 60)

National Register of Historic Places, current edition (36 CFR 60 78, 79, 800, and 1228) National Trails System Act of 1968 (16 U.S.C. 1271)

Native American Graves Protection and Repatriation Act of 1990 (25 U.S.C. 3001- 3013)

Natural Resources Management Program (32 CFR 190)

Neotropical Migratory Bird Conservation Act (16 U.S.C. 6101 et seq.)

Nonindigenous Aquatic Nuisance Prevention and Control Act as amended (16 U.S.C. 4701et seq.)

North American Wetlands Conservation Act (16 U.S.C. 4401 et seq.)

Noxious Plant Control Act (43 U.S.C. 1241). Ocean Dumping Regulations and Criteria (40 CFR 220, 227)

Off-Road Vehicles Use on Public Lands (Executive Order 11989)

Oil Pollution Control Act of 1990 (33 U.S.C. 2701 et seq.)

Outdoor Recreation – Federal/State Program Act (16 U.S.C. 4601 et seq.)

Outer Continental Shelf Air Regulations (40 CFR 55) Partners for Fish and Wildlife Act (16 U.S.C.3771 et seq.)

Plant Quarantine Act (7 U.S.C. 151-167)

Pollution Prevention Act (42 U.S.C. 13101 et seq.)

Greening the Government Through Leadership in Environmental Management (Executive Order 13148)

Protecting Public Health and the Environment and Restoring Science to Tackle the Climate Crisis (Executive Order 13990)

Protection and Enhancement of Environmental Quality (Executive Order 11514, as amended by Executive Order 11541 and 11991)

Protection and Enhancement of the Cultural Environment (Executive Order 11593)

Protection of Wetlands (Executive Order 11990, amended by Executive Order 12608)

Rebuilding and Enhancing Programs to Resettle Refugees and Planning for the Impact of Climate Change on Migration (Executive Order 14013)

Recreational Fisheries (Executive Order 12962, as amended by Executive Order 13474)

Regulations Concerning Marine Mammals (50 CFR 10)

Regulations Concerning Marine Mammals (50 CFR 18, 216, 228)

Resource Conservation and Recovery Act (42 U.S.C. 6901 et seq.)

Responsibilities of Federal Agencies to Protect Migratory Birds (Executive Order 13186)

Rivers and Harbors Act of 1889 (33 U.S.C. 403et seq.)

Safe Drinking Water Act (42 U.S.C. 300(f) et seq.)

Sales of Forest Products on Federal Lands (10 U.S.C. 2665 et seq.)

Salmon and Steelhead Conservation and Enhancement Act (16 U.S.C. 3301-3345)

Sikes Act Improvement Act of 1997 (16 U.S.C. 670a et seq.)

Soil and Water Conservation Act (16 U.S.C. 2001 et seq.)

Soil Conservation (16 U.S.C. 5901)

Strengthening Federal Environmental, Energy, and Transportation Management (Executive Order 13423)

Tackling the Climate Crisis at Home and Abroad (Executive Order 14008)

Water Pollution Prevention and Control (33 U.S.C. 1251 et seq.)

Wetland Resources (16 U.S.C. 3901)

Wild and Scenic River Act (16 U.S.C. 1274) Youth Conservation Corps Act of 1972 (16 U.S.C. 1701)

Federal Guidelines

Cooperative Agreement between the Department of Defense and The Nature Conservancy for Assistance in Natural Resources Inventory

Memorandum of Agreement for Federal Neotropica Migratory Bird Conservation Program and Addendum (Partners in Flight-Aves De Las Americas) among the Department of Defense, through Each of the Military Services, and Over 110 Other Federal and State Agencies and Nongovernmental Organizations

Memorandum of Agreement for Professional and Technical Assistance Conducting Biological Surveys, Research and Related Activities between the Department of Defense and the National Biological Service of the Department of the Interior

Memorandum of Understanding between Department of Defense, U.S. Fish and Wildlife Service, and the International Association of Fish and Wildlife Agencies for a Cooperative Integrated Natural Resources Management Program on Military Installations

Memorandum of Understanding between the Environmental Protection Agency and the Department of Defense with Respect to Integrated Pest Management

Memorandum of Understanding for Watchable Wildlife Programs

USACE 1987 Wetland Delineation Manual

Department of Defense Policy, Regulations and Guidance

32 CFR 651 Environmental Analysis of Army

AR 200–1, Environmental Protection and Enhancement

AR 200-4, Cultural Resources Management

AR 210–9, Use of Off-Road Vehicles on Army Lands

AR 210-20, Master Planning

AR 350–19, The Army Sustainable Range Program

AR 405–80, Granting Use of Real Estate Army Forestry Program Authority, 10 United States Code 2665

AR 420-1, Facilities Engineering Fire and Emergency Services

Army Installation Wildland Fire Program Implementation Guidance. 2021.

Army Directive 2020-08 U.S. Army Installation Policy to Address Threats Caused by Changing Climate and Extreme Weather

Army Goals and Implementing Guidance for Natural Resources Planning Level Survey and Integrated Natural Resources Management Plan Army Guidance for the Implementation of the Sikes Act Improvement Act

Army Policy and Guidance on Critical Habitat Designations

Army Policy Guidance for Fish & Wildlife Conservation Fund

Army Policy Guidance for Management and Control of Invasive Species

Army Policy Guidance on Migratory Bird Treaty Act

Department of Army Memorandum, Sustainable Design and Development Policy Update – SpiRiT to LEED Transition

Department of Army Pam 420–7, Natural Resources – Land, Forest, and Wildlife Management

Department of Army, Army Forest Inventory Guidance

Deputy Under Secretary of Defense Memorandum, Integrated Natural Resource Management Plan Template

DoD Directive 3200.15, Sustainment of Ranges and Operating Areas

DoD Directive 4001.1, Installation Management

DoD Directive 4140.1, Material Management Policy

DoD Directive 4150.7, DoD Pest Management Program

DoD Directive 4165.57, Air Installations Compatible Use Zones

DoD Directive 4165.59, DoD Implementation of the Coastal Zone Management Act

DoD Directive 4165.61, Intergovernmental Coordination of DoD Federal Development Programs and Activities

DoD Directive 4700.2, Secretary of Defense Award for Natural Resources and Environmental Management

DoD Directive 4700.4, Natural Resources Management Program

DoD Directive 4705.1, Management of Land- Based Water Resources in Support of Joint Contingency Operations

DoD Directive 4710.1, Archaeological and Historic Resources Management DoD Directive 4715.1, Environmental Security

DoD Directive 4715.03, Natural Resources Conservation Program

DoD Instruction 4715.03, Natural Resources Conservation Program

DoD Manual 4715.03, Integrated Natural Resources Management Plan (INRMP) Implementation Manual

DoD Directive 4715.4, Pollution Prevention

DoD Directive 4715.6, Environmental Compliance

DoD Directive 4715.7, Environmental Restoration Program

DoD Directive 4715.9, Environmental Planning and Analysis

DoD Directive 4715.21: Climate Change Adaptation and Resilience (updated 2018)

DoD Directive 4751.DD-R, Draft Integrated Natural Resources Management in the Department of Defense

DoD Directive 5030.41, Oil and Hazardous Substance Pollution Prevention and Contingency Program

DoD Instruction 5525.17 Conservation Law Enforcement Program (CLEP)

DoD Directive 6050.1, Environmental Effects in the U.S. of DoD Actions

DoD Directive 6050.15, Prevention of Oil Pollution from Ships Owned or Operated by the Department of Defense

DoD Directive 6050.2 (as amended), Use of Off-Road Vehicles on DoD Lands

DoD Directive 6050.4, Marine Sanitation Devices for Vessels Owned or Operated by DoD

DoD Directive 6050.5, DoD Hazard Communication Program

DoD INRMP Handbook, Resources for INRMP Implementation

DoD Instruction 5000.13, Natural Resources – The Secretary of Defense Natural Resource Conservation Award

DoD Directive 5124.02, Under Secretary of Defense for Personnel and Readiness (USD [P&R]). June 23, 2008.

DoD Instruction 6055.6, DoD Fire and Emergency Services Program

DoD Memorandum on Implementation of Ecosystem Management in DoD

DoD Urban Forestry Manual Emergency Consultations under the Endangered Species Act

DoD Integrated Natural Resources Management Plan (INRMP) Implementation Manual

FHL, Firewood Cutting on Fort Hunter Liggett. 18 June 2010.

FHL Regulation 200-2, Environmental Analysis, Protection and Enhancement

FHL 350-2, Training at Fort Hunter Liggett.

FHL Regulation. 420-26, Game Law Enforcement

Supplemental Army Policy Guidance on Migratory Bird Treaty Act

Applicable State and Local Regulation

Aquatic Invasive Species (Fish & Game Code 2300-2302)

Ballast Management for Control of Nonindigenous Species Act of 1999 (California Public Resources Code 71200-71271)

Birds (Fish & Game Code 3500-3864)

California Coastal Act (Public Resources Code 30000-30900)

California Endangered Species Act (Fish & Game Code 2050 et seq.)

California Environmental Quality Act (Public Resources Code 21000-21177)

California Habitat Enhancement Act (Fish & Game Code 2600-2602)

California Harbors and Navigation Code (Division 1.5 Sections 90-153, Division 2 Sections 240-308, Division 3 Sections 650- 685, and Division 6 Sections 1690-3980)

California Ocean Protection Act (Public Resources Code 35500-35650)

California Conservation Program (Fish & Game Code 1385-1391)

California Senate Bill 856 Wild pigs: validations

California Assembly Bill 711: Hunting: nonlead ammunition.

California Waterfowl Habitat Program (Fish & Game Code 3460-3467)

California Watershed Protection and Restoration Act (Public Resources Code 5808-5808.2)

California Wetlands Preservation (Public Resources Code 5810-5818.2)

California Wildlife Protection Act (Fish & Game Code 2780-2799.6)

California Wildlife, Coastal, and Park Land Conservation Act (Public Resources Code 5900 et seq.)

Coastal Ecosystems Protection Act of 2006 (California Public Resources Code 71205.3)

Cobey-Alquist Flood Management Act (Water Code 8400-8415)

Conservation and Management of Marine Living Resources (Fish & Game Code 7050-7090)

Conservation of Aquatic Resources (Fish & Game Code 1700)

Conservation of Wildlife Resources (Fish & Game Code 1801-1802)

Conservation, Development, and Utilization of State Water Resources (Water Code 10004- 10013)

Consolidated Appropriations Act of 2005 (Public Law 108-447)

Fish (Fish & Game Code 6400-6930)

Fish and Wildlife Habitat Enhancement Act of 1984 (Fish & Game Code 2600-2651)

Fish and Wildlife Protection and Conservation (Fish & Game Code 1600-1616)

Inland Wetlands Conservation Program (Fish & Game Code 1400-1431)

Mammals (Fish & Game Code 4150-4904)

Management of Fish and Wildlife on Military Lands (Fish & Game Code 3450-3453)

Marine Invasive Species Act of 2003 (California Public Resources Code 71200)

Marine Life Protection Act (Fish & Game Code 2850-2863)

Native Plant Protection (Fish & Game Code 1900-1913)

Native Species Conservation and Enhancement (Fish & Game Code 1750-1772)

Natural Community Conservation Planning Act (Fish & Game Code 2800-2835)

Ocean Use Planning (Public Resources Code 30960)
Pesticides and Pest Control Operations (Food and Agriculture Code 6000 et seq.)

Porter-Cologne Water Quality Control Act (Water Code 13000 et seq.)

Refuges (Fish & Game Code 10500-10932)

Reptiles and Amphibians (Fish & Game Code 5000-5050)

Stream Alteration Controls (Water Code 5653, 1601 et seq.)

The Safe Drinking Water, Water Quality and Supply, Flood Control, River and Coastal

Protection Bond Act of 2006(Public Resources Code 75001-75130)

Urban Forestry (Public Resources Code 4799.06-4799.12)

Watershed, Clean Beaches, and Water Quality Act (Public Resources Code 30901-30960)

Wetlands Mitigation Banking (Fish & Game Code 1850-1852)

Wildlife and Natural Areas Conservation Program (Fish & Game Code 2700-2729)

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Appendix D: Five Year Implementation Plan

Table D-1: Fort Hunter Liggett INRMP Projects and Implementation Table. This table contains natural resources projects proposed for FHL, and includes a natural resources management subject area, a corresponding law or regulation, project driver, and proposed execution for implementing each recommendation. All requirements set forth in this INRMP requiring the expenditure of FHL funds are expressly subject to the availability of appropriations and requirements of the Anti-Deficiency Act (31 USC section 1341). No obligation undertaken by FHL under the terms of this INRMP will require or be interpreted to require a commitment to expend funds not obligated for a particular purpose.

INRMP Objective(s) or Program Element	Driver (Law/Reg/Agreement)	Proposed Project Title and Description	Prioritization Category, 1–3 (1=highest)	Execution Timeframe	Effectiveness Indicator	Monitoring Frequency
Coordinate Environmental Planning	SAIA, ESA, California Endangered Species Act (CESA), CA Mgmt. of Fish and Wildlife on Military Lands (CA MIL), DoD Instruction 4715.03	**Intra-agency Coordination** Coordinate with DPTMS twice per year, in approximately October and February, to identify status of natural resources concerns related to planned training activities. Coordinate with DPW at weekly staff meetings to identify infrastructure and operations projects that may affect natural resources. Maintain up-to-date environmental coordination map to communicate sensitive resources and land-use-controls to DPW, DPTMS, and other directorates and tenant agencies.	1	Continuous	Natural resources staff included in pre-project planning meetings.	Year-round
Coordinate with Regulatory Agencies	SAIA, ESA, CESA, CA MIL, DoD Instruction 4715.03	**Inter-agency Coordination** Prepare a Natural Resources Management annual report, to include, at minimum, management of ESA/DoD SAR, and migratory birds. Deliver reports to CDFW and USFWS and solicit agency feedback.	1	Continuous	Delivery of annual natural resources report(s) and responsiveness to agency feedback.	Year-round
Employ Conservation Law Enforcement Officers	SAIA, ESA, CESA, CA MIL, DoD Instruction 4715.03, DoD Directive 5124.02	**Conservation Law Enforcement** Develop a high compliance rate of FHL users with applicable natural and cultural resource related laws and regulations. Coordinate law enforcement effort for natural and cultural resource program needs among Law Enforcement and PWE staff. Support Conservation Law Enforcement Officers or a full-time warden to address the hunting and fishing program (DES).	1	Continuous	Trained officers on staff and projects/tasks implemented.	Year-round
Enhance Environmental Awareness	SAIA, DoD Instruction 4715.03, AR 200-1	**Natural Resources Education** Establish a training program for military, civilian, and contract personnel who may have contact with sensitive resources. Education program will cover, at minimum, environmental review requirements and procedures, endangered species protection measures, and erosion and sedimentation BMPs, and wetland protection requirements. Provide environmental briefings to unit leaders prior to large training exercises.	2	2022–2026 Initiate then Continue	Staff are trained on resource protection measures and outreach.	Year-round
Enhance Environmental Awareness Foster Community Relationships	SAIA, DoD Instruction 4715.03, AR 200-1	**Natural Resources Education** Investigate and implement methods to improve communication with FHL users and the public that promotes environmental awareness (e.g., maintaining an informative website, creating pamphlets and standard operating procedures, developing informational posters). Periodically review and update educational materials to ensure that each is still current.	2	2022–2026 Initiate then Continue	Volunteer opportunities and outreach events held that are open to public.	Year-round
Foster Community Relationships	SAIA, DoD Instruction 4715.03, AR 200-1	**Community Engagement** Develop volunteer activities for outside community groups such as schools, scout troops, or local naturalist societies. Examples include bird walks, creating bat-nesting boxes, or planting pollinator gardens. External stakeholders can also be used to supplement surveying efforts to relieve PWE staff.	3	2022–2026 Initiate then Continue	Volunteer opportunities and outreach events held that are open to public.	As needed
Review Impacts of Actions on Natural Resources	NEPA, SAIA, DOD Instruction 4715.03, AR 200-1, 32 CFR 651	**Environmental Review and Mitigation Actions** Conduct environmental review (NEPA reviews) to identify actions that may result in adverse effects on sensitive resources or that require a compliance action, such as consulting with, obtaining a permit from, or notifying a regulatory agency. Coordinate with proponent to implement mitigation as needed: typical mitigation includes minor modifications of the location, timing, or extent of the action to avoid sensitive resources.	1	Continuous	Number of projects reviewed before suspense date.	Year-round

INRMP Objective(s) or Program Element	Driver (Law/Reg/Agreement)	Proposed Project Title and Description	Prioritization Category, 1–3 (1=highest)	Execution Timeframe	Effectiveness Indicator	Monitoring Frequency
Review Impacts of Actions on Natural Resources Conduct Ecosystem Management	SAIA, DoD Instruction 4715.03, AR 200-1	**Impacts Monitoring** Survey habitats during and/or after projects or training activities occur to ensure activity scope and impacts do not exceed those covered under environmental review. Develop management actions based on survey.	1	Continuous	Surveys conducted and impacts do not exceed those covered under environmental review.	Ongoing basisYear-round
Promote Professional Data Collection and Management	SAIA, DoD Instruction 4715.03, AR 200-1	**Natural Resources Data Library** Develop and maintain a library in accordance with Army data standards to store and catalog natural resources surveys, reports, consultations, communications, permits and other relevant documents. Electronic library should be regularly backed up.	2	Continuous	Percent of relevant documents catalogued.	Ongoing basisYear-round
Promote Professional Data Collection and Management	SAIA, DoD Instruction 4715.03, AR 200-1	**Natural Resources GIS Database Updates and Maintenance** Maintain the geodatabase for use by PWE staff that includes wetlands, special status species, soils, wildfire and prescribed burn areas, and significant natural resources. Develop a standardized system for recording and mapping significant resource observations (e.g., plants, wildlife, erosion, damage) when incidentally encountered. Develop a standardized system to integrate survey results and incidental observations into GIS database. Ensure language used in cooperative agreements and contracts specifies GIS data format that is compatible with installation GIS database.	2	Continuous	GIS layers developed and/or incorporated into geodatabase and layers updated with current data.	Ongoing basisYear-round
Consider Impacts of Climate Change on Resource Management Planning and decisions.	SAIA, DoD Instruction 4715.03, AR 200-1, Army Directive 2020-08, DoD Directive 4715.21	**Climate Change Adaptation and Resilience.** Assess, plan for, and adapt to the projected impacts of changing climate and extreme weather by adding the results of climate change prediction analysis tools into all facility and infrastructure related plans, policies, and procedures. Ex: Ensure that FHL component plans account for potential climate change variability and plan for potential increase in natural resources management costs due to expansion of invasive species and new listed and at-risk species.	2	2022–2026 Initiate then Continue	FHL component plans and installations account for potential climate change variability.	Ongoing basisYear-round as needed, as needed
Consider Impacts of Climate Change on Resource Management Planning and Decisions.	SAIA, DoD Instruction 4715.03, AR 200-1, Army Directive 2020-08, DoD Directive 4715.21	**Climate Change Vulnerability Assessment** Complete installation level Climate Change Vulnerability Assessment Utilize the four-step Army Climate Resilience Handbook. Compile information using the Army Climate Assessment Tool. Consider creating a Climate Change Adaptations Component Plant incorporating results of the Climate Change Vulnerability Assessment using the framework of the Climate Adaptation for DoD Natural Resource Managers.	3	2022–2026 Single Action	Climate Change Vulnerability Assessment completed.	TBD
Conduct Habitat Restoration and Rehabilitation. Prevent and Control Erosion	SAIA, DoD Instruction 4715.03, AR 200-1	**Post-Action Erosion Monitoring** Monitor construction projects and training sites as part of the post-action monitoring phase of the environmental review process to detect changes caused by military activities: mission creep, off-road maneuvers, and photo-monitoring analysis. ITAM will continue to monitor training-related land erosion or potential erosion sites.	1	Continuous	100% of construction projects and training sites are monitored.	Year-round, as needed
Conduct Habitat Restoration and Rehabilitation. Prevent and Control Erosion	SAIA, CWA, CA Wetlands Preservation, DoD Instruction 4715.03, AR 200-1	**Monitor Soil Conditions in Heavily Trafficked Areas** The FHL SESCC includes additional considerations for areas where soil compaction and/or rutting may impact training activities and vegetation habitats. Maintain a georeferenced database of soil erosion restoration sites. This database should include information regarding the extent to which the site exhibited adverse soil conditions, BMPs employed, and the outcome of the employed BMP. This database will provide valuable historical and geospatial information that ITAM can use to evaluate the efficacy of prior BMPs.	2	Continuous	Soil erosion not adversely impacting mission or resources.	Year-round
Conduct Habitat Restoration and Rehabilitation. Prevent and Control Erosion	SAIA, DoD Instruction 4715.03, AR 200-1	**Restore Erosion sites and Degraded Areas in Coordination with ITAM** Continue evaluation and prioritization of active erosion sites and degraded areas and restore those areas using native species. Develop specifications and standards for locally sourced reseeding/revegetation of disturbed sites with species contained on the approved plant list for use in contracts, maintenance, and other projects. Use GIS topographic, surface water, and soils data for conservation planning. Update data as improved data sources become available. When possible, collect native seeds from healthy plant populations in FHL for use in future restoration projects.	2	Continuous	Proportion of retired firebreaks (miles) restored. Density of invasive weeds in firebreaks before and after restoration	Seasonally as needed

INRMP Objective(s) or Program Element	Driver (Law/Reg/Agreement)	Proposed Project Title and Description	Prioritization Category, 1–3 (1=highest)	Execution Timeframe	Effectiveness Indicator	Monitoring Frequency
Conduct Habitat Restoration and Rehabilitation. Prevent and Control Erosion	SAIA, DoD Instruction 4715.03, AR 200-1	**Implement Soil Erosion and Sedimentation Control Component (SESCC) at FHL** Require that all earth-moving activities comply with the SESCC. Follow recommendations in the SESCC and update SESCC as needed.	1	Continuous	100% of projects follow SESCC recommendations. SESCC updated as needed.	Year-round as needed
Groundwater and Surface Water Pollution Prevention Protect Wetlands, Vernal Pools and Waters	SAIA, CWA, CA Wetlands Preservation, DoD Instruction 4715.03, AR 200-1	**Groundwater and Floodplains** Monitor and clean up groundwater contamination as described in the Installation Action Plan. Continue efforts to minimize the risk of new pollution sources to surface water (which can then seep into groundwater), as described in the Storm Water Pollution Prevention Plan. Monitor the HydroSphere website (https://cloud.xylem.com/hydrosphere/public-sites/OWA_1245EDE7887A4C7D888D3671A060A8E1) for potential flooding and ensure that floodplains are clear of equipment when flooding is predicted.	1	2022–2026 Initiate then Continue.	New or existing pollution sources identified, and impacts minimized.	As needed
Groundwater and Surface Water Pollution Prevention Protect Wetlands, Vernal Pools and Waters	SAIA, CWA, CA Wetlands Preservation, DoD Instruction 4715.03, AR 200-1	**Surface Water and Pollution Prevention** Continue monitoring storm runoff and performing best practices for protecting surface waters and preventing polluted runoff during storms, as well as maintaining the wastewater treatment plant, as described in the Storm Water Pollution Prevention Plan (SWPPP). Verify that the storm water retention settling basin at the 63rd RD maintenance complex is kept free of sediment and debris and determine whether it will be large enough to handle larger rainstorms that are predicted due to climate change.	1	Continuous	Storm water runoff monitored with water quality standards are met. Retention basin clear of debris.	Year-round as needed
Groundwater and Surface Water Pollution Prevention Protect Wetlands, Vernal Pools and Waters	SAIA, CWA, CA Wetlands Preservation, DoD Instruction 4715.03, AR 200-1	**Wetlands Protection and Erosion Control** Monitor water quality and remove sources of water pollution by following water quality protocols and best management practices contained within the SWPPP. Conduct surveys to determine whether activities are adversely impacting soil and water resources through erosion and sedimentation, and if the SESCC BMPs are followed. Survey vehicle stream crossings and culverts to ensure adverse impacts on surface waters are minimized. Monitor water quality around the cantonment following storm events.	1	Continuous	Water pollution sources removed, wetland surveys showing no adverse impacts and mitigation employed if needed.	Seasonally or as needed
Protect Wetlands, Vernal Pools and Waters	SAIA, CWA, CA Wetlands Preservation, DoD Instruction 4715.03, AR 200-1	**Wetland Mapping** Update and maintain wetland inventory data, including wetland distribution and classification. Conduct or contract a wetlands delineation for major land use areas on the installation. In areas in or near future development, obtain jurisdictional determination for wetlands.	2	Multi-year	Acres of wetlands identified and protected.	Ongoing Basis
Protect Wetlands, Vernal Pools and Waters	SAIA, CWA, CA Wetlands Preservation, DoD Instruction 4715.03, AR 200-1	**Wetland Protection and Monitoring Program** Continue education and enforcement of restrictions on off-road travel and pesticide use around wetlands. Implementation of ESMC recommendations, including providing environmental education materials to FHL users and restoring areas where roads have been abandoned. Disturbance monitoring and California Rapid Assessment Method surveys are conducted annually on a subset of pools as part of the vernal pool fairy shrimp surveys. Consider the development and implementation of a wetland monitoring program for major land use areas and sensitive species habitat.	1	Continuous	Standardized monitoring program developed and implemented. Acres of wetland areas restored.	Ongoing Basis
Manage Invasive Species: Plants	SAIA, EO 13112, CA MIL, DoD Instruction 4715.03, AR 200-1	**Invasive Plants Prevention** Reduce ground-disturbance-induced spread of noxious and invasive weeds by limiting off-road driving to designated maneuver areas, as enforced by DPTMS. Require weed-free fill dirt use in training area rehabilitation and infrastructure projects.	2	Continuous	Distribution (acreage) and density of invasive weeds,	Year-round
Promote Native Plants Conduct Habitat Restoration and Rehabilitation.	SAIA, EO 13112, CA MIL, DoD Instruction 4715.03, AR 200-1	**Native Plant Establishment** Maintain and distribute a list of native plants that can be used for landscaping, mitigation plantings, revegetation, and erosion control.	2	2022–2026 Single Action	100% of base-wide planting projects utilizing native plants	As needed

