Integrated Natural Resources Management Plan

Fiscal Years 2018 through 2022

Marine Air Ground Task Force Training Command
Marine Corps Air Ground Combat Center
Twentynine Palms, California

2018

Marine Air Ground Task Force Training Command
Marine Corps Air Ground Combat Center

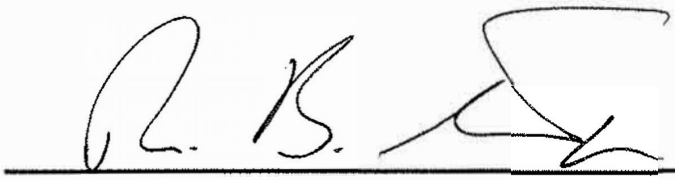
Twentynine Palms, California

INTEGRATED NATURAL RESOURCES MANAGEMENT PLAN

FISCAL YEARS 2018-2022

Approval

This Integrated Natural Resources Management Plan meets the requirements of the Sikes Act (16 USC 670a *et seq.*) as amended.



Commanding General
Marine Air Ground Task Force Training Command
Marine Corps Air Ground Combat Center

Marine Air Ground Task Force Training Command
Marine Corps Air Ground Combat Center

Twentynine Palms, California

INTEGRATED NATURAL RESOURCES MANAGEMENT PLAN

FISCAL YEARS 2018-2022

Endorsement

This Integrated Natural Resources Management Plan meets the requirements of the Sikes Act (16 USC 670a *et seq*.) as amended.

Scott A. Sobiech 3/13/19

Acting

Field Supervisor, Carlsbad Fish and Wildlife Office United States Fish and Wildlife Service

Marine Air Ground Task Force Training Command
Marine Corps Air Ground Combat Center

Twentynine Palms, California

INTEGRATED NATURAL RESOURCES MANAGEMENT PLAN

FISCAL YEARS 2018-2022

Endorsement

This Integrated Natural Resources Management Plan meets the requirements of the Sikes Act (16 USC 670a *et seq.*) as amended.

Scott Wilson FOR

Leslie MacNair,
Regional Manager, Inland Desert Regions
California Department of Fish and Wildlife

EXECUTIVE SUMMARY

Purpose

The purpose of this Integrated Natural Resources Management Plan (INRMP) is to prescribe targeted natural resources management strategies that sustain military mission readiness at the Marine Air Ground Task Force Training Command, Marine Corps Air Ground Combat Center (MAGTFTC MCAGCC, herein referred to as the "Combat Center" or the "installation"). The INRMP provides a strategy for Natural Resources Management across both the legacy lands and expansion areas of the Combat Center for Fiscal Years 2018 – 2022. Implementation of this INRMP ensures military mission readiness by maintaining compliance with all applicable natural resources laws, sustaining the quality of training lands over time, and facilitating natural resources management in a manner that is consistent with Marine Corps federal stewardship requirements. Use of this INRMP fulfills statutory requirements under the Sikes Act Improvement Act (SAIA), Public Law 105-85, Div. B Title XXIX, Nov. 18, 1997, 111 Stat 2017-2019, 2020-2033, which requires the Secretaries of the Army, Air Force, and Navy to prepare and implement INRMPs for each military installation. This INRMP also meets requirements under Marine Corps Order 5090.2A and Combat Center Order 5090.1F to maintain installation compliance with environmental law.

The SAIA requires wildlife regulators, sovereign Native American Nations, and the public be engaged in the development of this INRMP. The Combat Center has cooperated with the U.S. Fish and Wildlife Service (USFWS) and the California Department of Fish and Wildlife (CDFW) throughout the development of this Plan and agency signatures reflect the mutual agreement of these parties that the identified actions fulfill requirements concerning the conservation, protection, and management of natural resources on the Combat Center. The Combat Center also consulted with seven regional Native American Tribes, as well as a variety of public interest groups. As a public document, the INRMP provides an opportunity to foster goodwill for the Combat Center, the U.S. Marine Corps, and the Department of Defense (DoD) throughout the Mojave Desert.

Goals and Management Initiatives

The 2018 – 2022 INRMP presents a streamlined version of the goal-driven framework of the Natural Resources Program, integrating management initiatives under the programmatic Elements and Objectives and updating ongoing and planned activities to meet current priorities. Programmatic Goals and initiatives are summarized below, described in Chapter 4, and scheduled in the 5-Year WorkPlan.

Goals

1. Strengthen the Combat Center's operational capabilities;
2. Support natural systems on the landscape;
3. Manage federally protected species;
4. Support other uses and engagement.