INRMP Objective(s) or Program Element	Driver (Law/Reg/Agreement)	Proposed Project Title and Description	Prioritization Category, 1–3 (1=highest)	Execution Timeframe	Effectiveness Indicator	Monitoring Frequency
Vegetation and Habitat Management Promote Native Plants	SAIA, EO 13112, CA MIL, DoD Instruction 4715.03, AR 200-1	**Vegetation Community Management** Maintain and periodically update GIS vegetation data layers if major land use changes arise. Within these, identify locations most frequently used for military training, and annual burn sites. Update BMP list for native vegetation management based on revised classifications. Implement vegetation management projects to enhance oak woodlands, riparian areas, and native grass vegetation communities. Vegetation management projects include exotic plant control, propagating and replanting oaks, and assessing effects of frequent fire.	2	Continuous	Number of BMPs identified.	Year-round
Protect and Enhance Sensitive and Rare Habitat Vegetation and Habitat Management Promote Native Plants Manage Special Status Species	SAIA, EO 13112, CA MIL, DoD Instruction 4715.03, AR 200-1	**Riparian Community Management** Maintain or enhance riparian community structure, functionality, and species diversity to protect water quality, federally endangered species habitat, and maintain regulatory compliance. Continue to monitor riparian health using the California Rapid Assessment Method. Restoration requirements are identified through sensitive species surveys, ER activity monitoring, or via remote sensing. Protect waterways and their associated riparian areas through land use limitations identified in FHL Regulation 350-2.	2	Continuous	Acres of habitat protected or restored.	Year-round
Protect and Enhance Sensitive and Rare Habitat Vegetation and Habitat Management Promote Native Plants Manage Special Status Species	SAIA, EO 13112, CA MIL, DoD Instruction 4715.03, AR 200-1	**Native Oak Community Management Ongoing Actions** Maintain oak woodland stands and enhance oak woodland seedling regeneration to ensure long-term conservation of oak woodlands and savannas. Implement management practices and actions from the Oak Management Plan and revise plan as needed. Collect local acorns and seeds for revegetation projects. Propagate and transplant 75-100 valley oaks annually at tactical concealment sites (ITAM) or oak mitigation sites (PWE). Monitor annually for SOD in FHL oak communities and report and record incidental observations.	3	Continuous	Acres of habitat protected or restored. Number of valley oaks propagated. Pounds of acorn seed collected.	Year-round
Protect and Enhance Sensitive and Rare Habitat Vegetation and Habitat Management Promote Native Plants Manage Special Status Species	SAIA, EO 13112, CA MIL, DoD Instruction 4715.03, AR 200-1	**Native Oak Community Management Recommended Actions** Use master planning documents to develop a map of where native oak tree mitigation plantings would best fit within the training areas and cantonment to maximize success of tree establishment and provide the best utility for people and wildlife. Establish an appropriate funding mechanism to care for oak tree mitigation plantings until they are established and self-sustaining.	3	2022–2026 Multi-year Action	Acres of habitat protected or restored. Funding mechanism identified and sustainable.	Year-round
Protect and Enhance Sensitive and Rare Habitat Vegetation and Habitat Management Promote Native Plants Manage Special Status Species	SAIA, EO 13112, CA MIL, DoD Instruction 4715.03, AR 200-1	**Native Bunch Grass Community Management** Identify and maintain stands of native bunch grasses. Promote diverse native bunch grass grasslands. Reseed areas disturbed during training activities (LRAM) or FHL projects (PWE) using a mixture of locally sourced native grass and forb seeds. Include as a contract requirement for military construction projects about the reseeding of disturbed areas at construction sites with native grasses and forbs. Collect local native bunch grass seeds for revegetation projects.	3	Continuous	Acres of habitat protected or restored. Pounds of seed collected.	Year-round
Protect and Enhance Sensitive and Rare Habitat Vegetation and Habitat Management Promote Native Plants	SAIA, EO 13112, CA MIL, DoD Instruction 4715.03, AR 200-1	**Rock Outcrop Community Management** Maintain rock outcrops as areas of special interest due to cultural resources and unique wildlife habitat. Prohibit activities that could degrade the Palisades rock formation and other rock formations. Limit rappel activities to authorized military training at appropriate sites approved by Range Control and PWE. Prohibit unauthorized destruction, removal, movement, or use of boulders and rock formations.	3	Continuous	Acres of habitat protected or restored.	Year-round

INRMP Objective(s) or Program Element	Driver (Law/Reg/Agreement)	Proposed Project Title and Description	Prioritization Category, 1–3 (1=highest)	Execution Timeframe	Effectiveness Indicator	Monitoring Frequency
Protect and Enhance Sensitive and Rare Habitat Vegetation and Habitat Management	SAIA, EO 13112, CA MIL, DoD Instruction 4715.03, AR 200-1	**Manage Designated Sensitive Resource Management Areas** Continue PWE coordination for all land-use activities within SRMAs unless otherwise specified. Monitor SRMAs individually, or as part of annual monitoring, for special status species.	1	Continuous	Acres of habitat protected or restored.	Year-round
Support Wildland Fire Program	SAIA, CA Habitat Enhancement Act, DoD Instruction 4715.03, AR 200-1	**Wildland Fire Plan Maintenance** Annually review and update the IWFMP. Implement procedures contained within, including habitat restoration, GIS data reporting, and coordinating with Fire Dept. Annual IWFMP review must be signed by the Garrison Commander.	2	Continuous	IWFMP is current and reviewed annually.	Year-round
Support Wildland Fire Program	SAIA, CA Habitat Enhancement Act, DoD Instruction 4715.03, AR 200-1	**Prescribed Fire Coordination** Initiate burn coordination meetings where DES Fire Department, ITAM, and PWE coordinate to plan annual fuel reduction burns and prescribed fire (ecosystem management burns) to ensure burns meet objectives.	2	Continuous	Burn coordination meetings occur at least annually where Fire Department, PWE, and ITAM are present.	Year-round and seasonally as needed
Support Wildland Fire Program Inventory and Monitor Game Species	SAIA, CA Habitat Enhancement Act, DoD Instruction 4715.03, AR 200-1	**Wildfire and Elk Study** FHL could study the potential impacts of controlled burning on the elk population. Specifically, if the frequency and amount of burning causes elk to leave FHL in search of more food. If this is the case, then rotational burning may be beneficial to elk.	2	Continuous	Study implemented and mitagaton measures utilized as needed.	Seasonally as needed
Grounds Management	SAIA, CA Habitat Enhancement Act, DoD Instruction 4715.03, AR 200-1	**FHL Installation Grounds Management** Support DPW-Master Planning Division in developing Area Development Plans and an Installation Design Guide that makes best use of existing native trees; conserves floodplains, drainages, and topography; and enhances aesthetic and structural standards fitting to the area and local historic structures. Prohibit planting of non-approved plants. Review and update approved plant list, fill sources, and recommended planting methods for construction and revegetation projects on FHL.	2	Continuous	100% of projects are implemented with approved plants and with the natural landscape in mind.	Year-round and seasonally as needed
Manage Invasive Species: Plants	SAIA, EO 13112, CA MIL, DoD Instruction 4715.03, AR 200-1	**Invasive Plants Control** Continue field surveys to monitor distribution and abundance of invasive plants. Implement plan for tamarisk removal for arroyo toad habitat restoration. Update Invasive Species Management Plan (ISMP) and Yellow Star-thistle Control Plan as necessary to incorporate new data and management goals. Apply proven habitat restoration practices to promote native vegetation in previously disturbed areas.	2	Continuous	Distribution (acreage where dominant) and density of invasive weeds, control methods implemented.	Seasonally as needed
Manage Invasive Species: Plants	SAIA, EO 13112, CA MIL, DoD Instruction 4715.03, AR 200-1	**Identifying New Invasive Plant Threats** Develop and implement action plans for controlling or eliminating new/increasingly problematic invasive plant species (e.g., hand pulling as soon as an invasive has been identified has been highly effective at small patches).	2	2022–2026 Initiate then Continue	Distribution (acreage where dominant) and density of invasive weeds, control methods implemented.	As needed
Manage Invasive Species: Plants	SAIA, EO 13112, CA MIL, DoD Instruction 4715.03, AR 200-1	**Biocontrol Agent Monitoring** Monitor and continue releases of biocontrol agents to sustain sufficient populations to reduce yellow star-thistle reinfestations and reduce yellow star-thistle in areas where it cannot be sprayed or otherwise controlled. Coordinate closely with USFWS, USDA, and CDFA prior to releases of bio-control agents to prevent harm to native species.	2	Continuous	Decreasing invasive plant cover as result of biocontrol agents.	As needed
Manage Invasive Species: Animals	SAIA, ESA, CESA, CA MIL, DoD Instruction 4715.03, AR 200-1	**Invasive Animal Species Control: Bullfrog, Crayfish, and Fish Populations** Continue surveying for bullfrogs and reduce exotic species, particularly in arroyo toad habitat. Research and implement crayfish trapping in the San Antonio River. Continue to monitor for crayfish and green sunfish.	2	Continuous	Reduction of invasive animal species detections following control measures.	Annual
Manage Invasive Species: Animals	SAIA, ESA, CESA, CA MIL, DoD Instruction 4715.03, AR 200-1	**Invasive Mussel Prevention Program** Establish a formal Invasive Mussel Prevention Program Plan using BMPs to prevent the introduction of zebra and quagga mussels.	2	2022–2026 Initiate then Continue	100% of watercrafts inspected. Prevention Program actions implemented.	TBD

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Manage Invasive Species: Disease Detection	SAIA, ESA, CESA, CA MIL, DoD Instruction 4715.03, AR 200-1	**Amphibian and Reptile Disease Detection and Spread Prevention** Identify potential for threatening diseases at FHL by identifying which diseases are most likely to occur at FHL, how they are transmitted, and species potentially affected. Consider a federal or university research study for this effort.	2	2022–2026 Initiate then Continue	Detection or non-detection of pathogens.	TBD
Integrated Pest Management	SAIA, ESA, CESA, CA MIL, DoD Instruction 4715.03, AR 200-1	**Integrated Pest Management Implementation** DPW Operations and Maintenance (O&M) updates the FHL IPMP to ensure that the plan reflects changes in pest populations and current management issues. DPW O&M implements pest management controls from the IPMP and other pest-related guidance and plans. DPW tracks usage of active ingredients per reporting requirements. DPW O&M conducts surveys of pests that pose a potential health risk to humans or natural resources.	1	2022–2026 Initiate then Continue	Protocol and BMPs implemented an enforced.	Year-round
Manage Special-Status Species (CESA, SSC, USFWS, DoD SAR.)	SAIA, DoD Instruction 4715.03, AR 200-1	**Special Status Species Management** Continue efforts for presence/distribution monitoring of all special status species. Stay up to date on listing/rank changes and required protocol for all species. Update for newly listed species.	2	Continuous	Acres of habitat protected or restored.	Year-round
Monitor Arroyo Toad, Monitor and Manage Federally Listed Species and Habitat Manage Special-Status Species	SAIA, ESA, CESA, CA MIL, DoD Instruction 4715.03, AR 200-1	**Arroyo toad Breeding Activity Monitoring** Continue surveys for arroyo toad as described in the ESMC; develop and implement breeding activity surveys for other special status amphibian species based of USFWS, USGS, or other established protocols.	1	Continuous	Breeding populations remain stable or increasing.	Annually
Monitor Arroyo Toad, Monitor and Manage Federally Listed Species and Habitat Manage Special-Status Species	SAIA, ESA, CESA, CA MIL, DoD Instruction 4715.03, AR 200-1	**Arroyo toad Breeding Habitat Monitoring** Continue mapping and assessing arroyo toad habitat as described in the ESMC. Implement pilot studies for arroyo toad habitat restoration projects in the San Antonio River. Reduce exotic species such as bullfrogs and tamarisk. Implement protection measures as needed to minimize adverse effects of FHL activities, such as placing signage at river crossings and closing unauthorized river crossings.	1	Continuous	No net loss of breeding habitat.	Annually
Survey and Monitor CRLF Monitor and Manage Federally Listed Species and Habitat Manage Special-Status Species	SAIA, ESA, CESA, CA MIL, DoD Instruction 4715.03, AR 200-1	**CRLF Habitat Monitoring** Detect populations of CRLF on FHL and minimize the potential for damage or degradation to red-legged frog habitat. Conduct red-legged frog surveys periodically and in response to FHL activities that may adversely affect habitat suitable for red-legged frogs.	1	Continuous	No net loss of habitat.	As needed
Promote CRLF Recovery Monitor and Manage Federally Listed Species and Habitat Manage Special-Status Species	SAIA, ESA, CESA, CA MIL, DoD Instruction 4715.03, AR 200-1	**Facilitated CRLF Dispersal** Consider research potential for translocation and reintroduction efforts of CRLF in consultation with USFWS.	3	2022–2026 Initiate then Continue	Number of CRLF encountered post-release in repatriation sites.	TBD
California Tiger Salamander Monitor and Manage Federally Listed Species and Habitat Manage Special-Status Species	SAIA, ESA, CESA, CA MIL, DoD Instruction 4715.03, AR 200-1	**Facilitated CRLF Dispersal** Coordinate with other agencies and researchers to make the FHL population available for research and teaching purposes. Investigate any associated effects hybrid salamanders may be having on other natives such as western spadefoot to determine if additional management of hybrids may be necessary.	3	2022–2026 Initiate then Continue	Number of CRLF encountered post-release in repatriation sites.	TBD

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Monitor Foothill Yellow-Legged Frog Monitor and Manage Federally Listed Species and Habitat Manage Special-Status Species	SAIA, ESA, CESA, CA MIL, CA Habitat Enhancement Act, DoD Instruction 4715.03, AR 200-1	**Yellow-Legged Frog Breeding Activity and Habitat Management** Await the finalization of the proposed USFWS ruling of the South Coast DPS as Endangered to determine further management actions necessary for ESA compliance, such as the completion of an ESMC. Coordinate management activities with BMP provided by USFWS and CDFW Considerations for Conserving the Foothill Yellow-legged Frog (2018): Consider recommended VES protocol by conducting one or two surveys for adult frogs followed by a tadpole survey, then a second survey for juveniles/subadults. Consider measures to avoid incidental take that are developed on a site- and project-specific basis. For example, measures may vary based on the type and extent of disturbance, duration and timing of disturbance, and influence of environmental factors.	1	Continuous	Breeding populations remain stable or increasing. No net loss of breeding habitat.	Annually
Monitor Western Spadefoot Manage Special-Status Species	SAIA, ESA, CESA, CA MIL, CA Habitat Enhancement Act, DoD Instruction 4715.03, AR 200-1	**Western Spadefoot Breeding Activity and Habitat Management** Consider additional recommended BMPs developed by the Partners in Amphibian and Reptile Conservation network. Identify and protect Western spadefoot breeding habitat/pools. Review aerial photography and installation GIS data to identify potentially suitable vernal pools and other ephemeral water sources. Post as necessary with official signage along roads and other human travel corridors to inform personnel about the actual or potential presence of spadefoot toads, particularly at road pools or ruts. If possible, direct traffic around these pools. Explicitly prohibit collection of Western Spadefoots on military sites. Establish long-term monitoring stations at known breeding pools to allow for the collection of two datasets: the establishment of a baseline (abundance, success of breeding attempts, breeding phenology) of Western Spadefoot at known locations; and the ability to compare data of the population over time. Conduct upland habitat use and natal pool dispersal studies. Protect and maintain upland aestivation habitat and connectivity between breeding locations. Avoid the use of all vehicles in breeding pool habitats used by Western Spadefoots. Avoid ditching and draining of ephemeral water sources. Control or Remove Invasive and Non-native Species. Vernal pools are known and well documented on military bases in California where Western Spadefoots are known or may potentially be present. These areas could be expanded, or new vernal pools could be established, using mechanical equipment that allows for altering the physical structure of the habitat and/or with chemical removal/reduction of non-natives/invasive plant species in areas where vernal pools were previously documented.	1	Continuous	Breeding populations remain stable or increasing. No net loss of breeding habitat.	Annually
Promote Amphibian Population Recovery Manage Special-Status Species	SAIA, ESA, CESA, CA MIL, DoD Instruction 4715.03, AR 200-1	**Special Status Amphibian Habitat Protection** Assess risks to special status amphibian habitat and implement protection measures as needed to minimize adverse effects of FHL activities. Conduct pre-project surveys and implement minimization measures outlined in biological opinions. Consult with USFWS when required.	2	Multi-year	Steps taken to prevent incidental take events or habitat degradation.	Year-round as needed
Promote California Condor Recovery Monitor and Manage Federally Listed Species and Habitat Manage Special-Status Species	SAIA, ESA, CESA, CA MIL, DoD Instruction 4715.03, AR 200-1	**California Condor Management** Coordinate with USFWS and Ventana Wilderness Society regarding California condor activities and requirements in the FHL area and develop management strategies as needed to address potential conflicts with FHL activities.	1	2022–2026 Initiate then Continue	TBD	TBD
Monitor and Protect Migratory Birds and Eagles Manage Special-Status Species	SAIA, MBTA, Bald and Golden Eagle Protection Act (BGEPA) DoD Instruction 4715.03, AR 200-1, Army MBTA Guidance, EO 13186	**Avian and Breeding Bird Surveys** Conduct point-count, breeding-bird surveys to monitor abundance, diversity, and breeding activity of migratory birds. Surveys should include specifics for special status species.	2	Continuous	Migratory bird populations trends are noted and monitored for change.	Seasonally

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Monitor and Protect Migratory Birds and Eagles Manage Special-Status Species	SAIA, MBTA, Bald and Golden Eagle Protection Act (BGEPA) DoD Instruction 4715.03, AR 200-1, Army MBTA Guidance, EO 13186	**Bald and Golden Eagle Protection Act** Conduct monitoring surveys, report incidental sightings and Breeding Bird Survey sightings of bald and golden eagles at FHL. Identify locations of overwintering bald and golden eagles. Identify bald and golden eagle nesting territories. Monitor active bald and golden eagle nests. Determine reproductive success. Remove roadkill from main roads to limit vehicle strikes. Record and map roadkill locations to determine high-risk areas for eagle-vehicle strikes.	1	Continuous	Populations trends and nesting territories are noted and monitored for change. Wildlife strike incidents prevented or reported.	Annually
Monitor and Protect Migratory Birds and Eagles	SAIA, BGEPA, MBTA, DoD Instruction 4715.03, AR 200-1, Army MBTA Guidance, EO 13186	**Migratory Bird Protection** Utilize information from breeding bird surveys and pre-project MBTA surveys to implement mitigation measures to protect migratory birds. Trap and remove feral cats per the IPMP.	1	Continuous	Frequency of incidental take of migratory birds.	Year-round
Monitor and Protect Migratory Birds and Eagles Monitor and Manage Federally Listed Species and Habitat Manage Special-Status Species	CESA, SAIA, DoD Instruction 4715.03, AR 200-1	**Least Bell's Vireo Monitoring** Continue Annual listening surveys conducted along established point transects for least Bell's vireo along Mission Creek and along the San Antonio River in Training Area 6B where riparian vegetation is suitable for nesting. Alter listening transects periodically to maintain focus on best available habitat.	1	Continuous	Habitat mapped and stable or increasing populations.	Annually
Monitor and Protect Migratory Birds and Eagles Manage Special-Status Species	CESA, SAIA, DoD Instruction 4715.03, AR 200-1	**California Spotted Owl Monitoring** Continue annual surveys for California spotted owls to provide continuous data on their presence, abundance, and distribution on FHL. Determine the extent of habitat on FHL of California Spotted owl through roosting and habitat mapping.		Continuous	Habitat mapped and stable or increasing populations.	Annually
Monitor and Protect Migratory Birds and Eagles Manage Special-Status Species	CESA, SAIA, DoD Instruction 4715.03, AR 200-1	**Tricolored Blackbird Monitoring** Continue annual surveys for tricolored blackbirds to provide continuous data on their presence, abundance, and distribution on FHL.	2	Continuous	Habitat mapped and stable or increasing populations.	Annually
Monitor and Protect Migratory Birds and Eagles	SAIA, BGEPA, MBTA, DoD Instruction 4715.03, AR 200-1, Army MBTA Guidance: Army Policy guidance on Mig. Bird Treaty Act, Supplemental Army Policy on Mig. Bird Treaty Act, EO 13186	**Migratory Bird Stakeholder Coordination** Continue participating and contributing to Monitoring Avian Productivity and Survivorship (MAPS) and other habitat and species management programs such as California PIF, various habitat-oriented conservation plans, and joint venture organizations.	3	Continuous	Partnerships and joint activities initiated.	Year-round
Monitor and Manage Federally Listed Species and Habitat: Plants	CESA, SAIA, DoD Instruction 4715.03, AR 200-1, EO 13186	**Purple Amole Monitoring and Management** Conduct pre- and post-training activity surveys to ensure sensitive areas are marked for avoidance and to address disturbances promptly. Investigate effects of low-impact training activities that may enhance and improve purple amole habitat. Conduct comprehensive purple amole surveys during October of each year to document other disturbances and if warranted, consider conservation actions. Coordinate purple amole monitoring so it is comparable across the species range. Delineate purple amole management units based on location and land use. Collect seed and deposit accessions into the permanent conservation seedbank. Consider experimental research projects, such as prescribed fire to benefit purple amole.	1	Continuous	Acres of habitat protected or restored. Stable or increasing populations.	Annually
Monitor and Manage Federally Listed Species and Habitat: Plants	CESA, SAIA, DoD Instruction 4715.03, AR 200-1, EO 13186	**Chorro Creek Bog Thistle Monitoring and Management** Detect populations of Chorro Creek bog thistle on FHL and minimize the potential for harm to potential habitat.	1	Continuous	Acres of habitat protected or restored. Stable or increasing populations.	Annually

INRMP Objective(s) or Program Element	Driver (Law/Reg/Agreement)	Proposed Project Title and Description	Prioritization Category, 1–3 (1=highest)	Execution Timeframe	Effectiveness Indicator	Monitoring Frequency
Monitor and Manage California Listed Species, Fully Protected Species and Special Species of Concern.	CESA, SAIA, BGEPA, MBTA, DoD Instruction 4715.03, AR 200-1, Army MBTA Guidance, EO 13186	**Santa Lucia mint Monitoring and Management** Monitor Santa Lucia mint sites for yellow star-thistle encroachment and disturbance from human activities or flooding and erosion of stream banks where populations occur. Continue annual presence surveys, photo-point monitoring, and mapping. Implement protection measures as needed.	1	Continuous	Acres of habitat protected or restored. Stable or increasing populations.	Annually
Monitor and Manage California Listed Species, Fully Protected Species and Special Species of Concern.	CESA, SAIA, BGEPA, MBTA, DoD Instruction 4715.03, AR 200-1, Army MBTA Guidance, EO 13186	**Greater Bonneted Bat, Townsend's Big-eared Bat, Western Red Bat and Little Brown Bat Monitoring** Determine presence of special status bat species at FHL as well as roosting sites. Identify artificial roost sites (i.e., man-made structures, buildings, and abandoned structures) and document in GIS database so that protection or mitigation actions may be applied as needed and determined through the FHL environmental review process.	3	Continuous	Acres of habitat protected or restored. Stable or increasing populations.	Annually
Monitor and Manage California Listed Species, Fully Protected Species and Special Species of Concern.	CESA, SAIA, BGEPA, MBTA, DoD Instruction 4715.03, AR 200-1, Army MBTA Guidance, EO 13186	**Mountain Lion Management** Maintain a stable mountain lion population and support state-wide scientific research and population monitoring to inform big game management and habitat conservation. Collaborate with CDFW on state-wide mountain lion research by coordinating access for radio-telemetry projects and assisting with data collection.	3	Continuous	Acres of habitat protected or restored. Stable or increasing populations	Annually
Manage special status species: California Native Plant Society	CESA, SAIA, DoD Instruction 4715.03, AR 200-1, Army MBTA Guidance	**Monitor CNPS Rare Plant Inventory Species on FHL: Santa Lucia monkeyflower, caper-fruited tropidocarpum, San Antonio collinsia, San Benito pentachaeta and yellow flowered eriastrum** Monitor and manage priority rare-plant species and their habitat on FHL. Presence surveys and disturbance monitoring should be conducted annually for all species. Consider a rare-plant monitoring program that coordinates with external stakeholders and volunteers to alleviate staffing time constraints.	2	Continuous	Acres of habitat protected or restored. Stable or increasing populations.	Annually
Manage Candidate Species Manage Special-Status Species	SAIA, DoD Instruction 4715.03, AR 200-1	**Southwestern Pond Turtle Management** Develop and implement mark-recapture population monitoring study for southwestern pond turtle. Retrofit adult female turtles with radio-transmitters and follow them to ascertain location of nests. Protect nest sites from human disturbance.	1	2022–2026 Initiate then Continue	Acres of habitat protected or restored. Stable or increasing populations.	Annually
Manage ESA and CESA Candidate Species Detect Monarch Butterfly/Milkweed	SAIA, DoD Instruction 4715.03, AR 200-1	**Monarch Butterfly Surveys** Continue visual encounter surveys and habitat surveys for monarch butterfly to determine distribution of butterflies and their habitat. Record and report sightings of both monarch butterflies and milkweed into the installation GIS database and the Western Monarch Milkweed Mapper.	1	2022–2026 Initiate then Continue	Habitat mapped. Stable or increasing populations.	Annually
Manage ESA and CESA Candidate Species Detect Monarch Butterfly/Milkweed	SAIA, DoD Instruction 4715.03, AR 200-1	**Monarch Butterfly Habitat Management** Conducting monarch butterfly habitat modeling and mapping to assess the threat of training impacts and to identify priority areas for conservation and management. Conducting landscape maintenance activities to avoid bloom periods of plants whenever possible. Not applying herbicide on blooming plants unless those plants are invasive species. Herbicide application should be targeted and not broad application. Implement mechanical plant removal rather than herbicide use whenever possible.	1	2022–2026 Initiate then Continue	Habitat mapped. Stable or increasing populations.	Annually
Manage ESA and CESA Candidate Species Detect Protected Bumble Bee Species.	SAIA, DoD Instruction 4715.03, AR 200-1	**Bumble Bee Surveys** Conduct bumblebee searches in appropriate habitat during peak flight season and provide information to CDFW to contribute to 12-month finding results.	2	2022–2026 Initiate then Continue	Habitat mapped. Stable or increasing populations.	Annually
Protect Wetlands, Vernal Pools and Waters Monitor and Manage Federally Listed Species and Habitat	SAIA, DoD Instruction 4715.03, AR 200-1	**Vernal Pool Fairy Shrimp ESMC Implementation** Continue surveys and disturbance monitoring for vernal pool fairy shrimp. Update ESMC in cooperation with USFWS to meet current conservation needs. Identify restoration opportunities to mitigate for loss of vernal pools due to natural succession.	1	Continuous	Acres of habitat protected or restored. Stable or increasing populations.	Annually

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Protect Wetlands, Vernal Pools and Waters Manage ESA and CESA Candidate Species	SAIA, DoD Instruction 4715.03, AR 200-1	**Western Ridged Mussel Management** Conduct surveys to determine distribution and stability of breeding population on FHL.	1	Continuous	Acres of habitat protected or restored. Stable or increasing populations.	Annually
Inventory and Monitor Wildlife	SAIA, DoD Instruction 4715.03, AR 200-1	**Reptile and Amphibian Inventory and Monitoring** Continue to implement standardized reptile and amphibian sampling using artificial cover (cover-board) arrays. These surveys may be integrated with special status species surveys.	3	Continuous	Stable or increasing populations.	Annually
Inventory and Monitor Wildlife	SAIA, DoD Instruction 4715.03, AR 200-1	**Crustacean, Fish, and Invertebrate Inventory and Monitoring** Continue to implement crustacean, fish, and invertebrate monitoring. These surveys are often integrated with special status species surveys but could be considered for stand-alone surveys if time and funding allow.	3	Continuous	Stable or increasing populations. Stable or decreasing populations for undesirable species.	Annually
Inventory and Monitor Wildlife Manage Bat Species	SAIA, DoD Instruction 4715.03, AR 200-1	**Bat Inventory** Continue acoustic surveys and participation in the North American Bat Monitoring Program; maintain species list for FHL. Monitor bat colonies in man-made structures and implement protection measures or mitigation for disturbance/loss. Consider augmenting program with mist-netting surveys to allow for verification of acoustic data to create a more robust inventory.	3	Continuous	Habitat identified and protected. Species list updated. Stable or increasing populations.	TBD
Inventory and Monitor Wildlife	SAIA, DoD Instruction 4715.03, AR 200-1	**Small Mammal Inventory** Use traps (e.g., Sherman traps) to capture and identify small mammal species across FHL. Inventorying small mammals could facilitate better-informed integrated pest management and ecosystem management.	3	2022–2026 Initiate then Continue.	Complete inventory and update small mammal list.	TBD
Inventory and Monitor Wildlife Detect San Joaquin Kit Fox (SJKF) Monitor and Manage Federally Listed Species and Habitat	SAIA, ESA, CESA, DoD Instruction 4715.03, AR 200-1	**San Joaquin Kit Fox Management** Continue effort to detect San Joaquin kit fox using scent station and camera trap surveys annually during spring and fall months. Continue pre-activity surveys prior to ground squirrel pest management. Update GIS data for kit fox and red fox observations. Train personnel on identification of San Joaquin kit fox, red fox, and grey fox on FHL.	1	Continuous	FHL personnel are trained on identification. Monitoring completed annually.	Annually
Inventory and Monitor Wildlife Monitor and Manage Federally Listed Species and Habitat	SAIA, ESA, CESA, DoD Instruction 4715.03, AR 200-1	**Remote Camera Monitoring** Use remote cameras to ascertain locations and activity hotspots for large and medium-sized mammals. Scent attractants may be used to improve detection probability of mesocarnivores. Camera traps are a low-cost and time-efficient way to monitor wildlife for multiple management objectives, e.g., detecting rare species, outbreaks of wildlife disease (e.g., mange), or overpopulation of deer.	3	2022–2026 Initiate then Continue.	Deploy camera traps deployed for monitoring. Identify trends or changes in species sightings.	TBD
Inventory and Monitor Wildlife Promote Professional Data Collection and Management	SAIA, DoD Instruction 4715.03, AR 200-1	**Update FHL Species Lists** Maintain up-to-date electronic list of mammals, birds, reptiles, amphibians, fish, invertebrates, and plants sighted on FHL.	3	Multi-year	List reviewed and updated.	Year-round
Implement Sustainable Hunting and Fishing Program Inventory and Monitor Game Species	SAIA, CWA, CA MIL, DoD Instruction 4715.03, AR 200-1, 10 U.S.C. 2671 et seq., 10 U.S.C. 2671	**Big Game Management Plans** Develop and implement deer and elk components to the INRMP that include protocols for how FHL will handle deer and elk tags, and harvest data collection and reporting to CDFW. Coordinate with CDFW to reevaluate population goal of 300 set in the 1995 Elk Management Plan, as population exceeds that goal. Implement cooperative agreements with various conservation agencies for FHL's game management program.	3	2022–2026 Initiate then Continue.	TBD	TBD

INRMP Objective(s) or Program Element	Driver (Law/Reg/Agreement)	Proposed Project Title and Description	Prioritization Category, 1–3 (1=highest)	Execution Timeframe	Effectiveness Indicator	Monitoring Frequency
Implement Sustainable Hunting and Fishing Program Inventory and Monitor Game Species	SAIA, CWA, CA MIL, DoD Instruction 4715.03, AR 200-1, 10 U.S.C. 2671 et seq., 10 U.S.C. 2671	**Game Management** Conduct spotlight surveys for deer and daytime composition counts for deer and elk for an index of population status. Conduct antlerless hunts based on the previous year's buck kill and fall rainfall. Conduct check station data collection to determine herd health. Conduct waterfowl/waterbird surveys to determine waterfowl presence and abundance at FHL. Provide CDFW with annual population and harvest data for big game annually.	2	Continuous	Buck to doe ratio exceeds 15:100 and population is stable or increasing without exceeding carrying capacity. Elk population is stable or increasing without exceeding carrying capacity.	Seasonally
Implement Sustainable Hunting and Fishing Program Inventory and Monitor Game Species	SAIA, CWA, CA MIL, DoD Instruction 4715.03, AR 200-1, 10 U.S.C. 2671 et seq., 10 U.S.C. 2671	**Game Management – Feral Pigs** Investigate options to manage pigs and their effects on species and habitats. Managing pigs, especially in sensitive areas, may contribute to protecting populations of listed plants and animals from pig rooting and predation.	2	Continuous	Acres of damaged sensitive habitat restored, or percent decline in acres damaged by pig rooting post pig management.	TBD
Implement Sustainable Hunting and Fishing Program Inventory and Monitor Game Species	SAIA, CWA, CA MIL, DoD Instruction 4715.03, AR 200-1, 10 U.S.C. 2671 et seq., 10 U.S.C. 2671	**Hunting Program Management** Establish desired hunter and harvest quotas based on population estimates or abundance indices, desired hunter density in the field, and access restrictions due to military training activities. Coordinate with DES to provide sufficient law enforcement effort to deter violations of applicable laws, policies, and regulations. Consult regularly with DPTMS-Range Operations to determine hunting area access.	2	2022–2026	Buck to doe ratio exceeds 15:100 and population is stable or increasing without exceeding carrying capacity. Elk population is stable or increasing without exceeding carrying capacity.	Seasonally
Implement Sustainable Hunting and Fishing Program	SAIA, CWA, CA MIL, DoD Instruction 4715.03, AR 200-1, 10 U.S.C. 2671 et seq., 10 U.S.C. 2671	**Fisheries Management** Monitor pond and reservoir water quality monthly. Use monitoring results to guide management actions that reduce occurrences of summer fish kills. Continue barley straw treatment to reduce algae growth. Initiate dam repairs and investigate deepening of reservoir shorelines. Investigate methods to prevent summer fish kill. Relocate fish between established fishing reservoirs to restore depleted or expired fisheries.	3	2022–2026	Viable sportfish populations. Fishing permits issued.	Seasonally
Implement Sustainable Hunting and Fishing Program Habitat Improvement and Wildlife Collisions	SAIA, CWA, CA MIL, DoD Instruction 4715.03, AR 200-1, 10 U.S.C. 2671 et seq., 10 U.S.C. 2671	**Terrestrial Habitat Improvement: Nesting and Forage** Continue to provide and maintain wood duck nest boxes in conjunction with California Waterfowl Association's Wood Duck Program. Conduct acorn mast (productivity) surveys and forage/browse surveys to assess food resources for wildlife.	3	2022–2026	Wood duck nest boxed deployed. Acorn mast survey results show stable or improving trends in food availability.	Year-round
Implement Sustainable Hunting and Fishing Program Habitat Improvement and Wildlife Collisions	SAIA, CWA, CA MIL, DoD Instruction 4715.03, AR 200-1, 10 U.S.C. 2671 et seq., 10 U.S.C. 2671	**Terrestrial Habitat Improvement: Water Sources** Conduct annual spring and guzzler maintenance and identify potential new guzzler locations. Establish escape cover (e.g., brush piles) around guzzlers in open terrain areas. Maintain a GIS layer of artificial and natural water sources.	2	2022–2026	Guzzlers monitored for usage and working status. New guzzlers added as needed.	Year-round
Implement Sustainable Hunting and Fishing Program Habitat Improvement and Wildlife Collisions	SAIA, CWA, CA MIL, DoD Instruction 4715.03, AR 200-1, 10 U.S.C. 2671 et seq., 10 U.S.C. 2671	**Terrestrial Habitat Improvement: Fencing** Remove derelict cattle fencing. Investigate the need to alter fencing to improve wildlife movement. Install wildlife-friendly fence modifications where appropriate.	3	2022–2026	Distance of fence removed or updated.	Year-round
Implement Sustainable Hunting and Fishing Program	SAIA, CWA, CA MIL, DoD Instruction 4715.03, AR 200-1, 10 U.S.C. 2671 et seq., 10 U.S.C. 2671	**Terrestrial Habitat Improvement: Prescribed Burning** Improve habitat through prescribed burning in coordination with FHL Fire Department. Require Range Operations staff to haze wildlife from firing ranges prior to firing.	3	2022–2026	Prescribed burns conducted. Incidental take of wildlife prevented.	Year-round

INRMP Objective(s) or Program Element	Driver (Law/Reg/Agreement)	Proposed Project Title and Description	Prioritization Category, 1–3 (1=highest)	Execution Timeframe	Effectiveness Indicator	Monitoring Frequency
Habitat Improvement and Wildlife Collisions						
Habitat Improvement and Wildlife Collisions	SAIA, CWA, CA MIL, DoD Instruction 4715.03, AR 200-1, 10 U.S.C. 2671 et seq., 10 U.S.C. 2671	**Wildlife Collisions Monitoring** Monitor vehicle collisions with wildlife, installing cautionary wildlife crossing signage where appropriate. Implement a FHL Wildlife Collisions monitoring program to track collisions, species involved, injuries and locations. Keep and maintain a geodatabase as part of this effort. Educate Range Operations staff about wildlife strikes and mitigation measures (e.g., hazing) for roadways and airfields.	2	2022–2026	Monitoring implemented to reduce the potential for wildlife-vehicle collisions.	Year-round
Habitat Improvement and Wildlife Collisions	SAIA, CWA, CA MIL, DoD Instruction 4715.03, AR 200-1, 10 U.S.C. 2671 et seq., 10 U.S.C. 2671	**Wildlife Collisions Monitoring** Share FHL's vehicle collision data with the CA Roadkill Observation System to support regional planning for roadkill mitigation projects to the recommendations.	2	2022–2026	Data shared annually with agencies.	Year-round
Implement Sustainable Recreation	SAIA, CWA, CA MIL, DoD Instruction 4715.03, AR 200-1, 10 U.S.C. 2671 et seq., 10 U.S.C. 2671	**Recreational Use** Identify off-road vehicle trespassing by hunters or other public, and close and restore trails. Review any future EAs for use of motorized off-road vehicles.	3	2022–2026	Development of recreational activities while conserving natural and cultural resources and environmental compliance.	Year-round

Appendix E: Relevant Installation Plans

This FHL INRMP will be reviewed by natural resources personnel to ensure that goals and management actions contained within this plan do not contradict those contained within other installation plans, and that this plan is integrated to the best extent feasible with the following:

1) Area Development Plans
2) Arroyo Toad Habitat Restoration Plan
3) Bald and Golden Eagle Management Plan
4) Deer Management Plan
5) Endangered Species Management Components (ESMCs)
    a. Endangered Species Management Plan for Vernal Pool Fairy Shrimp (*Branchinecta lynchi*)
    b. Endangered Species Management Plan for the Arroyo Toad (*Anaxyrus californicus*)
    c. Endangered Species Management Plan for the Purple Amole (*Hooveria purpurea* var. *purpurea*)
6) Fort Hunter Liggett Range Complex Master Plan (RCMP)
7) Fort Hunter Liggett Real Property Master Plan
8) Integrated Cultural Resources Management Plan (ICRMP)
9) Integrated Pest Management Plan (IPMP)
10) Integrated Wildland Fire Management Plan (IWFMP)
11) Installation Action Plan
12) Invasive Species Management Plan
13) Oak Woodland Management Plan
14) Soil Erosion and Sedimentation Control Component (SESCC)
15) Storm Water Pollution Prevention Plan
16) Yellow Star-thistle Control Plan (YSTCP)

Appendix F: Fort Hunter Liggett Species Lists

Amphibians and Reptiles of Fort Hunter Liggett

Key

*	New observed species
[1]	Observed at FHL
[2]	"In range Observed; species not determined" (2015)
Bold	"Species of concern" or "Species at risk"

Family	Common Name	Scientific Name
Amphibians—Class Amphibia		
North American Spadefoots (Scaphiopodidae)		
	Western spadefoot[1]	***Spea hammondii***
Treefrogs (Hylidae)		
	Sierran treefrog[1]	*Pseudacris sierra*
True Frogs (Ranidae)		
	California red-legged frog	***Rana draytonii***
	Foothill yellow-legged frog[1]	***Rana boylii***
	American bullfrog[1]	*Lithobates catesbeianus*
True Toads (Bufonidae)		
	California toad[1]	*Anaxyrus boreas halophilus*
	Arroyo toad[1]	***Anaxyrus californicus***
Lungless Salamanders (Plethodontidae)		
	Arboreal salamander	*Aneides lugubris*
	Gabilan Mountains slender salamander[2]	*Batrachoseps gavilanensis*
	Santa Lucia Mountains slender salamander[2]	*Batrachoseps luciae*
	Blackbelly slender salamander[2]	*Batrachoseps nigribentris*
	Monterey ensatina	*Ensatina eschoscholtzii*
	Yellow-eyed ensatina[1]*	*Ensatina eschoscholtzii xanthoptica*
Mole Salamanders (Ambystomatidae)		
	Western tiger salamander[1]	*Ambystoma mavortium*
	Eastern tiger salamander[1]	*Ambystoma tigrinum*
	Tiger salamander (hybrid)[1]	***Ambystoma sp.***
Newts (Salamandridae)		
	California newt[1]	*Taricha torosa*
North American Spadefoots (Scaphiopodidae)		
	Western spadefoot[1]	***Spea hammondii***
Reptiles—Class Reptilia		
Alligator Lizards and Allies (Anguidae)		
	Woodland alligator lizard[1]	*Elgaria multicarinata*

Family	Common Name	Scientific Name
Boas and Pythons (Boidae)		
	Northern rubber boa[1]	*Charina bottae*
Vipers (Viperidae)		
	Northern Pacific rattlesnake[1]	*Crotalus oreganus oreganus*
Colubrids (Colubridae)		
	Western yellow-bellied racer[1]	*Coluber constrictor mormon*
	San Joaquin coachwhip[1]	*Coluber flagellum ruddocki*
	California striped racer[1]	*Coluber lateralis lateralis*
	Common sharp-tailed snake[1]	*Contia tenuis*
	Monterey ring-necked snake[1]	*Diadophis punctatus vandenburghi*
	California nightsnake	*Hypsiglena ochrorhyncha nuchalata*
	California kingsnake[1]	*Lampropeltis californiae*
	California mountain kingsnake[1]	*Lampropeltis zonata*
	Pacific gopher snake[1]	*Pituophis catenifer catenifer*
	Long-nosed snake	*Rheinocheilus lecontei*
	Diablo range gartersnake[1]	*Thamnophis atratus zaxanthus*
	Coast garternsake[1]	*Thamnophis elegans terrestris*
	Two-striped gartersnake[1]	*Thamnophis hammondii*
	California red-sided gartersnake[1]	*Thumnophis sirtalis infernalis*
Lizards (Phrynosomatidae)		
	Coast Range fence lizard[1]	*Sceloporus occidentalis bocourtii*
	Western side-blotched lizard[1]	*Uta stansburiana elegans*
	Blainville's horned lizard[1]	*Phrynosoma blainvillii*
	Western sagebrush lizard[1]	*Sceloporus graciosus gracilis*
North American Legless Lizards (Anniellidae)		
	Northern California legless lizard[1]	*Anniella pulchra*
Skinks (Scincidae)		
	Skinks (Scincidae)	Skinks (Scincidae)
Whiptails and Racerunners (Teiidae)		
	California whiptail[1]	*Aspidoscelis tigris munda*
Box and Basking Turtles (Emydidae)		
	Southwestern pond turtle[1]	*Actinemys pallida*
	Red-eared slider[1]*	*Trachemys scripta*

Mammals of Fort Hunter Liggett

Key

Bold "Species of concern" or "Species at risk"

Family	Common Name	Scientific Name
Mammals—Class Mammalia		
Foxes, Wolves, Coyotes (Canidae)		
	Coyote	*Canis latrans*
	Gray fox	*Urocyon cinereoargenteus*
	San Joaquin kit fox	***Vulpes macrotis mutica***
	Red fox	*Vulpes vulpes*
Beavers (Castoridae)		
	Beaver	*Castor canadensis*
Elk and Deer (Cervidae)		
	Tule elk	*Cervus canadensis nannodes*
	Mule deer	*Odocoileus hemionus columbianus*
Mice, Rats, Lemmings, Voles (Cricetidae)		
	California meadow vole	*Microtus californicus*
	Dusky-footed woodrat	*Neotoma fuscipes*
	Desert woodrat	*Neotoma lepida*
	Brush mouse	*Peromyscus boylii*
	California mouse	*Peromyscus californicus*
	Deer mouse	*Peromyscus maniculatus*
	Pinyon mouse	*Peromyscus truei*
	Western harvest mouse	*Reithrodontomys megalotis*
Possums (Didelphidae)		
	Virginia opossum	*Didelphis virginiana*
Cats (Felidae)		
	Feral cats	*Felis catus*
	Bobcat	*Lynx rufus*
	Mountain lion	*Puma concolor*
Pocket Gophers (Geopyidae)		
	Botta's pocket gopher	*Thomomys bottae*
Kangaroo Rats and Pocket Mice (Heteromyidae)		
	California pocket mouse	*Chaetodipus californicus*
	Narrow-faced kangaroo rat	*Dipodomys venustus*
	Heermann's kangaroo rat	*Dipodomys heermanni*
	Little pocket mouse	*Perognathus longimembris*
	San Joaquin pocket mouse	*Perognathus inornatus*
Hares and Rabbits (Leporidae)		
	Black-tailed jackrabbit	*Lepus californicus*
	Desert cottontail	*Sylvilagus audubonii*
	Brush rabbit	*Sylvilagus bachmani*
Bats, Free-tailed (Molossidae)		
	Greater western mastiff bat	***Eumops perotis***
	Brazilian free-tailed bat	*Tadarida brasiliensis*
Old World Rats and Mice (Muridae)		
	House mouse	*Mus musculus*
	Norway rat	*Rattus norvegicus*
	Black rat	*Rattus rattus*
Skunks (Mephitidaeae)		
	Striped skunk	*Mephitis mephitis*
	Western spotted skunk	*Spilogale gracilis*
Mustelids (Mustelidae)		
	Long-tailed weasel	*Mustela frenata*
	American badger	*Taxidea taxus*
Raccoons and Coatis (Procyonidae)		
	Ringtail cat	*Bassariscus astutus*
	Raccoon	*Procyon lotor*
Squirrels and relatives (Sciuridae)		
	Western gray squirrel	*Sciurus griseus*
	California ground squirrel	*Spermophilus beecheyi*
	Merriam's chipmunk	*Tamias merriami*
Shrews (Soricidae)		
	Ornate shrew	*Sorex ornatus*