Initiatives

- Protect sensitive natural resources areas;
- Manage and monitor desert tortoises to ensure compliance with the Endangered Species Act;
- Manage and monitor Migratory Birds to ensure compliance with the Migratory Bird Treaty Act;
- Manage and monitor for Golden Eagles to ensure compliance with the Bald and Golden Eagle Act;
- Use science-based monitoring to inform the management of floral and faunal resources;
- Inform Marines and others in the Combat Center's community about the value of natural resources and the various means to conserve them;
- Support Mojave Desert regional initiatives;
- Use remote sensing and Geographic Information Systems to facilitate natural resources management;
- Implement an ecosystem management philosophy that conserves biodiversity;
- Regularly assess the need for a Wildfire Management Plan and invasive species management priorities;
- Use National Environmental Policy Act (NEPA) to inform conservation decisions pertaining to natural resources;
- Protect cultural resources while managing natural resources.

Document Organization

The INRMP is organized as follows:

- Chapter 1 describes the purpose and need for the INRMP, lists compliance requirements, details the management philosophy, describes regional programs, details the interagency and public review and endorsement process, and summarizes the program structure and reporting process.
- Chapter 2 details area land use, the formation and growth of the installation, the military mission, and key relationships between the military mission and the Natural Resources Program.
- Chapters 3 describes the physical environment of the installation and natural features that may be impacted by the military mission.
- Chapter 4 reviews the Natural Resources Management Program including specific goals, elements, and objectives, as well as resources available to implement the program.
- Appendix A presents a 5-Year Workplan summarizing all actions necessary to achieve the Natural Resources Program mission. The workplan assigns priority levels to tasks, identifies implementation leads, and presents a tentative implementation schedule. Since not all of the actions require funding, a separate summary of anticipated budget requests is also included.
- Appendix B presents the Environmental Assessment performed to ensure NEPA compliance.
- Appendix C presents all plant species documented aboard the installation.
- Appendix D presents all wildlife species documented aboard the installation.
- Appendix E presents Desert Tortoise Contact Flowcharts that outline what Marines should do when a tortoise is encountered in the field.

- Appendix F presents the Bird Nest Response Matrix that outlines what authorized staff can do with bird nests on buildings and vehicles.
- Appendix G presents the Department of the Marine Corps Letter of Instruction on Depredation of Predators.

Implementation Monitoring

INRMP implementation will be evaluated in five ways:

- Annual progress reporting to Headquarters Marine Corps (HQMC), USFWS, and CDFW;
- Annual updates to the 5-Year Workplan in coordination with USFWS and CDFW;
- Interim Environmental Compliance Evaluations (ECE) by Combat Center;
- Formal ECE by Headquarters Marine Corps every three years;
- Formal INRMP revisions every 5 years.

Costs and Benefits

The cost to implement this INRMP is estimated at $37,426,291 for Fiscal Years (FY) 2018-2022. Funding will be primarily from Operations and Maintenance Marine Corps Funds. Budgets will be adjusted annually, as needed. Not included in the estimate are costs specific to water and air quality management, pest management, pollution prevention, range maintenance activities, and in-house salaries. The Natural Resources Management Program ensures compliance with environmental law, provides prudent stewardship of natural resources, and is unlikely to be a significant financial burden the military mission.

TABLE 4-2 Summary Budget Request for Natural Resources Across FYs 2018-2022

	FY 18	FY 19	FY 20	FY 21	FY 22
COLS 3 Totals	$ 9,832,048	$ 9,000,194	$ 8,413,924	$ 4,155,280	$ 4,622,445
COLS 2 Totals	$ 599,600	$ 243,500	$ 109,000	$ 337,100	$ 113,200
COLS 1 Totals	$ -	$ -	$ -	$ -	$ -
Total Request	***$ 10,431,648***	***$ 9,243,694***	***$ 8,522,924***	***$ 4,492,380***	***$ 4,735,645***

The budget is skewed towards COLS 3 and 2 priorities due to funding limitations. Costs for most but not all projects have been estimated; five projects are outstanding and shall be costed closer to the date of scheduled implementation.

Military Mission Benefits

Implementation of this INRMP will maintain quality training lands, enhancing mission realism. The prescribed planning process used to develop the strategy presented for natural resources conservation will maintain further reduce maintenance costs, improve the capability for long-range planning, and reduce or avoid encroachment on the military mission from potential natural resources conflicts.

Environmental Benefits

This INRMP provides the basis for the conservation of natural resources through various tasks that help reduce vegetation loss and soil erosion caused by military activities. Projects will conserve biodiversity and reduce the potential for environmental pollution. Plan implementation will increase overall knowledge of the environment of the Combat Center as well as the regional ecosystem through surveys, monitoring and research.