Family	Common Name	Scientific Name
	Trowbridge's shrew	*Sorex towbridgii*
Pigs (Suidae)		
	Feral hog	*Sus scrofa*
Moles (Talpidae)		
	Broad-footed mole	*Scapanus latimanus*
Bats, Mouse-eared (Vespertilionidae)		
	Pallid bat	***Antrozous pallidus***
	Townsend's Long-eared bat	***Corynorhinus townsendii***
	Big brown bat	*Eptesicus fuscus*
	Western red bat	***Lasiurus blossevillii***
	Hoary bat	*Lasiurus cinereus*
	California myotis	*Myotis californicus*
	Small-footed myotis	*Myotis ciliolabrum*
	Long-eared myotis	*Myotis evotis*
	Little brown bat	***Myotis lucifugus***
	Fringed myotis	*Myotis thysanodes*
	Long-legged myotis	*Myotis volans*
	Yuma myotis	*Myotis yumanensis*
	Western pipstrelle	*Pipstrellus hesperus*
Bears (Ursidae)		
	Black bear	*Ursus americanus*

Fish of Fort Hunter Liggett

Family	Common Name	Scientific Name
Ray-finned Fishes—Class Actinopterygii		
Sucker (Catostomidae)		
	Sacramento sucker	*Catostomus occidentalis*
Sunfish (Centrarchidae)		
	Green sunfish	*Lepomis cyanellus*
	Bluegill	*Lepomis macrochirus*
	Redear Sunfish	*Lepomis microlophus*
	Small-mouth bass	*Micropterus dolomieu*
	Large-mouth bass	*Micropterus salmoides*
Minnow and Carp (Cyprinidae)		
	Goldfish	*Carassius auratus auratus*
	Common carp	*Cyprinus carpio*
	California roach	*Hesperoleucus symmetricus*
	Hitch	*Lavinia exilicauda*
	Hardhead	*Mylopharodon conocephalus*
	Sacremento pikeminnow	*Ptychocheilus gradis*
	Speckled dace	*Rhinichthys osculus*
Sticklenacks and tubesnouts (Gasterosteidae)		
	Threespine stickleback	*Gasterosteus aculeatus aculeatus*
Bullhead catfish (Ictaluridae)		
	Black bullhead	*Ameiurus melas*
	Brown bullhead	*Ameiurus nebulosus*
	Channel catfish	*Ictalurus punctatus*
Smelt (Osmeridae)		
	Longfin smelt	*Spirinchus thaleichthys*
Livebearer (Poeciliidae)		
	Mosquitofish	*Gambusia affinis*
Salmon (Salmonidae)		
	Rainbow trout	*Oncorhynchus mykiss*

Birds of Fort Hunter Liggett

Key

Bolded "Species of concern" or "Species at risk"

Family	Common Name	Scientific Name
Birds—Class Aves		
Eagles, Kites, Harriers, and Hawks (Accipitridae)		
	Coopers hawk	*Accipiter cooperii*
	Sharp-shinned hawk	*Accipiter striatus*
	Golden eagle	***Aquila chrysaetos***
	Red-tailed hawk	*Buteo jamaicensis*
	Rough-legged hawk	*Buteo lagopus*
	Red-shouldered hawk	*Buteo lineatus*
	Ferruginous hawk	*Buteo regalis*
	Northern harrier	*Circus cyaneus*
	White-tailed kite	*Elanus leucurus*
	Bald eagle	***Haliaeetus leucocephalus***
Falcons (Falconidae)		
	Merlin	*Falco columbarius*
	Prairie falcon	*Falco mexicanus*
	Peregrine falcon	*Falco peregrinus*
	American kestrel	*Falco sparverius*
Long-eared owl		
	Northern saw-whet owl	*Aegolius acadicus*
	Short-eared owl	*Asio flammeus*
	Long-eared owl	*Asio otis*
	Western burrowing owl	***Athene cunicularia hypugaea***
	Great horned owl	*Bubo virginianus*
	Northern pygmy-owl	*Glaucidium gnoma*
	Western screech-owl	*Megascops kennicottii*
	California spotted owl	***Strix occidentalis occidentalis***
Barn Owls (Tytonidae)		
	Barn owl	*Tyto alba*
Bushtits (Aegithalidae)		
	Bushtit	*Psaltriparus minimus*
Larks (Alaudidae)		
	Horned lark	*Eremophila alpestris*
Kingfishers (Alcedinidae)		
	Belted kingfisher	*Megaceryle alcyon*
Swans, Ducks, and Geese (Anatidae)		

Family	Common Name	Scientific Name
	Wood duck	*Aix sponsa*
	Northern pintail	*Anas acuta*
	Green-winged teal	*Anas crecca*
	Mallard	*Anas platyrhynchos*
	Greater white-fronted goose	*Anser albifrons*
	Snow goose	*Anser caerulenscens*
	Ross's goose	*Anser rossii*
	Lesser scaup	*Aythya affinis*
	Redhead	*Aythya americana*
	Ring-necked duck	*Aythya collaris*
	Greater scaup	*Aythya marila*
	Canvasback	*Aythya valisineria*
	Canada Goose	*Branta canadensis*
	Bufflehead	*Bucephala albeola*
	Common goldeneye	*Bucephala clangula*
	Hooded merganser	*Lophodytes cucullatus*
	American wigeon	*Mareca americana*
	Gadwall	*Mareca strepera*
	Common merganser	*Mergus merganser*
	Red-breasted merganser	*Mergus serrator*
	Ruddy duck	*Oxyura jamaicensis*
	Northern shoveler	*Spatula clypeata*
	Cinnamon teal	*Spatula cyanoptera*
	Blue-winged teal	*Spatula discors*
Swifts (Apodidae)		
	White-throated swift	*Aeronautes saxatalis*
Herons, Bitterns, and Egrets (Ardeidae)		
	Great egret	*Ardea alba*
	Great blue heron	*Ardea herodias*
	American bittern	*Botaurus lentiginosus*
	Green heron	*Butorides virescens*
	Snowy egret	*Egretta thula*
	Least bittern	***Ixobrychus exilis***
	Black-crowned night heron	*Nycticorax nycticorax*
Waxwings (Bombycillidae)		
	Cedar waxwing	*Bombycilla cedrorum*
	Phainopepla	*Phainopepla nitens*
Buntings (Calcariidae)		
	Lapland longspur	*Calcarius lapponicus*
Goatsuckers (Caprimulgidae)		

Family	Common Name	Scientific Name
	Common poorwill	*Phalaenoptilus nuttallii*
Cardinals and Allies (Cardinalidae)		
	Lazuli bunting	*Passerina amoena*
	Blue grosbeak	*Passerina caerulea*
	Black-headed grosbeak	*Pheucticus melanocephalus*
	Western tanager	*Piranga ludoviciana*
New World Vultures (Cathartidae)		
	Turkey vulture	*Cathartes aura*
	California condor	***Gymnogyps californianus***
Tree Creepers (Certhiidae)		
	Brown creeper	*Certhia americana*
Plovers (Charadriiae)		
	Killdeer	*Charadrius vociferus*
Pigeons and Doves (Columbidae)		
	Rock pigeon	*Columba livia*
	Band-tailed pigeon	*Petagioenas fasciata*
	Eurasian collared-dove	*Streptopelia decaocto*
	Mourning dove	*Zenaida macroura*
Crows, Ravens, and Jays (Corvidae)		
	Western scrub-jay	*Aphelocoma californica*
	American crow	*Corvus brachyrhynchos*
	Common raven	*Corvus corax*
	Stellar's jay	*Cyanocitta stelleri*
	Yellow-billed magpie	*Pica nuttalli*
Cuckoos and Allies (Cuculidae)		
	Greater roadrunner	*Geococcyx californianus*
Finches (Fringillidae)		
	House finch	*Haemorhous mexicanus*
	Purple finch	*Haemorhous purpureus*
	Lawrence's goldfinch	*Spinus lawrencei*
	Pine siskin	*Spinus pinus*
	Lesser goldfinch	*Spinus psaltria*
	American goldfinch	*Spinus tristis*
Loons (Gaviidae)		
	Common loon	*Gavia immer*
Swallows (Hirundinidae)		
	Barn swallow	*Hirundo rustica*
	Cliff swallow	*Petrochelidon pyrrhonota*
	Purple martin	*Progne subis*
	Northern rough-winged swallow	*Stelgidopteryx serripennis*

Family	Common Name	Scientific Name
	Tree swallow	*Tachycineta bicolor*
	Violet-green swallow	*Tachycineta thalassina*
Blackbirds and Allies (Icteridae)		
	Red-winged blackbird	*Agelaius phoeniceus*
	Tricolored blackbird	***Agelaius tricolor***
	Brewer's blackbird	*Euphagus cyanocephalus*
	Bullock's oriole	*Icterus bullockii*
	Brown-headed cowbird	*Molothrus ater*
	Western meadowlark	*Sturnella neglecta*
Yellow-breasted chat (Icteriidae)		
	Yellow-breasted chat	*Icteria virens*
Shrikes (Laniidae)		
	Loggerhead shrike	*Lanius ludovicianus*
Gulls and Terns (Laridae)		
	Black tern	***Chlidonias niger***
	California gull	*Larus californicus*
	Black skimmer	*Rynchops niger*
	California least tern	***Sternula antillarum (=albifrons) browni***
Mimids (Mimidae)		
	Northern mockingbird	*Mimus polyglottos*
	California thrasher	*Toxostoma redivivum*
Pipits (Motacillidae)		
	American pipit	*Anthus rubescens*
New World Quail (Odontophoridae)		
	California quail	*Callipepla californica*
	Mountain quail	*Oreortyx pictus*
Osprey (Pandionidae)		
	Osprey	*Pandion haliaetus*
Chickadees and Titmice (Paridae)		
	Oak titmouse	*Baeolophus inornatus*
Wood-Warblers (Parulidae)		
	Wilson’s warbler	*Cardellina pusilla*
	MacGillivray's warbler	*Geothlypis tolmiei*
	Common yellowthroat	*Geothlypis trichas*
	Orange-crowned warbler	*Leiothlypis celata*
	Nashville warbler	*Leiothlypis ruficapilla*
	Yellow-rumped warbler	*Setophaga coronata*
	Black-throated gray warbler	*Setophaga nigrescens*
	Yellow warbler	*Setophaga petechia*
	Townsend's warbler	*Setophaga virens*

Family	Common Name	Scientific Name
New World Sparrows (Passerellidae)		
	Rufous-crowned sparrow	*Aimophila ruficeps*
	Grasshopper sparrow	*Ammodramus savannarum*
	Sagebrush sparrow	*Artemisiospiza nevadensis*
	Lark sparrow	*Chondestes grammacus*
	Dark-eyed junco (Oregon Race)	*Junco hyemalis*
	Lincoln sparrow	*Melospiza lincolnii*
	Song sparrow	*Melospiza melodia*
	California towhee	*Melozone crissalis*
	Savannah sparrow	*Passerculus sandwichensis*
	Fox sparrow	*Passerella iliaca*
	Spotted towhee	*Pipilo maculatus*
	Black-chinned sparrow	*Spizella atrogularis*
	Chipping sparrow	*Spizella passerina*
	Golden-crowned sparrow	*Zonotrichia atricapilla*
	White-crowned sparrow	*Zonotrichia leucophrys*
Old World Sparrows (Passeridae)		
	House sparrow	*Passer domesticus*
Pelicans (Pelicanidae)		
	American white pelican	***Pelecanus erythrorhynchos***
Cormorants (Phalacrocoradidae)		
	Double-crested cormorant[1]	*Phalacrocorax auritus*
Old World Quail, Pheasants, Turkey (Phasianidae)		
	Wild turkey	*Meleagris gallopavo*
	Ring-necked pheasant	*Phasianus colchicus*
Woodpeckers (Picidae)		
	Northern flicker (Red-shafted)	*Colaptes auratus*
	Downy woodpecker	*Dryobates pubescens*
	Hairy woodpecker	*Dryobates villosus*
	Acorn woodpecker	*Melanerpes formicivorus*
	Lewis's woodpecker	*Melanerpes lewis*
	Nuttall's woodpecker	*Picoides nuttallii*
	Red-breasted sapsucker	*Sphyrapicus ruber*
Grebes (Podicipedidae)		
	Clark’s grebe	*Aechmophorus clarkii*
	Western grebe	*Aechmophorus occidentalis*
	Pied-billed grebe	*Podilymbus podiceps*
	Eared grebe	*Podiceps nigricollis*
	Horned grebe	*Podiceps auritus*
Gnatcatchers (Polioptilidae)		

Family	Common Name	Scientific Name
	Blue-gray gnatcatcher	*Polioptila caerulea*
Rails, Gallinules, and Coots (Rallidae)		
	American coot	*Fulica americana*
	Common moorhen	*Gallinula chloropus*
	Sora	*Porzana carolina*
	Virginia rail	*Rallus limicola*
Avocets and Stilts (Recurvinrostridae)		
	Black-necked stilt	*Himantopus mexicanus*
	American avocet	*Recurvirostra americana*
Kinglets (Regulidae)		
	Ruby-crowned kinglet	*Regulus calendula*
	Golden-crowned kinglet	*Regulus satrapa*
Sandpipers (Scolopacidae)		
	Spotted sandpiper	*Actitis macularia*
	Western sandpiper	*Calidris mauri*
	Least sandpiper	*Calidris minutilla*
	Wilson's snipe	*Gallinago delicata*
	Dowitcher sp.	*Limnodromus sp.*
	Greater yellowlegs	*Tringa melanoleuca*
Nuthatches (Sittidae)		
	Red-breasted nuthatch	*Sitta canadensis*
	White-breasted nuthatch	*Sitta carolinensis*
Starlings (Sturnidae)		
	European starling	*Sturnus vulgaris*
Wrentit (Sylviidae)		
	Wrentit	*Chamaea fasciata*
Ibises and Spoonbills (Threskiornithidae)		
	White-faced ibis	*Plegadis chihi*
Hummingbirds (Trochilidae)		
	Black-chinned hummingbird	*Archilochus alexandri*
	Anna’s hummingbird	*Calypte anna*
	Costa's hummingbird	*Calypte costae*
	Allen's hummingbird	*Selasphorus sasin*
Wrens (Troglodytidae)		
	Canyon wren	*Catherpes mexicanus*
	Marsh wren	*Cistothorus palustris*
	Rock wren	*Salpinctes obsoletus*
	Bewick's wren	*Thryomanes bewickii*
	House wren	*Troglodytes aedon*
	Winter wren	*Troglodytes hiemalis*

Family	Common Name	Scientific Name
Thrushes (Turdidae)		
	Hermit thrush	*Catharus guttatus*
	Swainson's thrush	*Catharus ustulatus*
	Western bluebird	*Sialia mexicana*
	American robin	*Turdus migratorius*
Tyrant Flycatchers (Tyrannidae)		
	Olive-sided flycatcher	*Contopus cooperi*
	Western wood-pewee	*Contopus sordidulus*
	Pacific-slope flycatcher	*Empidonax difficilis*
	Ash-throated flycatcher	*Myiarchus cinerascens*
	Black phoebe	*Sayornis nigricans*
	Say's phoebe	*Sayornis saya*
	Western kingbird	*Tyrannus verticalis*
	Cassin's kingbird	*Tyrannus vociferans*
Vireos (Vireonidae)		
	Least bell's vireo	***Vireo belli pusillus***
	Cassin's vireo	*Vireo cassinii*
	Warbling vireo	*Vireo gilvus*
	Hutton's vireo	*Vireo huttoni*

Invertebrates of Fort Hunter Liggett

This list includes a separate aquatic macroinvertebrate section containing species sampled from the San Antonio River at three sites in 2014. Together, these lists should not be considered inclusive of all invertebrates on FHL as dedicated surveys will be conducted in the future to expand this list.

Key

Bolded "Species of concern" or "Species at risk"

[4] Indicates species with potential to occur

Family	Common Name	Scientific Name
Bivalves—Class Bivalvia		
Freshwater Mussels (Unionidae)		
	River Mussels	*Anodonta spp.*
Lamp Shells—Class Brachiopoda		
Fairy Shrimp (Branchinectidae)		
	Vernal pool fairy shrimp	***Branchinecta conservatio***
	California fairy shrimp[4]	*Linderiella occidentallis*
Insects—Class Insecta		
Bumblebees (Apidae)		
	Crotch's bumble bee[4]	***Bombus crotchii***
	Western bumble bee[4]	***Bombus occidentalis***
Brush-footed butterflies (Nymphalidae)		
	Monarch butterfly	***Danaus plexippus***
Sphinx moths (Sphingidae)		
	Kern primrose sphinx moth[4]	*Euproserpinus euterpe*
Crabs, Shrimps, Lobsters, Isopods, and Amphipods—Class Malacostraca		
Crayfish (Cambaridae)		
	Red swamp crayfish	*Procambarus clarkii*

Aquatic Macroinvertebrates

Higher Classification	Common Name	Lowest Taxonomic Identification
Ephemeroptera	Mayflies	*Acentrella insignificans*
		Ameletus sp.
		Baetidae
		Baetis sp.
		Centroptilum sp.
		Drunella coloradensis/flavilinea
		Epeorus sp.
		Ephemerella dorothea/excrucians
		Ephemerella maculata
		Ephemerella sp.
		Serratella micheneri

Higher Classification	Common Name	Lowest Taxonomic Identification
		Siphlonurus sp.
		Tricorythodes sp.
Plecoptera	Stoneflies	*Isoperla* sp.
		Perlodidae
		Taenionema sp.
Trichoptera	Caddisflies	*Agapetus* sp.
		Amiocentrus aspilus
		Brachycentridae
		Glossosomatidae
		Hydroptila sp.
		Micrasema sp.
		Wormaldia sp.
Odonata	Dragonflies and Damselflies	Libellulidae
Hemiptera	True Bugs	Corixidae
		Sigara sp.
Coleoptera	Beetles and Weevils	*Agabus* sp.
		Berosus sp.
		Helichus sp.
		Hydroporinae
		Laccobius sp.
		Optioservus divergens
		Ordobrevia nubifera
		Peltodytes sp.
		Stictotarsus sp.
Diptera-Chironomidae	Midges/lake flies	*Ablabesmyia* sp.
		Alotanypus sp.
		Apedilum sp.
		Brillia sp.
		Chironomini
		Chironomus sp.
		Corynoneura sp.
		Cricotopus bicinctus gr.
		Cricotopus sp.
		Dicrotendipes sp.
		Eukiefferiella claripennis gr.
		Euryhapsis sp.
		Hydrobaenus sp.
		Labrundinia sp.
		Limnophyes sp.
		Micropsectra sp.
		Microtendipes pedellus gr.
		Microtendipes rydalensis gr.
		Nanocladius sp.
		Orthocladiinae
		Orthocladius Complex
		Orthocladius sp.

Higher Classification	Common Name	Lowest Taxonomic Identification
		Paracladopelma sp.
		Parakiefferiella sp.
		Parametriocnemus sp.
		Paraphaenocladius sp.
		Paratanytarsus sp.
		Paratendipes sp.
		Pentaneura sp.
		Phaenopsectra sp.
		Polypedilum sp.
		Psectrocladius sp.
		Pseudochironomus sp.
		Pseudosmittia sp.
		Rheocricotopus sp.
		Rheotanytarsus sp.
		Stempellinella sp.
		Synorthocladius sp.
		Tanytarsini
		Tanytarsus sp.
		Thienemanniella sp.
		Thienemannimyia gr. sp.
		Tvetenia bavarica gr.
		Zavrelimyia sp.
Diptera	Flies	*Bezzia/Palpomyia* sp.
		Ceratopogonidae
		Ceratopogoninae
		Dasyhelea sp.
		Erioptera sp.
		Hedriodiscus/Odontomyia sp.
		Muscidae
		Odontomyia sp.
		Prosimulium sp.
		Psychodidae
		Sciomyzidae
		Simuliidae
		Simulium sp.
Annelida-Oligochaeta	Aquatic and Terrestrial Worms	Oligochaeta
Mollusca-Gastropoda	Snails and Slugs	*Gyraulus* sp.
		Physa sp.
Crustacea-Amphipoda	Malacostracan Crustaceans with No Carapace	*Hyalella* sp.
Crustacea-Isopoda	Isopod	Cymothoida
Crustacea-Ostracoda	Seed Shrimp	Ostracoda
Acari	Mites and Ticks	*Atractides* sp.
		Lebertia sp.
		Limnesia sp.
		Mideopsis sp.

Higher Classification	Common Name	Lowest Taxonomic Identification
		Sperchon sp.
		Torrenticola sp.
Turbellaria	Flatworm species	Turbellaria

Plants of Fort Hunter Liggett

Key

Bolded "Species of concern" or "Species at risk"

[4] Indicates species with potential to occur

Family	Common Name	Scientific Name
Lycophytes		
Isoetaceae (Quillwort)		
	Nuttall's quillwort	*Isoetes nuttallii*
	Orcutt's quillwort	*Isoetes orcuttii*
Selaginellaceae (Spike-moss)		
	Bushy spike-moss	*Selaginella bigelovii*
Ferns		
Azollaceae (Mosquito fern)		
	Pacific azolla	*Azolla filiculoides*
Blechnaceae (Deer fern)		
	Giant chain fern	*Woodwardia fimbriata*
Dennstaedtiaceae (Bracken)		
	Eagle fern	*Pteridium aquilinum*
	Hairy bracken fern	*Pteridium aquilinum var. pubescens*
Dryopteridaceae (Wood fern)		
	California wood fern	*Dryopteris arguta*
	Narrowleaf sword fern	*Polystichum imbricans*
	Narrowleaf sword fern	*Polystichum imbricans ssp. curtum*
	Narrowleaf sword fern	*Polystichum imbricans ssp. imbricans*
Marsileaceae (Marsilea)		
	Hairy pepperwort	*Marsilea vestita*
	Hairy water-clover	*Marsilea vestita ssp. vestita*
	American pillwort	*Pilularia americana*
Polypodiaceae (Polypody)		

Family	Common Name	Scientific Name
	California polypody	*Polypodium californicum*
	Nested polypody	*Polypodium calirhiza*
Pteridaceae (Brake)		
	California maidenhair	*Adiantum jordanii*
	California lace fern	*Aspidotis californica*
	Carlotta Hall's lace fern	*Aspidotis carlotta-halliae*
	Dense lace fern	*Aspidotis densa*
	Cooper's lip fern	*Cheilanthes cooperae*
	Coastal lip fern	*Cheilanthes intertexta*
	Coffee fern	*Pellaea andromedifolia*
	Bird's Foot Cliff-Brake	*Pellaea mucronata*
	Bird's Foot Cliff-Brake	*Pellaea mucronata* ssp. *mucronata*
	Bird's-foot fern	*Pellaea mucronata var. mucronata*
	California Goldback Fern	*Pentagramma triangularis*
	Goldback fern	*Pentagramma triangularis* ssp. *triangularis*
Woodsiaceae (Cliff fern)		
	Fragile fern	*Cystopteris fragilis*
Horsetails		
Equisetaceae (Horsetail)		
	Common horsetail	*Equisetum arvense*
	Western scouringrush	*Equisetum hyemale*
	Common scouring rush	*Equisetum hyemale ssp. affine*
	Smooth scouring rush	*Equisetum laevigatum*

Family	Common Name	Scientific Name
	Giant horsetail	*Equisetum telmateia*
	Giant horsetail	*Equisetum telmateia ssp. braunii*
Gymnosperms		
Cupressaceae (Cypress)		
	Deodar cedar	*Cedrus deodara*
	Cuyamaca cypress	*Hesperocyparis arizonica*
	Gowen cypress	*Hesperocyparis goveniana*
	Sargent cypress	*Hesperocyparis sargentii*
Pinaceae (Pine)		
	Bristle-cone fir	***Abies bracteata***
	Knobcone pine	*Pinus attenuata*
	Coulter pine	*Pinus coulteri*
	Rock pine	*Pinus ponderosa*
	North plateau ponderosa pine	*Pinus ponderosa* var. *ponderosa*
	Foothill pine	*Pinus sabiniana*
	Oregon pine	*Pseudotsuga menziesii*
	Douglas-fir	*Pseudotsuga menziesii* var. *menziesii*
Magnolids		
Lauraceae (Laurel)		
	California bay	*Umbellularia californica*
Ceratophyllales		
Ceratophyllaceae (Hornwort)		
	Hortwort	*Ceratophyllum demersum*
Eudicots		
Adoxaceae (Muskroot)		
	Black elderberry	*Sambucus nigra*
	Blue elderberry	*Sambucus nigra* ssp. *caerulea*
Amaranthaceae (Amaranth)		
	Tumbleweed	*Amaranthus albus*
	Procumbent pigweed	*Amaranthus blitoides*
	Californian amaranth	*Amaranthus californicus*
	Smooth pigweed	*Amaranthus hybridus*
	Redscale saltweed	*Atriplex rosea*
	Lamb's Quarters	*Chenopodium album*
	Pit-Seed Goosefoot	*Chenopodium berlandieri*

Family	Common Name	Scientific Name
	California Goosefoot	*Chenopodium californicum*
	Arid goosefoot	*Chenopodium desiccatum*
	Desert goosefoot	*Chenopodium pratericola*
	Jerusalem oak goosefoot	*Dysphania botrys*
Anacardiaceae (Sumac)		
	Skunk bush	*Rhus aromatica*
	Western poison oak	*Toxicodendron diversilobum*
Apiaceae (Carrot)		
	Bur-chervil	*Anthriscus caucalis*
	Wild celery	*Apiastrum angustifolium*
	Hoary bowlesia	*Bowlesia incana*
	Poison hemlock	*Conium maculatum*
	American wild carrot	*Daucus pusillus*
	Coyote-thistle	*Eryngium vaseyi*
	Coyote-thistle	*Eryngium vaseyi* var. *vaseyi*
	Fennel	*Foeniculum vulgare*
	California lomatium	*Lomatium californicum*
	Alkali desertparsley	*Lomatium caruifolium* var. *caruifolium*
	Woollyfruit desertparsley	*Lomatium dasycarpum*
	Woollyfruit desertparsley	*Lomatium dasycarpum* ssp. *dasycarpum*
	Bigseed biscuitroot	*Lomatium macrocarpum*
	Small-leaved lomatium	*Lomatium parvifolium*
	Common lomatium	*Lomatium utriculatum*
	Sweet-cicely	*Osmorhiza berteroi*
	California sweet-cicely	*Osmorhiza brachypoda*
	California yampah	*Perideridia californica*
	Adobe yampah	*Perideridia pringlei*
	Sharptooth blacksnakeroot	*Sanicula arguta*
	Poison sanicula	*Sanicula bipinnata*
	Purple sanicula	*Sanicula bipinnatifida*
	Pacific blacksnakeroot	*Sanicula crassicaulis*
	Turkey pea	*Sanicula tuberosa*
	Hartweg's umbrellawort	*Tauschia hartwegii*
	Tall sock-destroyer	*Torilis arvensis*

Family	Common Name	Scientific Name
	Short sock-destroyer	*Torilis nodosa*
	Falsecarrot	*Yabea microcarpa*
Apocynaceae (Dogbane)		
	Indian hemp	*Apocynum cannabinum*
	California milkweed	*Asclepias californica*
	Kotolo	*Asclepias eriocarpa*
	Narrow-leaf milkweed	*Asclepias fascicularis*
	Greater periwinkle	*Vinca major*
Araliaceae (Ginseng)		
	Elk clover	*Aralia californica*
	Marsh penny wort	*Hydrocotyle ranunculoides*
Asteraceae (Sunflower)		
	Common yarrow	*Achillea millefolium*
	Blow-wives	*Achyrachaena mollis*
Asteraceae (Sunflower) continued…		
	Bigflower agoseris	*Agoseris grandiflora*
	Annual agoseris	*Agoseris heterophylla*
	Annual agoseris	*Agoseris heterophylla* var. *cryptopleura*
	Annual agoseris	*Agoseris heterophylla* var. *heterophylla*
	Spearleaf agoseris	*Agoseris retrorsa*
	Annual bur-sage	*Ambrosia acanthicarpa*
	Woolly fishhooks	*Ancistrocarphus filagineus*
	Woodland tarweed	*Anisocarpus madioides*
	Mayweed	*Anthemis cotula*
	Heartleaf arnica	*Arnica cordifolia*
	Rayless arnica	*Arnica discoidea*
	California sagebrush	*Artemisia californica*
	Mugwort	*Artemisia douglasiana*
	Tarragon	*Artemisia dracunculus*
	Marsh baccharis	*Baccharis glutinosa*
	Coyote brush	*Baccharis pilularis*
	Chaparral Broom, Coyote Brush	*Baccharis pilularis* ssp. *consanguinea*
	Plummer's baccharis	*Baccharis plummerae*
	San Simeon baccharis	***Baccharis plummerae* ssp. *glabrata***
	Mule fat	*Baccharis salicifolia*

Family	Common Name	Scientific Name
	Mule fat	*Baccharis salicifolia* ssp. *salicifolia*
	English daisy	*Bellis perennis*
	Sticktight	*Bidens frondosa*
	Common stickyseed	*Blennosperma nanum*
	Common stickyseed	*Blennosperma nanum* var. *nanum*
	Big tarweed	*Blepharizonia laxa*
	California brickellbush	*Brickellia californica*
	Small-flowered calycadenia	***Calycadenia micrantha***
	Rosinweed	*Calycadenia truncata*
	Rosinweed	*Calycadenia truncata* ssp. *truncata*
	Dwarf calycadenia	***Calycadenia villosa***
	Italian thistle	*Carduus pycnocephalus*
	Italian thistle	*Carduus pycnocephalus* ssp. *pycnocephalus*
	Slender flowered thistle	*Carduus tenuiflorus*
	Diffue knapweed	*Centaurea diffusa*
	Tocalote	*Centaurea melitensis*
	Yellow star-thistle	*Centaurea solstitialis*
	Fitch's tarweed	*Centromadia fitchii*
	Pappose tarweed	*Centromadia parryi*
	Congdon's tarplant	*Centromadia parryi* ssp. *congdonii*
	Yellow pincushion	*Chaenactis glabriuscula*
	Yellow pincushion	*Chaenactis glabriuscula* var. *glabriuscula*
	Inner coast range pincushion	*Chaenactis glabriuscula* var. *heterocarpha*
	Sand button	*Chaenactis glabriuscula* var. *lanosa*
	Chorro creek bog thistle[4]	***Cirsium fontinale* var. *obispoense***
	Cobwebby thistle	*Cirsium occidentale*
	California thistle	*Cirsium occidentale* var. *californicum*
	Venus thistle	*Cirsium occidentale* var. *venustum*
	Brownie thistle	*Cirsium quercetorum*
	Bull thistle	*Cirsium vulgare*
	California-aster	*Corethrogyne filaginifolia*

Family	Common Name	Scientific Name
	California-aster	*Corethrogyne filaginifolia* var. *filaginifolia*
	Threeray tarplant	*Deinandra lobbii*
	Golden-fleece	*Ericameria arborescens*
	Rubber rabbitbrush	*Ericameria nauseosa*
	Mojave rabbitbrush	*Ericameria nauseosa* var. *mohavensis*
	Showy rabbitbrush	*Ericameria nauseosa* var. *speciosa*
	Flax-leaved horseweed	*Erigeron bonariensis*
	Horseweed	*Erigeron canadensis*
	Leafy fleabane	*Erigeron foliosus*
	Leafy fleabane	*Erigeron foliosus* var. *foliosus*
	Rock-loving fleabane	*Erigeron petrophilus*
	Rock-loving fleabane	*Erigeron petrophilus var. petrophilus*
Asteraceae (Sunflower) continued…		
	Philadelphia fleabane	*Erigeron philadelphicus*
	Philadelphia fleabane	*Erigeron philadelphicus* var. *philadelphicus*
	Golden-yarrow	*Eriophyllum confertiflorum*
	Golden-yarrow	*Eriophyllum confertiflorum* var. *confertiflorum*
	Common woolly sunflower	*Eriophyllum lanatum*
	Common woolly sunflower	*Eriophyllum lanatum* var. *achilleoides*
	Roughleaf aster	*Eurybia radulina*
	Western goldenrod	*Euthamia occidentalis*
	Pacific cudweed	*Gamochaeta ustulata*
	Western marsh cudweed	*Gnaphalium palustre*
	Great Valley gumplant	*Grindelia camporum*
	Hairy gumweed	*Grindelia hirsutula*
	Saw-toothed goldenbush	*Hazardia squarrosa*
	Saw-toothed goldenbush	*Hazardia squarrosa* var. *squarrosa*
	Sneezeweed	*Helenium puberulum*
	Slender sunflower	*Helianthus gracilentus*
	Hayfield tarweed	*Hemizonia congesta*
	Hayfield tarweed	*Hemizonia congesta* ssp. *luzulifolia*
	Dwarf evax	*Hesperevax acaulis*

Family	Common Name	Scientific Name
	Stemless evax	*Hesperevax acaulis var. acaulis*
	Fire evax	*Hesperevax acaulis* var. *ambusticola*
	Big evax	*Hesperevax acaulis* var. *robustior*
	Few flowered evax	*Hesperevax sparsiflora* var. *sparsiflora*
	Telegraph weed	*Heterotheca grandiflora*
	Oregon false goldenaster	*Heterotheca oregona*
	Rayless goldenaster	*Heterotheca oregona* var. *scaberrima*
	Goldenaster	*Heterotheca sessiliflora*
	Bristly goldenaster	*Heterotheca sessiliflora* ssp. *echioides*
	White hawk weed	*Hieracium albiflorum*
	Southern hawk weed	*Hieracium argutum*
	Heermann's tarweed	*Holocarpha heermannii*
	White crown	*Holozonia filipes*
	Smooth cat's ear	*Hypochaeris glabra*
	Rough cat's ear	*Hypochaeris radicata*
	Willowleaf lettuce	*Lactuca saligna*
	Prickly lettuce	*Lactuca serriola*
	Bitter lettuce	*Lactuca virosa*
	Branched lagophylla	*Lagophylla ramosissima*
	Branched lagophylla	*Lagophylla ramosissima* ssp. *ramosissima*
	California goldfields	*Lasthenia californica*
	Smooth goldfields	*Lasthenia glaberrima*
	Common goldfields	*Lasthenia gracilis*
	Salinas valley goldfields	*Lasthenia leptalea*
	Small-ray goldfields	*Lasthenia microglossa*
	Smooth tidy-tips	*Layia chrysanthemoides*
	White layia	*Layia glandulosa*
	Pale-yellow layia	***Layia heterotricha***
	Tall tidy-tips	*Layia hieracioides*
	Tidy-tips	*Layia platyglossa*
	Douglas' tickseed	*Leptosyne douglasii*
	Valley lessingia	*Lessingia glandulifera*

Family	Common Name	Scientific Name
	Valley lessingia	*Lessingia glandulifera* var. *glandulifera*
	Valley lessingia	*Lessingia pectinata*
	Valley lessingia	*Lessingia pectinata* var. *tenuipes*
	Spring lessingia	*Lessingia tenuis*
	California cottonrose	*Logfia filaginoides*
	Daggerleaf cottonrose	*Logfia gallica*
	Common madia	*Madia elegans*
	Common madia	*Madia elegans* ssp. *elegans*
	Small tarplant	*Madia exigua*
	Gumweed	*Madia gracilis*
	Coast tarweed	*Madia sativa*
	California desertdandelion	*Malacothrix californica*
	Cleveland's desertdandelion	*Malacothrix clevelandii*
	Woolly desertdandendelion	*Malacothrix floccifera*
Asteraceae (Sunflower) continued…		
	Dusky-fruited malacothrix	*Malacothrix phaeocarpa*
	Cliff desert dandelion	*Malacothrix saxatilis*
	Cliff desert dandelion	*Malacothrix saxatilis* var. *commutata*
	Pineapple weed	*Matricaria discoidea*
	Q-tips	*Micropus californicus*
	Cottontop	*Micropus californicus* var. *californicus*
	Q-tips	*Micropus californicus* var. *subvestitus*
	Douglas' silverpuffs	*Microseris douglasii*
	Douglas' silverpuffs	*Microseris douglasii* ssp. *douglasii*
	Douglas' silverpuffs	*Microseris douglasii* ssp. *tenella*
	Elegant silverpuffs	*Microseris elegans*
	Common hillside daisy	*Monolopia lanceolata*
	Brewer's ragwort	*Packera breweri*
	Tiny pygmydaisy	*Pentachaeta alsinoides*
	Meager pygmydaisy	*Pentachaeta exilis*
	San Benito pentachaeta	***Pentachaeta exilis* ssp. *aeolica***
	Slender pentachaeta	*Pentachaeta exilis* ssp. *exilis*
	Arctic sweet coltsfoot	*Petasites frigidus*
	Western sweet coltsfoot	*Petasites frigidus* var. *palmatus*

Family	Common Name	Scientific Name
	Fragrant everlasting	*Pseudognaphalium beneolens*
	Ladies' tobacco	*Pseudognaphalium californicum*
	Jersey cudweed	*Pseudognaphalium luteoalbum*
	Feltleaf	*Pseudognaphalium microcephalum*
	Pink cudweed	*Pseudognaphalium ramosissimum*
	Cottonbatting plant	*Pseudognaphalium stramineum*
	Slender cudweed	*Pseudognaphalium thermale*
	Short woollyheads	*Psilocarphus brevissimus*
	Dwarf woollyheads	*Psilocarphus brevissimus* var. *brevissimus*
	Round woolly-marbles	*Psilocarphus chilensis*
	Slender woolly-marbles	*Psilocarphus tenellus*
	California chicory	*Rafinesquia californica*
	Wireweed	*Rigiopappus leptocladus*
	Chapparal ragwort	*Senecio aphanactis*
	San Gabriet ragwort	*Senecio astephanus*
	Threadleaf ragwort	*Senecio flaccidus*
	Threadleaf ragwort	*Senecio flaccidus* var. *douglasii*
	Common groundsel	*Senecio vulgaris*
	Milk thistle	*Silybum marianum*
	Velvety goldenrod	*Solidago velutina*
	California velvety goldenrod	*Solidago velutina* ssp. *californica*
	Field burrweed	*Soliva sessilis*
	Prickly sow thistle	*Sonchus asper*
	Prickly sow thistle	*Sonchus asper* ssp. *asper*
	Common sow thistle	*Sonchus oleraceus*
	Derived microseris	*Stebbinsoseris heterocarpa*
	Silver rock-lettuce	*Stephanomeria cichoriacea*
	Santa Barbara wirelettuce	*Stephanomeria elata*
	Small wirelettuce	*Stephanomeria exigua*
	Whiteplume wirelettuce	*Stephanomeria exigua* ssp. *carotifera*
	Whiteplume wirelettuce	*Stephanomeria exigua* ssp. *coronaria*
	Rod wirelettuce	*Stephanomeria virgata*

Family	Common Name	Scientific Name
	Wand wirelettuce	*Stephanomeria virgata* ssp. *pleurocarpa*
	Everlasting neststraw	*Stylocline gnaphaloides*
	Lemmon's syntrichopappus	*Syntrichopappus lemmonii*
	Common dandelion	*Taraxacum officinale*
	Silverpuffs	*Uropappus lindleyi*
	Shining mule ears	*Wyethia glabra*
	Whitehead wyethia	*Wyethia helenioides*
	Spiny cocklebur	*Xanthium spinosum*
	Cocklebur	*Xanthium strumarium*
Berberidaceae (Barberry)		
	California barberry	*Berberis pinnata* ssp. *pinnata*
Betulaceae (Birch)		
	White alder	*Alnus rhombifolia*
Boraginaceae (Borage)		
	Douglas' fiddleneck	*Amsinckia douglasiana*
	Eastwood's fiddleneck	*Amsinckia eastwoodiae*
	Common fiddleneck	*Amsinckia intermedia*
	Bugloss-flowered fiddleneck	*Amsinckia lycopsoides*
	Common fiddleneck	*Amsinckia menziesii*
	Rigid fiddleneck	*Amsinckia retrorsa*
	Cleveland's catseye	*Cryptantha clevelandii*
	Coastal cryptantha	*Cryptantha clevelandii* var. *florosa*
	Coast range cryptantha	*Cryptantha corollata*
	Gravel cryptantha	*Cryptantha decipiens*
	Weak-stemmed cryptantha	*Cryptantha flaccida*
	Clearwater catseye	*Cryptantha intermedia*
	Clearwater catseye	*Cryptantha intermedia var. intermedia*
	Tejon cryptantha	*Cryptantha microstachys*
	Prickly-nut cryptantha	*Cryptantha muricata*
	Sharp-nut cryptantha	*Cryptantha oxygona*
	Rattan's cryptantha	*Cryptantha rattanii*
	Few-flowered cryptantha	*Cryptantha sparsiflora*

Family	Common Name	Scientific Name
	Torrey's cryptantha	*Cryptantha torreyana*
	Whispering bells	*Emmenanthe penduliflora*
	Whispering bells	*Emmenanthe penduliflora* var. *penduliflora*
	California yerba santa	*Eriodictyon californicum*
	Woolly yerba santa	*Eriodictyon tomentosum*
	Spotted hideseed	*Eucrypta chrysanthemifolia*
	Spotted hideseed	*Eucrypta chrysanthemifolia* var. *chrysanthemifolia*
	Seaside heliotrope	*Heliotropium curassavicum*
	Seaside heliotrope	*Heliotropium curassavicum* var. *oculatum*
	Baby blue-eyes	*Nemophila menziesii*
	Baby blue-eyes	*Nemophila menziesii* var. *menziesii*
	Smallflower nemophila	*Nemophila parviflora*
	Smallflower nemophila	*Nemophila parviflora* var. *parviflora*
	Littlefoot nemophila	*Nemophila pedunculata*
	Eastwood's baby blue-eyes	*Nemophila pulchella*
	Fremont's baby blue-eyes	*Nemophila pulchella* var. *fremontii*
	Northern pectocarya	*Pectocarya penicillata*
	Little pectocarya	*Pectocarya pusilla*
	Shortlobe phacelia	*Phacelia brachyloba*
	Brewer's phacelia	*Phacelia breweri*
	Caterpillar scorpionweed	*Phacelia cicutaria* var. *hispida*
	Common phacelia	*Phacelia distans*
	Douglas' scorpionweed	*Phacelia douglasii*
	Rock phacelia	*Phacelia egena*
	Santa Lucia scorpionweed	*Phacelia grisea*
	Imbricate scorpionweed	*Phacelia imbricata*
	Imbricate scorpionweed	*Phacelia imbricata* ssp. *imbricata*
	Stinging scorpionweed	*Phacelia malvifolia*
	Shade phacelia	*Phacelia nemoralis*
	Branching phacelia	*Phacelia ramosissima*
	Rattan's phacelia	*Phacelia rattanii*
	Sweetscented phacelia	*Phacelia suaveolens*

Family	Common Name	Scientific Name
	Lacy scorpionweed	*Phacelia tanacetifolia*
	Tacky scorpioweed	*Phacelia viscida*
	Tacky scorpioweed	*Phacelia viscida var. viscida*
	Blue fiestaflower	*Pholistoma auritum*
	Blue fiestaflower	*Pholistoma auritum* var. *auritum*
	Adobe popcornflower	*Plagiobothrys acanthocarpus*
	Bracted popcornflower	*Plagiobothrys bracteatus*
	Valley popcornflower	*Plagiobothrys canescens*
	Hill Popcornflower	*Plagiobothrys collinus*
	Rough-stemmed popcornflower	*Plagiobothrys collinus* var. *fulvescens*
	Field popcornflower	*Plagiobothrys fulvus*
	Field popcornflower	*Plagiobothrys fulvus var. campestris*
Boraginaceae (Borage) continued…		
	Dye popcornflower	*Plagiobothrys infectivus*
	Rusty popcornflower	*Plagiobothrys nothofulvus*
	Stalked popcornflower	*Plagiobothrys stipitatus*
	Great valley popcornflower	*Plagiobothrys stipitatus* var. *micranthus*
	Pacific popcornflower	*Plagiobothrys tenellus*
	Rough-nutlet popcornflower	*Plagiobothrys trachycarpus*
	Hooked popcornflower	***Plagiobothrys uncinatus***
	Wavy-stemmed popcornflower	*Plagiobothrys undulatus*
Brassicaceae (Mustard)		
	Coast rockcress	*Arabis blepharophylla*
	Brewer's rockcress	*Arabis breweri*
	Common sandweed	*Athysanus pusillus*
	American yellowrocket	*Barbarea orthoceras*
	Early winter cress	*Barbarea verna*
	Brewer's rockcress	*Boechera breweri*
	Brewer's rockcress	*Boechera breweri* ssp. *breweri*
	Black mustard	*Brassica nigra*
	Sahara mustard	*Brassica tournefortii*
	Shepherd's purse	*Capsella bursa-pastoris*

Family	Common Name	Scientific Name
	Milk maids	*Cardamine californica*
	Hairy bittercress	*Cardamine hirsuta*
	Little western bittercress	*Cardamine oligosperma*
	California mustard	*Caulanthus lasiophyllus*
	Tansymustard	*Descurainia pinnata*
	Yellow tansy mustard	*Descurainia pinnata* ssp. *glabra*
	Menzie's tansy mustard	*Descurainia pinnata* ssp. *menziesii*
	Spring whitlowgrass	*Draba verna*
	Western wallflower	*Erysimum capitatum*
	Western wallflower	*Erysimum capitatum* var. *capitatum*
	Perennial mustard	*Hirschfeldia incana*
	Lens-podded hoary cress	*Lepidium chalepense*
	Heart-podded hoary cress	*Lepidium draba*
	Perennial pepperweed	*Lepidium latifolium*
	Dwarf pepperweed	*Lepidium latipes*
	Shining pepperweed	*Lepidium nitidum*
	Forked pepperweed	*Lepidium oxycarpum*
	Upright pepperweed	*Lepidium strictum*
	Sweet alyssum	*Lobularia maritima*
	Water cress	*Nasturtium officinale*
	Radish	*Raphanus sativus*
	Curvepod yellowcress	*Rorippa curvisiliqua*
	Yellow watercress	*Rorippa palustris*
	Bog yellowcress	*Rorippa palustris* ssp. *palustris*
	Charlock	*Sinapis arvensis*
	Tumble mustard	*Sisymbrium altissimum*
	Hedge mustard	*Sisymbrium officinale*
	Indian hedgemustard	*Sisymbrium orientale*
	Most beautiful jewelflower[4]	***Streptanthus albidus ssp. peramoenus***
	Bristly jewelflower	*Streptanthus glandulosus*
	Sand fringepod	*Thysanocarpus curvipes*
	Sand fringepod	*Thysanocarpus curvipes* ssp. *elegans*
	Santa Cruz Island fringepod	*Thysanocarpus laciniatus*
	Caper-fruited tropidocarpum	***Tropidocarpum capparideum***

Family	Common Name	Scientific Name
	Dobiepod	*Tropidocarpum gracile*
	Tower mustard	*Turritis glabra*
Campanulaceae (Bellflower)		
	Harebell	*Campanula griffinii*
	Toothed calicoflower	*Downingia cuspidata*
	Flatface calicoflower	*Downingia pulchella*
	San Gabriel bluecup	*Githopsis diffusa*
	San Gabriel bluecup	*Githopsis diffusa* ssp. *diffusa*
	San Gabriel bluecup	*Githopsis diffusa* ssp. *robusta*
	Common bluecup	*Githopsis specularioides*
	Rareflower heterocodon	*Heterocodon rariflorum*
	Smallflower threadplant	*Nemacladus ramosissimus*
Caprifoliaceae (Honeysuckle)		
	Pink honeysuckle	*Lonicera hispidula*
	Chaparral honeysuckle	*Lonicera interrupta*
Caprifoliaceae (Honeysuckle) continued…		
	Wild Honeysuckle	*Lonicera subspicata*
	Honeysuckle	*Lonicera subspicata* var. *denudata*
	Snowberry	*Symphoricarpos albus*
	Snowberry	*Symphoricarpos albus var. albus*
	Creeping snowberry	*Symphoricarpos mollis*
Caryophyllaceae (Pink)		
	Sticky mouse-ear chickweed	*Cerastium glomeratum*
	Spreading pygmyleaf	*Loeflingia squarrosa*
	California sandwort	*Minuartia californica*
	Cismontane minuartia	*Minuartia cismontana*
	Douglas' stitchwort	*Minuartia douglasii*
	Annual sandwort	*Minuartia pusilla*
	Proliferous pink	*Petrorhagia dubia*
	Four-leaved allseed	*Polycarpon tetraphyllum*
	Four-leaved allseed	*Polycarpon tetraphyllum* var. *tetraphyllum*
	Dwarf pearlwort	*Sagina apetala*
	Western pearlwort	*Sagina decumbens* ssp. *occidentalis*
	Soapwort	*Saponaria officinalis*
	Multinerved catchfly	*Silene coniflora*
	Small-flower catchfly	*Silene gallica*
	Mexican/Southern Pink	*Silene laciniata*
	California pink	*Silene laciniata* ssp. *californica*
	Lemmon's catchfly	*Silene lemmonii*
	San Francisco campion	*Silene verecunda*
	Stickwort	*Spergula arvensis*
	Boccone's sand-spurrey	*Spergularia bocconi*
	Red sand-spurrey	*Spergularia rubra*
	Common chickweed	*Stellaria media*
	Shining chickweed	*Stellaria nitens*
	Pale Starwort	*Stellaria pallida*
Chenopodiaceae (Goosefoot)		
	Tumbling oracle	*Atriplex rosea*
	Lamb's quarters	*Chenopodium album*
	Pitseed goosefoot	*Chenopodium berlandieri*
	California goosefoot	*Chenopodium californicum*
	Aridland goosefoot	*Chenopodium desiccatum*
	Desert goosefoot	*Chenopodium pratericola*
	Mexican tea	*Dysphania ambrosioides*
	Jerusalem oak	*Dysphania botrys*
	Tumbleweed	*Salsola tragus*
Cistaceae (Rock-rose)		
	Peak rush-rose	*Crocanthemum scoparium*
Convolvulaceae (Morning-glory)		
	Coast range false bindweed	*Calystegia collina*
	Coast range false bindweed	*Calystegia collina* ssp. *collina*
	Island false bindweed	*Calystegia macrostegia*
	Island false bindweed	*Calystegia macrostegia* ssp. *cyclostegia*
	San Diego morning glory	*Calystegia macrostegia* ssp. *tenuifolia*
	Sierra false bindweed	*Calystegia malacophylla*
	Jepson’s morning glory	*Calystegia malacophylla* ssp. *pedicellata*
	Pacific false bindweed	*Calystegia purpurata*
	Smooth western morning glory	*Calystegia purpurata* ssp. *purpurata*

Family	Common Name	Scientific Name
	Bindweed	*Convolvulus arvensis*
	Chapparal dodder	*Cuscuta californica*
	California dodder	*Cuscuta californica* var. *californica*
	Papillate dodder	*Cuscuta californica* var. *papillosa*
	Field dodder	*Cuscuta campestris*
	Canyon dodder	*Cuscuta subinclusa*
	California ponysfoot	*Dichondra donelliana*
Cornaceae (Dogwood)		
	Brown dogwood	*Cornus glabrata*
	Red osier dogwood	*Cornus sericea*
	American dogwood	*Cornus sericea* ssp. *occidentalis*
	Red osier dogwood	*Cornus sericea* ssp. *sericea*
Crassulaceae (Stonecrop)		
	Water pygmy-weed	*Crassula aquatica*
	Pygmy-weed	*Crassula connata*
Crassulaceae (Stonecrop) continued…		
	Moss pygmy-weed	*Crassula tillaea*
	Canyon liveforever	*Dudleya cymosa*
	Canyon liveforever	*Dudleya cymosa* ssp. *pumila*
	Lance-leaved dudleya	*Dudleya lanceolata*
	Mt. Hamilton mock stonecrop	*Sedella pentandra*
	Coast range stonecrop	*Sedum radiatum*
	Broadleaf stonecrop	*Sedum spathulifolium*
Cucurbitaceae (Gourd)		
	California man-root	*Marah fabacea*
Datiscaceae (Datisca)		
	Durango root	*Datisca glomerata*
Dipsacaceae (Teasel)		
	Wild teasel	*Dipsacus fullonum*
Elatinaceae (Waterwort)		
	Short-seed waterwort	*Elatine brachysperma*
	California waterwort	*Elatine californica*
Ericaceae (Heath)		
	Pacific madrone	*Arbutus menziesii*
	Eastwood's manzanita	*Arctostaphylos glandulosa*
	Cushing manzanita	*Arctostaphylos glandulosa* ssp. *cushingiana*

Family	Common Name	Scientific Name
	Eastwood's manzanita	*Arctostaphylos glandulosa* ssp. *glandulosa*
	Howell's manzanita	*Arctostaphylos glandulosa* ssp. *howellii*
	Bigberry manzanita	*Arctostaphylos glauca*
	Hoover's manzanita	*Arctostaphylos hooveri*
	Common manzanita	*Arctostaphylos manzanita* ssp. *manzanita*
	Bishop manzanita	*Arctostaphylos obispoensis*
	Point-leaf manzanita	*Arctostaphylos pungens*
Euphorbiaceae (Spurge)		
	Spotted spurge	*Chamaesyce maculata*
	Contura Creek sandmat	*Chamaesyce ocellata*
	Contura Creek sandmat	*Chamaesyce ocellata* ssp. *ocellata*
	Prostrate sandmat	*Chamaesyce prostrata*
	Thymeleaf sandmat	*Chamaesyce serpyllifolia*
	Thyme-leaved spurge	*Chamaesyce serpyllifolia* ssp. *hirtula*
	Thyme-leaved spurge	*Chamaesyce serpyllifolia* ssp. *serpyllifolia*
	Turkey-mullein	*Croton setigerus*
	Chinese caps	*Euphorbia crenulata*
	Warty spurge	*Euphorbia spathulata*
Fabaceae (Legume)		
	American Lotus, Spanish-Clover	*Acmispon americanus*
	Spanish lotus	*Acmispon americanus* var. *americanus*
	Canyon bird's-foot trefoil	*Acmispon argyraeus*
	Canyon bird's-foot trefoil	*Acmispon argyraeus var. multicaulis*
	Foothill deervetch	*Acmispon brachycarpus*
	Deerweed	*Acmispon glaber*
	Common deerweed	*Acmispon glaber* var. *glaber*
	Chaparral bird's-foot trefoil	*Acmispon grandiflorus*
	Chaparral birdsfoot trefoil	*Acmispon grandiflorus* var. *grandiflorus*
	Woolly lotus	*Acmispon heermannii*

Family	Common Name	Scientific Name
	Heermann's Lotus	*Acmispon heermannii var. heermannii*
	Foothill deervetch	*Acmispon humistratus*
	Alkali Lotus	*Acmispon maritimus*
	Coastal birdsfoot trefoil	*Acmispon maritimus* var. *maritimus*
	Desert deervetch	*Acmispon parviflorus*
	Silky deerweed	*Acmispon procumbens*
	Silky deerweed	*Acmispon procumbens* var. *procumben*
	Bishop lotus	*Acmispon strigosus*
	Chilean birdsfoot trefoil	*Acmispon wrangelianus*
	California false indigo	*Amorpha californica*
	California false indigo	*Amorpha californica* var. *californica*
	San Joaquin milkvetch	*Astragalus asymmetricus*
	Jacumba milkvetch	*Astragalus douglasii*
	Douglas's milkvetch	*Astragalus douglasii* var. *douglasii*
Fabaceae (Legume) continued…		
	Gambel's milkvetch	*Astragalus gambelianus*
	Salinas millkvetch	*Astragalus macrodon*
	Nuttall's milkvetch	*Astragalus nuttallii*
	Crown vetch	*Coronilla varia*
	French broom	*Genista monspessulana*
	Large leatherroot	*Hoita macrostachya*
	Roundleaf leatherroot	*Hoita orbicularis*
	Streambank birdsfoot trefoil	*Hosackia oblongifolia*
	Streambank birdsfoot trefoil	*Hosackia oblongifolia* var. *oblongifolia*
	Sweet Pea	*Lathyrus vestitus*
	Wild pea	*Lathyrus vestitus* var. *vestitus*
	Canyon bird's-foot trefoil	*Acmispon argyraeus* ssp. *multicaulis*
	Canyon bird's-foot trefoil	*Lotus argyraeus*
	Bird's-foot trefoil	*Lotus corniculatus*
	Short podded lotus	*Acmispon brachycarpus*
	Small flowered lotus	*Acmispon micranthus*
	Streambank bird's-foot trefoil	*Hosackia oblongifolia*
	Streambank bird's-foot trefoil	*Hosackia oblongifolia var. oblongifolia*

Family	Common Name	Scientific Name
	American Lotus, Spanish-Clover	*Acmispon americanus*
	American Lotus, Spanish-Clover	*Acmispon americanus var. americanus*
	Deerweed	*Acmispon glaber*
	Strigose Lotus	*Acmispon strigosus*
	Chilean bird's-foot trefoil	*Acmispon wrangelianus*
	Sicklekeel lupine	*Lupinus albicaulis* var. *albicaulis*
	Silver bush lupine	*Lupinus albifrons*
	Abram's lupine	*Lupinus albifrons var. abramsii*
	Silver lupine	*Lupinus albifrons* var. *albifrons*
	Silver lupine	*Lupinus albifrons* var. *collinus*
	Spider lupine	*Lupinus benthamii*
	Miniature lupine	*Lupinus bicolor*
	Santa Lucia lupine	*Lupinus cervinus*
	Bajada lupine	*Lupinus concinnus*
	Summer lupine	*Lupinus formosus*
	Summer lupine	*Lupinus formosus* var. *formosus*
	Stinging lupine	*Lupinus hirsutissimus*
	Chick lupine	*Lupinus microcarpus*
	Chick lupine	*Lupinus microcarpus* var. *densiflorus*
	Chick lupine	*Lupinus microcarpus* var. *microcarpus*
	Sky lupine	*Lupinus nanus*
	Sky lupine	*Lupinus nanus* ssp. *nanus*
	Big pod lupine	*Lupinus pachylobus*
	Coulter's lupine	*Lupinus sparsiflorus*
	Arroyo lupine	*Lupinus succulentus*
	California burclover	*Medicago polymorpha*
	White sweetclover	*Melilotus albus*
	Sourclover	*Melilotus indicus*
	Chaparral Pea	*Pickeringia montana*
	Chaparral pea	*Pickeringia montana* var. *montana*
	Black locust	*Robinia pseudoacacia*
	Forest scurfpea	*Rupertia physodes*
	Purple crownvetch	*Coronilla varia*
	California goldenbanner	*Thermopsis californica*

Family	Common Name	Scientific Name
	California goldenbanner	*Thermopsis californica* var. *californica*
	Rancheria clover	*Trifolium albopurpureum*
	Bearded clover	*Trifolium barbigerum*
	Pinole clover	*Trifolium bifidum* var. *bifidum*
	Foothill clover	*Trifolium ciliolatum*
	Cowbag clover	*Trifolium depauperatum*
	Balloon sack clover	*Trifolium depauperatum* var. *amplectens*
	Truncate sack clover	*Trifolium depauperatum* var. *truncatum*
	Branched Indian clover	*Trifolium dichotomum*
	Bull clover	*Trifolium fucatum*
	Pinpoint clover	*Trifolium gracilentum*
	Gray's clover	*Trifolium grayi*
	Rose clover	*Trifolium hirtum*
	Small-head clover	*Trifolium microcephalum*
	Thimble clover	*Trifolium microdon*
	Clammy clover	*Trifolium obtusiflorum*
	Few-flowered clover	*Trifolium oliganthum*
	White clover	*Trifolium repens*
	Whitetip clover	*Trifolium variegatum*
	Small-flowered variegated clover	*Trifolium variegatum* var. *geminiflorum*
	Large variegated clover	*Trifolium variegatum* var. *major*
	Variegated clover	*Trifolium variegatum* var. *variegatum*
	Tomcat clover	*Trifolium willdenovii*
	Purple vetch	*Vicia benghalensis*
	Slender vetch	*Vicia hassei*
	Deer Pea Vetch	*Vicia ludoviciana*
	Deerpea vetch	*Vicia ludoviciana* var. *ludoviciana*
	Narrowleaf vetch	*Vicia sativa*
	Narrow-leaved vetch	*Vicia sativa* ssp. *nigra*
	Hairy vetch	*Vicia villosa*
	Woollypod vetch	*Vicia villosa* ssp. *varia*
	Winter vetch	*Vicia villosa* ssp. *villosa*
Fagaceae (Oak)		

Family	Common Name	Scientific Name
	Tanoak	*Notholithocarpus densiflorus*
	Tan oak	*Notholithocarpus densiflorus* var. *densiflorus*
	Coast Live Oak	*Quercus agrifolia*
	Coast live oak	*Quercus agrifolia* var. *agrifolia*
	Scrub oak	*Quercus berberidifolia*
	Canyon live oak	*Quercus chrysolepis*
	Blue oak	*Quercus douglasii*
	Nuttall's scrub oak[4]	***Quercus dumosa***
	Leather oak	*Quercus durata*
	Leather oak	*Quercus durata* var. *durata*
	Oak hybrid	*Quercus hybrid*
		*(Q. agrifolia X Q. par*vula *var. shrevei or Q. wislizeni)*
	Oak hybrid	*Quercus hybrid*
		(Q. berberidifolia or Q. durata X Q. lobata)
	Oak hybrid	*Quercus hybrid*
		*(Q. wislizenii X Q. par*vula *var. shrevei)*
	Tucker's oak	*Quercus john-tuckeri*
	Valley oak	*Quercus lobata*
	Shreve oak	*Quercus parvula* var. *shrevei*
	Interior live oak	*Quercus wislizeni*
	Interior live oak	*Quercus wislizeni* var. *frutescens*
	Interior live oak	*Quercus wislizeni* var. *wislizeni*
	Alvord's oak	*Quercus X alvordiana*
		(Q. douglasii X Q. john-tuckeri)
	Jolon's oak	*Quercus X jolonensis*
		(Q. douglasii X Q. lobata)
Frankeniaceae (Frankenia)		
	Alkali heath	*Frankenia salina*
Garryaceae (Silk tassel)		
	Ashy silktassel	*Garrya flavescens*
	Canyon silktassel	*Garrya veatchii*
Gentianaceae (Gentian)		
	Slender centaury	*Centaurium tenuiflorum*

Family	Common Name	Scientific Name
	Timwort	*Cicendia quadrangularis*
	Davy's centaury	*Zeltnera davyi*
	Tall centaury	*Zeltnera exaltata*
	Monterey centaury	*Zeltnera muehlenbergii*
Geraniaceae (Geranium)		
	Longbeak stork's bill	*Erodium botrys*
	Shortfruit stork's bill	*Erodium brachycarpum*
	Redstem filaree	*Erodium cicutarium*
	Greenstem filaree	*Erodium moschatum*
	Bicknell's crane's-bill	*Geranium bicknellii*
	Carolina geranium	*Geranium carolinianum*
	Alderney crane's-bill	*Geranium core-core*
	Cutleaf geranium	*Geranium dissectum*
	Small geranium	*Geranium pusillum*
Grossulariaceae (Gooseberry)		
	Golden currant	*Ribes aureum*
	Golden currant	*Ribes aureum* var. *gracillimum*
	Hillside gooseberry	*Ribes californicum*
	Hillside gooseberry	*Ribes californicum.* var. *californicum*
	Chaparral currant	*Ribes malvaceum*
	Chaparral currant	*Ribes malvaceum* var. *malvaceum*
	Chaparral currant	*Ribes malvaceum* var. *viridifolium*
	Canyon gooseberry	*Ribes menziesii var. menziesii*
	Oakwoods gooseberry	*Ribes quercetorum*
	Fuchsia-flowered gooseberry	*Ribes speciosum*
Hydrangeaceae (Hydrangea)		
	Modesty	*Whipplea modesta*
Hypericaceae (St. John's Wort)		
	Scouler's St. Johnswort	*Hypericum scouleri*
Juglandaceae (Walnut)		
	Southern California black walnut	*Juglans californica*
	Northern California black walnut	*Juglans hindsii*
Lamiaceae (Mint)		
	San Benito thorn-mint	*Acanthomintha obovata*
	San Benito thorn mint	*Acanthomintha obovata* ssp. *obovata*

Family	Common Name	Scientific Name
	Yerba buena	*Clinopodium douglasii*
	Monkey-flower savory	*Clinopodium mimuloides*
	Henbit	*Lamium amplexicaule*
	Woodbalm	*Lepechinia calycina*
	Horehound	*Marrubium vulgare*
	Field mint	*Mentha arvensis*
	American cornmint	*Mentha canadensis*
	Peppermint	*Mentha X piperita*
	Bush mint	*Mentha spicata*
	Spearmint	*Mentha spicata* var. *spicata*
	Brewer's monardella	*Monardella breweri*
	Palmer's monardella	***Monardella palmeri***
	Coyote mint	*Monardella villosa*
	Coyote mint	*Monardella villosa* ssp. *obispoensis*
	Coyote mint	*Monardella villosa* ssp. *villosa*
	Santa Lucia mint	***Pogogyne clareana***
	Thymeleaf beardstyle	*Pogogyne serpylloides*
	Sacramento beardstyle	*Pogogyne zizyphoroides*
	Common selfheal	*Prunella vulgaris*
	Self-heal	*Prunella vulgaris* var. *lanceolata*
	Lance selfheal	*Prunella vulgaris* ssp. *lanceolata*
	Thistle sage	*Salvia carduacea*
	Chia	*Salvia columbariae*
	Black sage	*Salvia mellifera*
	Creeping sage	*Salvia sonomensis*
	California hummingbird sage	*Salvia spathacea*
	Skullcap	*Scutellaria tuberosa*
	Hedge-nettle	*Stachys ajugoides*
	California hedge-nettle	*Stachys bullata*
	Short-spiked hedge-nettle	*Stachys pycnantha*
	Rough hedgenettle	*Stachys rigida*
	Oak Hedge-Nettle	*Stachys rigida var. quercetorum*
	Woolly blue curls	*Trichostema lanatum*
	Vinegar weed	*Trichostema lanceolatum*
Limnanthaceae (Meadowfoam)		

Family	Common Name	Scientific Name
	Douglas' meadowfoam	*Limnanthes douglasii*
	Douglas' meadowfoam	*Limnanthes douglasii* ssp. *douglasii*
	Douglas' meadowfoam	*Limnanthes douglasii* ssp. *nivea*
Linaceae (Flax)		
	Smallflower dwarfflax	*Hesperolinon micranthum*
Loasaceae (Loasa)		
	Yellow blazing star	*Mentzelia affinis*
	Nevada blazing star	*Mentzelia dispersa* var. *obtusa*
	Blazing star	*Mentzelia gracilenta*
	Giant blazing star	*Mentzelia laevicaulis*
	Smoothstem blazingstar	*Mentzelia laevicaulis var. laevicaulis*
	Lindley's blazing star	*Mentzelia lindleyi*
	San Luis stick leav	*Mentzelia micrantha*
Lythraceae (Loosestrife)		
	California loosestrife	*Lythrum californicum*
	Hyssop loosestrife	*Lythrum hyssopifolia*
Malvaceae (Mallow)		
	Parry's mallow	*Eremalche parryi* ssp. *parryi*
	Flannelbush	*Fremontodendron californicum*
	Abbot's bush mallow	***Malacothamnus abbottii***
	Davidson's bush-mallow	***Malacothamnus davidsonii***
	Jones' bush-mallow	*Malacothamnus jonesii*
	Palmer bush-mallow	*Malacothamnus palmeri*
	Carmel Valley bush-mallow	***Malacothamnus palmeri* var. *involucratus***
	Bull mallow	*Malva nicaeensis*
	Cheeseweed	*Malva parviflora*
	Alkali-mallow	*Malvella leprosa*
	Fringed checkerblooom	*Sidalcea diploscypha*
	Chaparral checkerbloom	*Sidalcea hickmanii*
	Hickman's checker-mallow	***Sidalcea hickmanii* ssp. *hickmanii***
	Checkerbloom	*Sidalcea malviflora*
	Geranium-leaved checkerbloom	*Sidalcea malviflora* ssp. *laciniata*
	Dwarf checkerbloom	*Sidalcea malviflora* ssp. *malviflora*
Meliaceae (Mahogany)		

Family	Common Name	Scientific Name
	China berry tree	*Melia azedarach*
Molluginaceae (Carpet-weed)		
	Lotus sweetjuice	*Glinus lotoides*
	Green carpetweed	*Mollugo verticillata*
Montiaceae (Miner's lettuce)		
	Brewer's calandrinia	*Calandrinia breweri*
	Red maids	*Calandrinia ciliata*
	Red Maids	*Calandrinia menziesii*
	Common pussypaws	*Calyptridium monandrum*
	Santa Cruz mountains pussypaws	***Calyptridium parryi* var. *hesseae***
	Common Calyptridium	*Cistanthe monandra*
	serpentine springbeauty	*Claytonia exigua*
	Little spring beauty	*Claytonia exigua* ssp. *exigua*
	Gypsum spring beauty	*Claytonia gypsophiloides*
	Streambank springbeauty	*Claytonia parviflora*
	Miner's lettuce	*Claytonia parviflora* ssp. *parviflora*
	Green miner's lettuce	*Claytonia parviflora* ssp. *viridis*
	Miner's-Lettuce	*Claytonia perfoliata*
	Southern miner's lettuce	*Claytonia perfoliata* ssp. *mexicana*
	Miner's lettuce	*Claytonia perfoliata* ssp. *perfoliata*
	Red stemmed miner's lettuce	*Claytonia rubra* ssp. *rubra*
	Oregon bitterroot	*Lewisia rediviva*
	Small bitterroot	*Lewisia rediviva* var. *minor*
	Bitterroot	*Lewisia rediviva* var. *rediviva*
	Water chickweed	*Montia fontana*
Myrsinaceae (Myrsine)		
	Scarlet pimpernel	*Anagallis arvensis*
	Chaffweed	*Anagallis minima*
Myrtaceae (Myrtle)		
	Red iron bark	*Eucalyptus sideroxylon*
Nyctacinaceae (Four o'clock)		
	Common four-o'clock	*Mirabilis jalapa*
	Marvel of Peru	*Mirabilis jalapa* var. *jalapa*
Oleaceae (Olive)		
	Desert olive	*Forestiera pubescens*

Family	Common Name	Scientific Name
	California ash	*Fraxinus dipetala*
	Olive	*Olea europea*
Onagraceae (Evening-primrose)		
	Mojave suncup	*Camissonia campestris*
	Mojave suncup	*Camissonia campestris* ssp. *campestris*
	Obispo suncup	*Camissonia campestris* ssp. *obispoensis*
	Plains eveningprimrose	*Camissonia contorta*
	Sandysoil suncup	*Camissonia strigulosa*
	Hardham's evening-primrose	***Camissoniopsis hardhamiae***
	Santa Cruz Island suncup	*Camissoniopsis hirtella*
	Intermediate suncup	*Camissoniopsis intermedia*
	Miniature suncup	*Camissoniopsis micrantha*
	Chaparral fairyfan	*Clarkia affinis*
	Punchbowl godetia	*Clarkia bottae*
	Speckled clarkia	*Clarkia cylindrica*
	Speckled fairyfan	*Clarkia cylindrica* ssp. *cylindrica*
	Canyon fairyfan	*Clarkia epilobioides*
	Jolon clarkia	***Clarkia jolonensis***
	Lewis' clarkia	*Clarkia lewisii*
	Waltham Creek clarkia	*Clarkia modesta*
	Winecup clarkia	*Clarkia purpurea*
	Winecup fairyfan	*Clarkia purpurea* ssp. *quadrivulnera*
	Winecup fairyfan	*Clarkia purpurea* ssp. *viminea*
	Diamond fairyfan	*Clarkia rhomboidea*
	Ruby chalice clarkia	*Clarkia rubicunda*
	Ramona fairyfan	*Clarkia similis*
	Redspot clarkia	*Clarkia speciosa*
	Redspot fairyfan	*Clarkia speciosa* ssp. *speciosa*
	Elegant fairyfan	*Clarkia unguiculata*
	Autumn willowweed	*Epilobium brachycarpum*
	Smooth spike primrose	*Epilobium campestre*
	California Fuchsia, Hummingbird Trumpet	*Epilobium canum*
	Hummingbird trumpet	*Epilobium canum* ssp. *canum*
	Willow Herb	*Epilobium ciliatum*

Family	Common Name	Scientific Name
	Coast willowweed	*Epilobium ciliatum* ssp. *ciliatum*
	Northern willowherb	*Epilobium ciliatum* ssp. *watsonii*
	Dense flowered spike primrose	*Epilobium densiflorum*
	Small willowweed	*Epilobium minutum*
	Torrey's willowherb	*Epilobium torreyi*
	Booth's evening primrose	*Eremothera boothii*
	Shredding evening-primrose	*Eremothera boothii* ssp. *decorticans*
	Creeping waterprimrose	*Ludwigia peploides*
	Floating primrosewillow	*Ludwigia peploides* ssp. *peploides*
	Tall Evening-Primrose	*Oenothera elata*
	Hooker's evening-primrose	*Oenothera elata* ssp. *hirsutissima*
	Slenderflower suncup	*Tetrapteron graciliflorum*
Orobanchaceae (Broomrape)		
	Coast Paintbrush	*Castilleja affinis*
	Coast indian paintbrush	*Castilleja affinis* ssp. *affinis*
	Martin's paintbrush	*Castilleja applegatei* ssp. *martinii*
	Valley tassel	*Castilleja attenuata*
	Denseflower indian paintbrush	*Castilleja densiflora*
	Denseflower indian paintbrush	*Castilleja densiflora* ssp. *densiflora*
	Denseflower indian paintbrush	*Castilleja densiflora* ssp. *gracilis*
	Purple Owl's-Clover	*Castilleja exserta*
	Purple owl's-clover	*Castilleja exserta* ssp. *exserta*
	Woolly paintbrush	*Castilleja foliolosa*
	Indian paintbrush	*Castilleja hybrid swarm*
	Lesser indian paintbrush	*Castilleja minor*
	Lesser indian paintbrush	*Castilleja minor* ssp. *spiralis*
	Stiffbranch Bird's Beak	*Cordylanthus rigidus*
	Stiffbranch bird's beak	*Cordylanthus rigidus* ssp. *rigidus*
	Dark-Tip Bird's Beak	*Cordylanthus rigidus* ssp. *setiger*
	Chaparral broomrape	*Aphyllon tuberosum*
	Naked broomrape	*Aphyllon purpureum*
	Warrior's plume	*Pedicularis densiflora*

Family	Common Name	Scientific Name
	Johnny-tuck	*Triphysaria eriantha*
	Butter-and-eggs	*Triphysaria eriantha* ssp. *eriantha*
	Johnny-tuck	*Triphysaria eriantha* ssp. *rosea*
	Little butter-and-eggs	*Triphysaria micrantha*
	Dwarf owl's clover	*Triphysaria pusilla*
Oxalidaceae (Oxalis)		
	Bermuda buttercup	*Oxalis pes-caprae*
	Radishroot woodsorrel	*Oxalis pilosa*
Paeoniaceae (Peony)		
	Peony	*Paeonia californica*
Papaveraceae (Poppy)		
	Chicalote	*Argemone munita*
	Bush poppy	*Dendromecon rigida*
	Golden eardrops	*Ehrendorferia chrysantha*
	Tufted poppy	*Eschscholzia caespitosa*
	California poppy	*Eschscholzia californica*
	San Benito poppy	*Eschscholzia hypecoides*
	Lemmon's poppy	*Eschscholzia lemmonii*
	Lemmon's goldenpoppy	*Eschscholzia lemmonii* ssp. *lemmonii*
	Diamond-petaled poppy	*Eschscholzia rhombipetala*
	Wind poppy	*Papaver heterophyllum*
	Cream cups	*Platystemon californicus*
Phrymaceae (Lopseed)		
	Santa Lucia monkeyflower	***Erythranthe hardhamiae***
	Sticky monkeyflower	*Diplacus aurantiacus*
	Sticky monkeyflower	*Diplacus grandiflorus*
	Bolander's monkeyflower	*Diplacus bolanderi*
	Scarlet monkeyflower	*Erythranthe cardinalis*
	Congdon's monkeyflower	*Erythranthe congdonii*
	Purple mouse ears	*Diplacus douglasii*
	Manyflowered monkeyflower	*Erythranthe floribundus*
	Fremont's monkeyflower	*Diplacus fremontii*
	Yellow monkeyflower	*Erythranthe guttatus*

Family	Common Name	Scientific Name
	Broad toothed monkeyflower	*Erythranthe latidens*
	Palmer's monkeyflower	*Erythranthe palmeri*
	False monkeyflower	*Mimetanthe pilosa*
	Rattan's monkeyflower	*Diplacus rattanii*
Plantaginaceae (Plantain)		
	Kellogg snapdragon	*Antirrhinum kelloggii*
	Multiflora snapdragon	*Antirrhinum thompsonii*
	Water starwort	*Callitriche heterophylla*
	Bolander's water starwort	*Callitriche heterophylla* var. *bolanderi*
	Varied leaved water starwort	*Callitriche heterophylla* var. *heterophylla*
	Winged water starwort	*Callitriche marginata*
	Effluent water starwort	*Callitriche trochlearis*
	San Antonio collinsia	***Collinsia antonina***
	White blue eyed Mary	*Collinsia bartsiifolia*
	Davidson's blue-eyed Mary	*Collinsia bartsiifolia* var. *davidsonii*
	Chinese houses	*Collinsia heterophylla*
	Parry's blue eyed Mary	*Collinsia parryi*
	Blue-eyed Mary	*Collinsia parviflora*
	Spinster's blue eyed Mary	*Collinsia sparsiflora*
	Spinster's blue-eyed Mary	*Collinsia sparsiflora* var. *collina*
	Gaping keckiella	*Keckiella breviflora*
	Gaping penstemon	*Keckiella breviflora* var. *breviflora*
	Red beardtongue	*Keckiella corymbosa*
	Roundleaf cancerwort	*Kickxia spuria*
	Kellogg's snapdragon	*Neogaerrhinum strictum*
	Blue toadflax	*Nuttallanthus texanus*
	Scarlet bugler	*Penstemon centranthifolius*
	Bunchleaf penstemon	*Penstemon heterophyllus*
	Foothill penstemon	*Penstemon heterophyllus* var. *heterophyllus*
	Buckhorn plantain	*Plantago coronopus*
	Dwarf plantain	*Plantago erecta*
	English plantain	*Plantago lanceolata*
	Common plantain	*Plantago major*

Family	Common Name	Scientific Name
	Mexican plantain	*Plantago subnuda*
	Water speedwell	*Veronica anagallis-aquatica*
	Speedwell	*Veronica arvensis*
	Chain speedwell	*Veronica catenata*
	Neckweed	*Veronica peregrina*
	Purslane speedwell	*Veronica peregrina* ssp. *xalapensis*
	Persian speedwell	*Veronica persica*
Platanaceae (Sycamore)		
	Western Sycamore	*Platanus racemosa*
Polemoniaceae (Phlox)		
	Purple false gilyflower	*Allophyllum divaricatum*
	Dense false gilyflower	*Allophyllum gilioides*
	Dense false gilyflower	*Allophyllum gilioides* ssp. *gilioides*
	Dense false gilyflower	*Allophyllum gilioides* ssp. *violaceum*
	Grand collomia	*Collomia grandiflora*
	Variable-leaf collomia	*Collomia heterophylla*
	Shrubby eriastrum	*Eriastrum densifolium*
	Giant eriastrum	*Eriastrum densifolium* ssp. *elongatum*
	Yellow-flowered eriastrum	***Eriastrum luteum***
	California gilia	*Gilia achilleifolia*
	California gilia	*Gilia achilleifolia* ssp. *achilleifolia*
	California gilia	*Gilia achilleifolia* ssp. *multicaulis*
	Chaparral gilia	*Gilia angelensis*
	Ball/Bluehead Gilia	*Gilia capitata*
	Bluehead gilia	*Gilia capitata* ssp. *abrotanifolia*
	Bluehead gilia	*Gilia capitata* ssp. *staminea*
	Purplespot gilia	*Gilia clivorum*
	Nevada gilia	*Gilia jacens*
	California gilia	*Gilia multicaulis*
	Volcanic gilia	*Gilia ochroleuca*
	Volcanic gilia	*Gilia ochroleuca* ssp. *bizonata*
	Greater yellowthroat gilia	*Gilia tenuiflora Benth.*
	Greater yellowthroat gilia	*Gilia tenuiflora* ssp. *amplifaucalis*
	Greater yellowthroat gilia	*Gilia tenuiflora* ssp. *tenuiflora*
	Bird's-eye gilia	*Gilia tricolor*
	Bird's-eye gilia	*Gilia tricolor* ssp. *diffusa*
	True babystars	*Leptosiphon bicolor*
	Whisker brush	*Leptosiphon ciliatus*
	Narrowflower flaxflower	*Leptosiphon liniflorus*
	Variable linanthus	*Leptosiphon parviflorus*
	Pygmy linanthus	*Leptosiphon pygmaeus*
	Pygmy linanthus	*Leptosiphon pygmaeus* ssp. *continentalis*
	Bigelow's linanthus	*Linanthus bigelovii*
	Evening snow	*Linanthus dichotomus* ssp. *dichotomus*
	Eveningsnow	*Linanthus dichotomus*
	Slender phlox	*Microsteris gracilis*
	Hollyleaf pincushionplant	*Navarretia atractyloides*
	Honeyscented pincushionplant	*Navarretia mellita*
	Mitrefruit pincushionplant	*Navarretia mitracarpa*
	Adobe navarretia	*Navarretia nigelliformis*
	Prostrate pincushionplant	***Navarretia prostrata***
	Downy pincushionplant	*Navarretia pubescens*
	Skunkbush	*Navarretia squarrosa*
	Grinnell's gilia	*Saltugilia splendens*
	Grand gilia	*Saltugilia splendens* ssp. *splendens*
Polygalaceae (Milkwort)		
	California milkwort	*Polygala californica*
Polygonaceae (Buckwheat)		
	Indian Valley spineflower	***Aristocapsa insignis***
	Two-lobe spineflower	*Chorizanthe biloba*
	Two-lobe spineflower	*Chorizanthe biloba* var. *biloba*
	Cleveland's spineflower	*Chorizanthe clevelandii*
	Douglas' spineflower	*Chorizanthe douglasii*
	Pink spineflower	*Chorizanthe membranacea*
	Spoon-sepal spineflower	*Chorizanthe obovata*
	Palmer's spineflower	*Chorizanthe palmeri*
	Straight-awned spineflower	***Chorizanthe rectispina***
	Turking rugging	*Chorizanthe staticoides*

Family	Common Name	Scientific Name
	One-awn spineflower	*Chorizanthe uniaristata*
	Angle-stem wild buckwheat	*Eriogonum angulosum*
	Bailey's wild buckwheat	*Eriogonum baileyi* var. *baileyi*
	Coville's wild buckwheat	*Eriogonum covilleanum*
	Elegant wild buckwheat	*Eriogonum elegans*
	Long-stem wild buckwheat	*Eriogonum elongatum* var. *elongatum*
	California Buckwheat	*Eriogonum fasciculatum*
	Leafy California buckwheat	*Eriogonum fasciculatum*var. *foliolosum*
	Mojave Desert California buckwheat	*Eriogonum fasciculatum* var. *polifolium*
	Slender Buckwheat	*Eriogonum gracile*
	Slender woolly wild buckwheat	*Eriogonum gracile*var. *gracile*
	Hairy-flower wild buckwheat	*Eriogonum hirtiflorum*
	Nakedstem buckwheat	*Eriogonum nudum*
	Ear-shaped wild buckwheat	*Eriogonum nudum* var. *auriculatum*
	Little-flower wild buckwheat	*Eriogonum nudum* var. *pauciflorum*
	Fremon't wild buckwheat	*Eriogonum nudum* var. *pubiflorum*
	Wand wild buckwheat	*Eriogonum roseum*
	Hoary wild buckwheat	*Eriogonum saxatile*
	Two-toothed wild buckwheat	*Eriogonum viridescens*
	Wright's buckwheat	*Eriogonum wrightii*
	Rough-node bastard-sage	*Eriogonum wrightii* var. *trachygonum*
	Wright's bastardsage	*Eriogonum wrightii var. wrightii*
	Water smartweed	*Persicaria amphibia*
	Willow weed	*Persicaria lapathifolia*
	Lady's thumb	*Persicaria maculosa*
	Dotted smartweed	*Persicaria punctata*
	Knotweed	*Polygonum aviculare*
	Knotweed	*Polygonum aviculare* ssp. *depressum*
	Fairy mist	*Pterostegia drymarioides*
	Sheep sorrel	*Rumex acetosella*
	Clustered dock	*Rumex conglomeratus*
	Curly dock	*Rumex crispus*

Family	Common Name	Scientific Name
	Willow dock	*Rumex salicifolius*
	Vortriede's spineflower	*Systenotheca vortriedei*
Portulacaceae (Purslane)		
	Purslane	*Portulaca oleracea*
Primulaceae (Primrose)		
	Padre's shootingstar	*Primula clevelandii var. insularis*
	Padre's shootingstar	*Primula clevelandii var. gracilis*
	Mosquito bills	*Primula hendersonii*
Ranunculaceae (Buttercup)		
	Van Houtte's columbine	*Aquilegia eximia*
	Sitka columbine	*Aquilegia formosa*
	Chaparral clematis	*Clematis lasiantha*
	Western virgin's bower	*Clematis ligusticifolia*
	California larkspur	*Delphinium californicum*
	Scarlet larkspur	*Delphinium cardinale*
	Gypsum-loving larkspur	*Delphinium gypsophilum*
	Foothill larkspur	*Delphinium hesperium*
	Western larkspur	*Delphinium hesperium* ssp. *hesperium*
	Pale-flowered western larkspur	*Delphinium hesperium* ssp. *pallescens*
	Red larkspur	*Delphinium nudicaule*
	San bernardino larkspur	*Delphinium parryi*
	Parry's larkspur	*Delphinium parryi* ssp. *parryi*
	Zigzag larkspur	*Delphinium patens*
	Zigzag larkspur	*Delphinium patens* ssp. *hepaticoideum*
	Umbrella larkspur	***Delphinium umbraculorum***
	Royal larkspur	*Delphinium variegatum*
	Larkspur hybrid	*Delphinium variegatum X Delphinium patens*
	Western rue-anemone	*Enemion occidentale*
	White water-crowfoot	*Ranunculus aquatilis*
	White water crowsfoot	*Ranunculus aquatilis* var. *aquatilis*
	White water crowsfoot	*Ranunculus aquatilus* var. *diffusus*
	California buttercup	*Ranunculus californicus*

Family	Common Name	Scientific Name
	California Buttercup	*Ranunculus californicus var. californicus*
	Delicate buttercup	*Ranunculus hebecarpus*
	Woodland buttercup	*Ranunculus uncinatus*
	Fendler's Meadow-Rue	*Thalictrum fendleri*
	Torrey's meadowrue	*Thalictrum fendleri var. polycarpum*
	Smooth-Leaf Meadow-Rue	*Thalictrum polycarpum*
Rhamnaceae (Buckthorn)		
	Buckbrush	*Ceanothus cuneatus*
	Buckbrush	*Ceanothus cuneatus* var. *cuneatus*
	Wavyleaf ceanothus	*Ceanothus foliosus*
	La Cuesta ceanothus	*Ceanothus foliosus* var. *medius*
	Deerbrush	*Ceanothus integerrimus*
	Deerbrush	*Ceanothus integerrimus* var. *macrothyrsus*
	Chaparral whitethorn	*Ceanothus leucodermis*
	Hairy ceanothus	*Ceanothus oliganthus*
	Explorer's bush	*Ceanothus oliganthus* var. *oliganthus*
	Jim brush	*Ceanothus oliganthus var. sorediatus*
	Ceanothus hybrid	*Ceanothus oliganthus* var. *sorediatus X C. papillosus*
	Waterleaf ceanothus	*Ceanothus papillosus*
	Wartleaf ceanothus	*Ceanothus papillosus var. roweanus*
	Jim Brush	*Ceanothus sorediatus*
	California Coffeeberry	*Frangula californica*
	California coffee berry	*Frangula californica* ssp. *californica*
	Spiny redberry	*Rhamnus crocea*
	Hollyleaf redberry	*Rhamnus ilicifolia*
	Mountain coffeeberry	*Rhamnus tomentella*
	Hoary coffeeberry	*Rhamnus tomentella* ssp. *tomentella*
Rosaceae (Rose)		
	Chamise	*Adenostoma fasciculatum*
	Chamise	*Adenostoma fasciculatum var. fasciculatum*
	Utah service-berry	*Amelanchier utahensis*

Family	Common Name	Scientific Name
	Field parsley piert	*Aphanes occidentalis*
	Birch-Leaf Mountain-Mahogany	*Cercocarpus betuloides*
	Birch-leaf mountain-mahogany	*Cercocarpus betuloides* var. *betuloides*
	Quince	*Cydonia oblonga*
	Sticky Cinquefoil	*Drymocallis glandulosa*
	Sticky cinquefoil	*Drymocallis glandulosa* var. *glandulosa*
	Sticky cinquefoil	*Drymocallis glandulosa var. wrangelliana*
	Wood strawberry	*Fragaria vesca*
	Toyon	*Heteromeles arbutifolia*
	Oceanspray	*Holodiscus discolor*
	Creambush	*Holodiscus discolor var. discolor*
	Santa Lucia horkelia	*Horkelia yadonii*
	Apple	*Malus pumila*
	Small burnet	*Poterium sanguisorba*
	Apricot	*Prunus armeniaca*
	Cherry plum	*Prunus cerasifera*
	European plum	*Prunus domestica*
	Sweet almond	*Prunus dulcis*
	Bitter cherry	*Prunus emarginata*
	Holly leaf cherry	*Prunus ilicifolia*
	Holly-Leaf Cherry	*Prunus ilicifolia var. ilicifolia*
	Peach	*Prunus persica*
	Chinese firethorn	*Pyracantha fortuneana*
	Common pear	*Pyrus communis*
	Ornamental rose	*Rosa [ornamental]*
	California rose	*Rosa californica*
	Wood rose	*Rosa gymnocarpa*
	Dwarf rose	*Rosa gymnocarpa var. gymnocarpa*
	Thimbleberry	*Rubus parviflorus*
	California blackberry	*Rubus ursinus*
Rubiaceae (Madder)		
	Phlox-leaved bedstraw	*Galium andrewsii*
	Andrew's bedstraw	*Galium andrewsii* ssp. *andrewsii*
	Phlox-leaf serpentine bedstraw	*Galium andrewsii* ssp. *gatense*

Family	Common Name	Scientific Name
	Narrow-Leaf Bedstraw	*Galium angustifolium*
	Narrowleaf bedstraw	*Galium angustifolium* ssp. *angustifolium*
	Goose grass	*Galium aparine*
	California bedstaw	*Galium californicum*
	California bedstaw	*Galium californicum* ssp. *flaccidum*
	Cone Peak bedstraw	***Galium californicum* ssp. *luciense***
	Hardham's bedstraw	***Galium hardhamiae***
	Wall bedstraw	*Galium parisiense*
	Graceful bedstraw	*Galium porrigens* var. *porrigens*
	Graceful bedstraw	*Galium porrigens* var. *tenue*
Salicaceae (Willow)		
	Western Cottonwood	*Populus fremontii*
	Fremont cottonwood	*Populus fremontii* ssp. *fremontii*
	Brewer's willow	*Salix breweri*
	Hind's willow	*Salix exigua* var. *hindsiana*
	Red willow	*Salix laevigata*
	Arroyo willow	*Salix lasiolepis*
	Sitka willow	*Salix sitchensis*
Sapindaceae (Soapberry)		
	Big-leaf maple	*Acer macrophyllum*
	California buckeye	*Aesculus californica*
Saxifragaceae (Saxifrage)		
	Coastal brookfoam	*Boykinia occidentalis*
	Crevice alumroot	*Heuchera micrantha*
	Common woodlandstar	*Lithophragma affine*
	Hillside woolandstar	*Lithophragma heterophyllum*
	California saxifrage	*Micranthes californica*
Scrophulariaceae (Figwort)		
	Northern mudwort	*Limosella aquatica*
	California figwort	*Scrophularia californica*
	Woolly mullein	*Verbascum thapsus*
	Wand mullein	*Verbascum virgatum*
Simaroubaceae (Quassia)		
	Tree of heaven	*Ailanthus altissima*
Solanaceae (Nightshade)		
	Jimsonweed	*Datura stramonium*
	Sacred thornapple	*Datura wrightii*

Family	Common Name	Scientific Name
	Indian tobacco	*Nicotiana quadrivalvis*
	Seaside petunia	*Petunia parviflora*
	Nightshade	*Solanum americanum*
	Black nightshade	*Solanum nigrum*
	Buffalo berry	*Solanum rostratum*
	Bluewitch nightshade	*Solanum umbelliferum*
	Purple nightshade	*Solanum xanti*
Tamaricaceae (Tamarisk)		
	Athel tamarisk	*Tamarix aphylla*
	Smallflower tamarisk	*Tamarix parviflora*
Ulmaceae (Elm)		
	English elm	*Ulmus minor*
Urticaceae (Nettle)		
	Western nettle	*Hesperocnide tenella*
	Western Pellitory	*Parietaria hespera*
	California pellitory	*Parietaria hespera* var. *californica*
	Tall Nettle	*Urtica dioica*
	Hoary nettle	*Urtica dioica* ssp. *holosericea*
	Dwarf nettle	*Urtica urens*
Valerianaceae (Valerian)		
	Long spurred plectritis	*Plectritis ciliosa*
	Shortspur seablush	*Plectritis congesta*
	Shortspur seablush	*Plectritis congesta* ssp. *brachystemon*
	Longhorn plectritis	*Plectritis macrocera*
Verbenaceae (Vervain)		
	Turkey tangle fogfruit	*Phyla nodiflora*
	Bigbract verbena	*Verbena bracteata*
	Western Vervain	*Verbena lasiostachys*
	Western vervain	*Verbena lasiostachys* var. *lasiostachys*
	Robust vervain	*Verbena lasiostachys* var. *scabrida*
Violaceae (Violet)		
	Douglas' violet	*Viola douglasii*
	Johnny-jump-up	*Viola pedunculata*
	Pine violet	*Viola purpurea*
	Mountain violet	*Viola purpurea* ssp. *purpurea*
	Goosefoot yellow violet	*Viola purpurea* ssp. *quercetorum*

Family	Common Name	Scientific Name
Viscaceae (Mistletoe)		
	Western dwarf mistletoe	*Arceuthobium campylopodum*
	Bollean mistletoe	*Phoradendron bolleanum*
	American mistletoe	*Phoradendron leucarpum* ssp. *macrophyllum*
	Pacific mistletoe	*Phoradendron leucarpum* ssp. *tomentosum*
Vitaceae (Grape)		
	Virgina creeper	*Parthenocissus inserta*
	California wild grape	*Vitis californica*
	Wine grape	*Vitis vinifera*
Zygophyllaceae (Caltrop)		
	Puncture vine	*Tribulus terrestris*
Monocots		
Agavaceae (Century plant)		
	Soap plant	*Hooveria pomeridianum*
	Soap plant	*Hooveria pomeridianum* var. *pomeridianum*
	Purple Amole	*Hooveria purpureum*
	Santa Lucia purple amole	***Hooveria purpureum* var. *purpureum***
	Chaparral yucca	*Hesperoyucca whipplei*
Alismataceae (Water-plantain)		
	Northern water-plantain	*Alisma triviale*
	European water plantain	*Alisma plantago-aquatica*
Alliaceae (Onion)		
	Narrowleaf onion	*Allium amplectens*
	Dusky onion	*Allium campanulatum*
	Crinkled onion	*Allium crispum*
	Scytheleaf onion	*Allium falcifolium*
	Fringed onion	*Allium fimbriatum*
	Fringed onion	*Allium fimbriatum* var. *fimbriatum*
	Hickman's Onion[4]	***Allium hickmanii***
	Pitted onion	*Allium lacunosum*
	Pitted onion	*Allium lacunosum* var. *lacunosum*
	Pitted onion	*Allium lacunosum* var. *micranthum*
	Mexicali onion	*Allium peninsulare*
	Mexicali onion	*Allium peninsulare* var. *peninsulare*
	Oneleaf onion	*Allium unifolium*
	Wild garlic	*Allium vineale*
Araceae (Arum)		
	Swollen duck weed	*Lemna gibba*
	Common duckweed	*Lemna minor*
	Least duckweed	*Lemna minuta*
	Turion duckweed	*Lemna turionifera*
	Valdivia duckweed	*Lemna valdiviana*
Asphodelaceae (Asphodel)		
Cyperaceae (Sedge)		
	Sturdy sedge	*Carex alma*
	Santa Barbara sedge	*Carex barbarae*
	Bolander's sedge	*Carex bolanderi*
	Fragile sheathed-sedge	*Carex fracta*
	Round-fruited sedge	*Carex globosa*
	Harford's sedge	*Carex harfordii*
	Slender-footed sedge	*Carex leptopoda*
	Mendocino sedge	*Carex mendocinensis*
	Torrent sedge	*Carex nudata*
	Black creeper sedge	*Carex praegracilis*
	Western rough sedge	*Carex senta*
	Saw-toothed sedge	*Carex serratodens*
	Brown sedge	*Carex subfusca*
	Foothill sedge	*Carex tumulicola*
	Tall flatsedge	*Cyperus eragrostis*
	Redroot flatsedge	*Cyperus erythrorhizos*
	Chufa flatsedge	*Cyperus esculentus*
	Brown flatsedge	*Cyperus fuscus*
	Black flatsedge	*Cyperus niger*
	Bearded flatsedge	*Cyperus squarrosus*
	Needle spikerush	*Eleocharis acicularis*
	Common spikerush	*Eleocharis macrostachya*
	Creeping spikerush	*Eleocharis palustris*
	Parish's spikerush	*Eleocharis parishii*
	Fewflower spikerush	*Eleocharis quinqueflora*
	Common tule	*Schoenoplectus acutus* var. *occidentalis*
	Southern bulrush	*Schoenoplectus californicus*

Family	Common Name	Scientific Name
	Common threesquare	*Schoenoplectus pungens var. longispicatus*
	Panicled bulrush	*Scirpus microcarpus*
Hydrochartaceae (Waterweed)		
	Common waterweed	*Elodea canadensis*
	Holly-leaved water-nymph	*Najas marina*
Iridaceae (Iris)		
	Seashore iris	*Iris spuria*
	Western blue-eyed grass	*Sisyrinchium bellum*
Juncaceae (Rush)		
	Baltic rush	*Juncus balticus*
	Moss rush	*Juncus bryoides*
	Toad rush	*Juncus bufonius*
	Toad rush	*Juncus bufonius* var. *bufonius*
	Toad rush	*Juncus bufonius* var. *congestus*
	Toad rush	*Juncus bufonius* var. *occidentalis*
	Dwarf rush	*Juncus capitatus*
	Coville's rush	*Juncus covillei*
	Mariposa rush	*Juncus dubius*
	Lamp rush	*Juncus effusus*
	Pacific rush	*Juncus effusus* ssp. *pacificus*
	Kellogg's dwarf rush	*Juncus kelloggii*
	Santa Lucia dwarf rush	***Juncus luciensis***
	Long-leaved rush	*Juncus macrophyllus*
	Spreading rush	*Juncus patens*
	Brownhead rush	*Juncus phaeocephalus*
	Spreading brown headed rush	*Juncus phaeocephalus* var. *paniculatus*
	Brownhead rush	*Juncus phaeocephalus* var. *phaeocephalus*
	Wrinkled rush	*Juncus rugulosus*
	Poverty rush	*Juncus tenuis*
	Tiehm's rush	*Juncus tiehmii*
	Inch-high rush	*Juncus uncialis*
	Iris-leaved rush	*Juncus xiphioideas*
	Pacific woodrush	*Luzula subsessilis*
Juncaginaceae (Arrow-grass)		
	Flowering quillwort	*Triglochin scilloides*
Liliaceae (Lily)		

Family	Common Name	Scientific Name
	White globe lily	*Calochortus albus*
	White fairy lantern	*Calochortus albus* var. *albus*
	Late-flowered mariposa lily	*Calochortus fimbriatus*
	Splendid mariposa lily	*Calochortus splendens*
	Butterly mariposa	*Calochortus venustus*
	Checker lily	*Fritillaria affinis*
	Stinkbells	*Fritillaria agrestis*
	Chocolate lily	*Fritillaria biflora*
	Chocolate lily	*Fritillaria biflora* var. *biflora*
	Ojai fritillary	***Fritillaria ojaiensis***
	San Benito fritillary	***Fritillaria viridea***
	Panther lily	*Lilium pardalinum*
	Leopard lily	*Lilium pardalinum* ssp. *pardalinum*
	Drops of gold	*Prosartes hookeri*
	Marsh zigadenus	*Toxicoscordion fontanum*
	Fremont's deathcamas	*Toxicoscordion fremontii*
	Death camas	*Toxicoscordion venenosum*
	Meadow deathcamas	*Toxicoscordion venenosum* var. *venosum*
Orchidaceae (Orchid)		
	Stream orchid	*Epipactis gigantea*
	Elegant piperia	*Piperia elegans*
	Chaparral orchi	*Piperia elongata*
	Michael's rein-orchid	*Piperia michaelii*
	Flat spurred piperia	*Piperia transversa*
	Dense flowered rein orchid	*Platanthera elongata*
	Creamy ladies' tresses	*Spiranthes porrifolia*
	Hooded ladies' tresses	*Spiranthes romanzoffiana*
Poaceae (Grass)		
	Spike bent grass	*Agrostis exarata*
	Small-leaf bent grass	*Agrostis microphylla*
	Dune bent grass	*Agrostis pallens*
	Creeping bent	*Agrostis stolonifera*
	Silver hair grass	*Aira caryophyllea*
	Loose silkybent	*Apera spica-venti*
	Oldfield three-awn	*Aristida oligantha*
	Giant reed	*Arundo donax*

Family	Common Name	Scientific Name
	Slender wild oat	*Avena barbata*
	Wild oat	*Avena fatua*
	Rattlesnake grass	*Briza maxima*
	Annual quaking grass	*Briza minor*
	Australian chess	*Bromus arenarius*
	Chilean chess	*Bromus berteroanus*
	California brome	*Bromus sitchensis* var. *carinatus*
	Ripgut brome	*Bromus diandrus*
	Tall brome	*Bromus grandis*
	Soft chess	*Bromus hordeaceus*
	Smooth brome	*Bromus inermis*
	Chinook brome	*Bromus laevipes*
	Foxtail Chess, Red Brome	*Bromus rubens*
	Poverty brome	*Bromus sterilis*
	Cheat grass	*Bromus tectorum*
	Columbia brome	*Bromus vulgaris*
	Pampas grass	*Cortaderia selloana*
	Swamp prickle grass	*Crypsis schoenoides*
	Modest prickle grass	*Crypsis vaginiflora*
	Bermuda grass	*Cynodon dactylon*
	Bristly dogtail grass	*Cynosurus echinatus*
	Annual hair grass	*Deschampsia danthonioides*
	Slender hair grass	*Deschampsia elongata*
	Salt grass	*Distichlis spicata*
	Barnyardgrass	*Echinochloa crus-galli*
	Medusa head	*Elymus caput-medusae*
	Giant wild rye	*Elymus condensatus*
	Squirreltail	*Elymus elymoides*
	Blue Wild-Rye	*Elymus glaucus*
	Blue wildrye	*Elymus glaucus* ssp. *glaucus*
	Big squirreltail	*Elymus multisetus*
	Beardless wild rye	*Elymus triticoides*
	Hansen's wildrye	*Elymus X hansenii*
	Stink grass	*Eragrostis cilianensis*
	Creeping love grass	*Eragrostis hypnoides*
	Mexican lovegrass	*Eragrostis mexicana*
	Chilean love grass	*Eragrostis mexicana* ssp. *virescens*

Family	Common Name	Scientific Name
	Carolina love grass	*Eragrostis pectinacea* var. *pectinacea*
	Brome fescue	*Festuca bromoides*
	California fescue	*Festuca californica*
	Elmer fescue	*Festuca elmeri*
	Idaho fescue	*Festuca idahoensis*
	Small fescue	*Festuca microstachys*
	Rattail sixweeks grass	*Festuca myuros*
	Sixweeks grass	*Festuca octoflora*
	Italian rye grass	*Festuca perennis*
	Crinkleawn fesuce	*Festuca temulenta*
	Nit grass	*Gastridium phleoides*
	Northwestern mannagrass	*Glyceria X occidentalis*
	Meadow barley	*Hordeum brachyantherum*
	Northern barley	*Hordeum brachyantherum* ssp. *brachyantherum*
	California barley	*Hordeum brachyantherum* ssp. *californicum*
	Low barley	*Hordeum depressum*
	Seaside barley	*Hordeum marinum*
	Mediterranean barley	*Hordeum marinum* ssp. *gussoneanum*
	Wall Barley	*Hordeum murinum*
	Smooth barley	*Hordeum murinum* ssp. *glaucum*
	Hare barley	*Hordeum murinum* ssp. *leporinum*
	Wall barley	*Hordeum murinum* ssp. *murinum*
	June grass	*Koeleria macrantha*
	Goldentop	*Lamarckia aurea*
	Giant Wild-Rye	*Leymus condensatus*
	Creeping wild rye	*Leymus triticoides*
	Darnel	*Festuca temulentum*
	California melic	*Melica californica*
	Geyer's oniongrass	*Melica geyeri*
	Harford's oniongrass	*Melica harfordii*
	Little California melica	*Melica imperfecta*
	Torrey's melic	*Melica torreyana*
	Deer grass	*Muhlenbergia rigens*
	Aparejo grass	*Muhlenbergia utilis*
	Western panicgrass	*Panicum acuminatum*

Family	Common Name	Scientific Name
	Pacific panic grass	*Panicum acuminatum* var. *fasciculatum*
	Witchgrass	*Panicum capillare*
	Knot grass	*Paspalum distichum*
	Timothy canary grass	*Phalaris angusta*
	Harding grass	*Phalaris aquatica*
	Lemmon's canary grass	*Phalaris lemmonii*
	Little-seeded canary grass	*Phalaris minor*
	Hood canary grass	*Phalaris paradoxa*
	Common reed	*Phragmites australis*
	Annual blue grass	*Poa annua*
	Bulbous bluegrass	*Poa bulbosa*
	Bulbous bluegrass	*Poa bulbosa* ssp. *vivipara*
	Howell's bluegrass	*Poa howellii*
	Kentucky blue grass	*Poa pratensis* ssp. *pratnesis*
	Sandberg bluegrass	*Poa secunda*
	One-sided blue grass	*Poa secunda* ssp. *secunda*
	Ditch beard grass	*Polypogon interruptus*
	Mediterranean beard grass	*Polypogon maritimus*
	Annual beard grass	*Polypogon monspeliensis*
	Water beard grass	*Polypogon viridis*
	Arabian schismus	*Schismus arabicus*
	Scribner grass	*Scribneria bolanderi*
	Nodding needle grass	*Stipa cernua*
	Crested needle grass	*Stipa coronata*
	Foothill needle grass	*Stipa lepida*
	Smilo Grass	*Stipa miliacea*
	Smilo grass	*Stipa miliacea* var. *miliacea*
	Purple needle grass	*Stipa pulchra*
	Medusa-head wild rye	*Taeniatherum caput-medusae*

Family	Common Name	Scientific Name
	Squirreltail fesue	*Festuca bromoides*
	Small fescue	*Festuca microstachys*
	Rat-Tail Fescue	*Festuca myuros*
	Sixweeks fescue	*Festuca octoflora*
Potamogetonaceae (Pondweed)		
	Leafy pondweed	*Potamogeton foliosus*
	Leafy pondweed	*Potamogeton foliosus* ssp. *foliosus*
	Small pondweed	*Potamogeton pusillus*
	Fennel-leaf pondweed	*Stuckenia pectinata*
	Horned pondweed	*Zannichellia palustris*
Ruscaceae (Butcher's-broom)		
	Starry flase lily of the valley	*Maianthemum stellatum*
Themidaceae (Brodiaea)		
	Common goldstar	*Bloomeria crocea*
	Common Goldenstar	*Bloomeria crocea* var. *crocea*
	Mesa brodiaea	*Brodiaea jolonensis*
	Dwarf clusterlily	*Brodiaea terrestris*
	Dwarf clusterlily	*Brodiaea terrestris* ssp. *terrestris*
	Blue Dicks, School Bells	*Dipterostemon capitatus*
	Comon muilla	*Muilla maritima*
	White brodiaea	*Triteleia hyacinthina*
	Cook's triteleia	***Triteleia ixioides* ssp. *cookii***
	Golden brodiaea	*Triteleia ixioides* ssp. *ixioides*
	Ithuriel's spear	*Triteleia laxa*
Typhaceae (Cattail)		
	Narrow-leaved cattail	*Typha angustifolia*
	Southern cattail	*Typha domingensis*
	Broad-leaved cattail	*Typha latifolia*
Zannichelliaceae (Horned-pondweed)		
	Horned-pondweed	*Zannichellia palustris*

Appendix G

Approved Plant List, Fill Sources, and Recommended Planting Methods for Construction and Revegetation Projects on Fort Hunter Liggett

This list is adapted from Suggested Plant Materials and Fill Sources for Use in Construction Projects on Fort Hunter Liggett provided by Art Hazebrook of FHL's Integrated Training Area Management (ITAM) program. All plantings at FHL (revegetation, landscaping, etc) require environmental review per FHL Regulation 200-2 and a plant species list included in the review request.

FHL NATIVE - CANTONMENT AND THE TRAINING AREAS

The following FHL native tree, shrub, grass, and forb species are suitable and recommended for revegetation projects in the Cantonment and the training areas. Within the training areas, specific plants chosen must be consistent with the vegetation community of the site in coordination with the Training Are Habitat Map (Eliassen 2014); e.g., a blue oak woodland site should be revegetated with local native species typically found in surrounding blue oak woodlands.

Trees - Container Stock	
Blue oak (*Quercus douglasii*)	Interior live oak (*Quercus wislizeni*)
California buckeye (*Aesculus californica*)	Knob-cone pine (*Pinus attenuata*)
California sycamore (*Platanus racemosa*)	Madrone (*Arbutus menziesii*)
Coast live oak (*Quercus agrifolia*)	Sargent cypress (*Hesperocyparis sargentii*)
Coast live oak (*Quercus agrifolia*)	Scrub oak (*Quercus berberidifolia*)
Fremont's cottonwood (*Populus fremontii*)	Valley oak (*Quercus lobata*)
Gray pine (*Pinus sabiniana*)	
Shrubs – Container Stock	
Bush mallow (*Malacothamnus davidsonii, M. jonesii, M. palmeri* var. *involucratus)*	
Bush poppy (*Dendromecon rigida)*	
California coffee-berry (*Frangula californica*)	
California flannel bush (*Fremontodendron californicum*)	
Ceanothus (*Ceanothus integerrimus, C. leucodermis, C. cuneatus)*	
Chaparral pea (*Pickeringia montana*)	
Coyote bush *(Baccharis pilularis)*	
Currant (*Ribes aureum* var. *gracillimum, R. malvaceum, R. malvaceum* var. *malvaceum, R. malvaceum* var. *viridifolium*	
Gooseberry (*Ribes californicum* var. *californicum, R. menziesii* var. *menziesii, R. quercetorum, R. speciosum)*	
Holly-leaved cherry (*Prunus ilicifolia*)	
Hollyleaf redberry (*Rhamnus ilicifolia)*	
Honeysuckle (*Lonicera hispidula, L. interrupta, L. subspicata* var. *denudata)*	
Mountain mahogany (*Cercocarpus betuloides*)	
Oceanspray (*Holodiscus discolor)*	
Redberry buckthorn (*Rhamnus crocea)*	
Sage (*Salvia mellifera*, *S. sonomensis*, *S. spathacea*)	
Silver bush lupine (*Lupinus albifrons)*	
Squaw bush (*Rhus aromatica*)	

Sticky monkey flower (*Diplacus aurantiacus*)	
Toyon (*Heteromeles arbutifolia*)	
Wooly bluecurls (*Trichostema lanatum)*	
Forbs and Grasses – container stock	
Blue wild rye (*Elymus glaucus*)	
California brome (*Bromus carinatus* var. *carinatus*)	
California fuchsia (*Epilobium canum* ssp. *canum)*	
Common wooly sunflower (*Eriophyllum lanatum*)	
Deer grass (*Muhlenbergia rigens*)	
Fescue (*Festuca californica*, *F. rubra*, *F. idahoensis*)	
Giant stipa (*Stipa coronatum*)	
Golden yarrow (*Eriophyllum confertiflorum* var. *confertiflorum*)	
Melic grass (*Melica californi*a, *M. torreyana*, *M. imperfecta*)	
Penstemon (*Penstemon centranthifolius*, *P. heterophyllus*)	
Yarrow (*Achillea millefolium*)	
Hydroseed Mix Containing:	
California melic (*Melica californica*)	3 kg/ha (3 lb/ac)
Nodding needlegrass (*Stipa cernua*)	6 kg/ha (5 lb/ac)
Pine bluegrass (*Poa secunda*)	2 kg/ha (2 lb/ac)
Small fescue* (*Festuca microstachys*)	11 kg/ha (10 lb/ac)
Tidy tips (*Layia platyglossa*)	1 kg/ha (1 lb/ac)
Baby blue eyes (*Nemophila menziesii)*	1 kg/ha (1 lb/ac)
Pinpoint clover (*Trifolium gracilentum*)	4 kg/ha (4 lb/ac)
Purshing's lotus (*Acmispon americanus*)	2 kg/ha (2 lb/ac)
Sky lupine* (*Lupinus nanus*)	2 kg/ha (2 lb/ac)
Woodland clarkia (*Clarkia unguiculata)*	1 kg/ha (1 lb/ac)
California poppy (*Eschscholzia californica*)	2 kg/ha (2 lb/ac)

* Native plant seed used for rehabilitating disturbed training land at FHL must be purchased from a seed company that has collected original seed stock for *Festuca micrstachys* and *Lupinus nanus* within Monterey County.

CALIFORNIA NATIVE - CANTONMENT ONLY

California native tree, shrub, and forb species that may be used in revegetation projects within the Cantonment only (in addition to the plants listed above):

Trees – container stock
Monterey cypress (*Hesperocyparis macrocarpa)*
Incense cedar (*Calocedrus decurrens)*
California juniper *(Juniperus californica)*
Monterey pine (*Pinus radiata)*
Douglas fir (*Pseudotsuga menziesii)*
Western redbud (*Cercis occidentalis)*
Black oak (*Quercus kellogii)*
Desert willow (*Chilopsis linearis)*
Box elder (*Acer negundo* var. *californicum)*
California nutmeg (*Torreya californica)*

Shrubs – Container Stock
Lemonade berry (*Rhus integrifolia)*
Nevin's mahonia (*Berberis nevinii)*
Manzanita (*Arctostaphylos pajaroensis* 'Paradise', *A. edmundsii* 'Carmel Sur', *A. parryana*)
Desert locust (*Robinia neomexicana)*
Honey mesquite (*Prosopis glandulosa* var. *torreyana)*
Silktassel bush *(Garrya* spp.)
Flowering currant (*Ribes snaguineum* var. *glutinosum)*
Bush anemone *(Carpenteria californica)*
Sage (*Salvia apiana, S. clevelandii, S. leucophylla)*
Yellow bush lupine (*Lupinus arboreus)*
California ash (*Fraxinus dipetala, F. velutina* 'Modesto')
Matilija poppy (*Romneya coulteri, R. trichocalyx)*
Ceanothus (*Ceanothus griseus horizontalis, C. impressus, C. thrysiflorus, Ceanothus* 'Ray Hartman', *C. rigidus* 'Snowball', *Ceanothus* 'Concha')
Douglas' spirea (*Spiraea douglasii)*
Ribbon bush (*Adenostoma sparsifolium)*
Service berry (*Amelanchier pallida)*
Forbs – Container Stock
Penstemon (*Penstemon grinnelli*, *P. grinnellii* var. *scrophularioides*, *P. spectabilis*)

NON-NATIVE - CANTONMENT ONLY

Non-native tree, shrub, grass, and forb species that may be used in revegetation projects in the Cantonment only (in addition to the plants listed above):

Trees – container stock
Arizona cypress (*Cupressus arizonica*)
Chinese pistache (*Pistacia chinensis*)
Chitalpa (×*Chitalpa tashkentensis* 'Pink dawn')
Strawberry tree (*Arbutus unedo)*
American sweetgum (*Liquidambar styraciflua*)
Crapemyrtle (*Lagerstroemia indica*)
Magnolia (*Magnolia grandiflora*)
Feijoa (*Acca sellowiana*)
Chinese elm (*Ulmus parvifolia*)
Shrubs – Container Stock
Smoke tree (*Cotinus coggygria*)
Rosemary (*Rosmarinus officinalis*)
Rockrose (*Cistus hybridus*, *C. ladanifer*, *C. purpureus*, *C. salvifolius*)
Purple hopseed bush (*Dodonaea viscosa* 'purpurea')
Lantana (*Lantana camara, L. montevidensis*, etc.)
Australian tea-tree (*Leptospermum laevigatum, L. scoparium* 'Ruby Glow')
Japanese Privet (*Ligustrum japonicum*)
Myrtle (*Myrtus communis*)
Heavenly bamboo (*Nandina domestica*)
Tobira (*Pittosporum tobira*)

Pink India Hawthorn (*Raphiolepis indic*a)
Jerusalem sage (*Phlomis fruticosa)*
Japanese rose (*Kerria japonica)*
Forbs and Grasses – Container Stock
Blue fescue (*Festuca ovina* 'Glauca')
Cane bluestem (*Bothriochloa barbinodis)*
Serbian bellflower (*Campanula poscharskyana)*
Heartleaf bergenia (*Bergenia cordifolia)*

NON-NATIVE – NOT PERMITTED FOR USE AT FHL

Commonly requested non-native tree, shrub, grass, and forb species that may not be used in revegetation projects on FHL because of their invasiveness rating† as defined by the California Invasive Plant Council (Cal-IPC; note that this list is not all inclusive):

Trees – container stock
London planetree (*Plantanus ×acerifolia)*
Olive[3] (*Olea europea)*
Pepper tree[3] (*Schinus molle, S. terebinthifolius)*
Tree of heaven[2] (*Ailanthus altissima)*
Blue gum eucalyptus[2] (*Eucalyptus globulus)*
Russian olive[2] (*Elaeagnus angustifolia)*
Saltcedar[1] (*Tamarix* spp.)
Shrubs – Container Stock
Bridal broom[2] (*Genista monosperma)*
French broom[1] (*Genista monspessulana)*
Scotch broom[1] (*Cytisus scoparius)*
Cotoneaster[2] (*Cotoneaster franchetii, C. lacteus, C. pannosus)*
Acacia[3] (*Acacia dealbata, A. melanoxylon*)
Forbs and Grasses – Container Stock
English ivy[1] (*Hedera helix)*
Algerian ivy[1] (*Hedera caneriensis)*
Iceplant[1] (*Carpobrotus edulis)*
Narrow leaved iceplant[3] (*Conicosia pugioniformis)*
Periwinkle[2] (*Vinca major)*
Giant reed[1] (*Arundo donax)*
Jubatagrass[1] (*Cortaderia jubata)*
Pampasgrass[1] (*Cortaderia selloana)*
Green fountain grass[2] (*Pennisetum setaceum)*

†Cal-IPC inventory rating categories:

[1]**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.

[2]**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.

[3]**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.

OTHER REQUIREMENTS

1) Trees and shrubs should be placed in a non-linear screening pattern. Planting locations are to be augured to a depth of 24–36 inches to assure rapid root development.

2) Trees to be planted outside of the Cantonment should be inside protective wire cages (36-inch height by ½ inch mesh hardware cloth) with 18 inches of the cage above ground and 18 inches extending below ground. These cages will protect the seedling trees from deer, elk, ground squirrels, and pocket gophers. The cages also serve to increase human awareness of the revegetation efforts in the area.

3) Sites with greater than 4:1 slope will be (aero) mulched at the rate of 560 kilograms of mulch per hectare (500 pounds per acre) to reduce erosion due to wind and water.

4) All fill material used for construction or other project will be obtained on Fort Hunter Liggett as feasible or be weed-free fill (material extracted 6"–8" below topsoil) obtained from sources in northern San Luis Obispo County, Monterey County and San Benito County. Fill sources will be from no further south than Santa Margarita in northern San Luis Obispo County and no further east than San Benito County. Once the project is near completion, all fill brought on-site will be treated with a federally approved, chemical pre-emergent/sterilant (aqueous application) that is compatible with proposed landscaping in order to prevent germination of weed seeds prior to turning the project over to the Government.

RESOURCES

Baldwin, B.G., D.H. Goldman, D.J. Keil, R. Patterson, T.J. Rosatti, and D.H. Wilken, editors. 2012. The Jepson manual: vascular plants of California, second edition. University of California Press, Berkeley.

Calflora: Information on California plants for education, research and conservation, based on data contributed by dozens of public and private institutions and individuals, including the Consortium of Calif. Herbaria. [web application]. 2013. Berkeley, California: The Calflora Database [a non-profit organization]. Available: http://www.calflora.org/ (Accessed 11 June 2013).

California Invasive Plant Council [Cal-IPC]. 2013. California Invasive Plant Inventory. Cal-IPC Publication 2006-02. California Invasive Plant Council: Berkeley, CA. Available: www.cal-ipc.org/ (Accessed 11 June 2013).

The point of contact for this information is the Natural Resources Manager, Conservation Branch, Environmental Division, Directorate of Public Works, U.S. Army Garrison Fort Hunter Liggett.