Other Benefits

The Combat Center environmental image, both internal and external to DoD, will be enhanced. Environmental awareness of individual Marines will be increased while training at the Combat Center. INRMP implementation will decrease long-term environmental costs and reduce personal and installation liabilities from environmental noncompliance.

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

1.0 **OVERVIEW**

1.1 Purpose and Need

The purpose of this Integrated Natural Resources Management Plan (INRMP) is to prescribe targeted natural resources management strategies to sustain military mission readiness at the Marine Air Ground Task Force Training Command (MAGTFTC) Marine Corps Air Ground Combat Center (MCAGCC), in Twentynine Palms, California (herein referred to as the Combat Center or the installation). This INRMP is a statutory requirement under the Sikes Act Improvement Act (SAIA), Public Law 105-85, Div. B Title XXIX, Nov. 18, 1997, 111 Stat 2017-2019, 2020-2033.

This INRMP guides implementation of the Combat Center's Natural Resources Program across federal fiscal years 2018 – 2022. The program:

1) Conserves Combat Center land and natural resources;
2) Ensures compliance with applicable federal and state environmental laws and regulations;
3) Maintains quality training lands necessary to accomplish the Combat Center's critical military mission on a sustained basis;
4) Ensures natural resources conservation measures and Marine Corps activities are integrated and consistent with federal stewardship requirements.

This INRMP also serves as the Endangered Species Management Plan for the desert tortoise (*Gopherus agassizii*), avian species protected by the Migratory Bird Treaty Act (MBTA), and bald (*Haliaeetus leucocephalus*) and golden (*Aquila chrysaetos*) eagles protected under the Bald and Golden Eagle Protection Act (BGEPA). Preparation and implementation of this INRMP are required by the Sikes Act Improvement Act, Department of Defense Instruction 4715.3 (*Environmental Conservation Program)*, and Marine Corps Order P50902.A (*Environmental Compliance and Protection Manual*).

Under the SAIA, wildlife regulators, sovereign Native American Nations and the public must be engaged in the development of this INRMP. The Combat Center has cooperated with the U.S. Fish and Wildlife Service (USFWS) and the California Department of Fish and Wildlife (CDFW) on the development of this plan and agency signatures reflect the mutual agreement of these parties that the identified actions fulfill requirements concerning the conservation, protection, and management of natural resources on the Combat Center. The Combat Center consulted with seven regional Native American Tribes on this document. As a public document, this INRMP also presents an opportunity to foster goodwill for the Combat Center, the U.S. Marine Corps, and the Department of Defense (DoD) throughout the Mojave Desert.

1.2 Scope

This INRMP applies to all lands associated with the Combat Center. The Combat Center is the Marine Corps largest combined-arms, live-fire training facility and recently underwent a land expansion that increased the total size from approximately 932 square miles to 1,102 square

miles. The Combat Center is divided into 27 range training areas, each of which may contain training areas, landing fields, targetry, main supply routes, fixed ranges, support areas, expeditionary areas, and safety buffer zones. Armed forces use the Combat Center to train Marines and test equipment to practice and perfect the principles of engagement for tomorrow's armed conflicts. The Combat Center annually provides training to one-third of the Fleet Marine Force and Reserves Units through Marine Air Ground Task Force (MAGTF) Exercises and numerous other training exercises. The Combat Center training mission is expected to evolve with the development of new weapons systems and tactics, therefore the impacts to natural resources are likely to change over time. This INRMP reviews anticipated impacts of training activities on natural resources aboard the installation during federal fiscal years 2018 – 2022 and discusses natural resources management solutions to offset anticipated impacts to protect and preserve the Mojave Desert ecosystem. This Plan does not evaluate the military mission, nor does it replace any requirement for environmental documentation of the military mission at the Combat Center.

The Combat Center's INRMP applies to organizations internal and external to the Combat Center that are involved with, or interested in, the management or use of the installations natural resources and lands. This includes active duty units, reserve components, directorates, state, county and local governments, non-governmental organizations, tribal groups, private groups, and individuals. This INRMP also defines the level of management and vehicles by which the Combat Center participates in regional planning efforts with entities such as (but not limited to) the Desert Managers Group and the Bureau of Land Management's West Mojave Habitat Conservation Plan (formerly West Mojave Coordinated Management Plan). The INRMP is also an integral part of the Combat Center Master Plan and coordinates with the Integrated Pest Management Plan (IPMP), Wildland Fire Management Plan (WFMP), and Invasive Species Management Plan (ISMP). The INRMP is also consistent with Integrated Cultural Resources Management Plan (ICRMP) and together they serve as the cornerstones of the Combat Center's resources management program.

1.3 Authority

The SAIA, as amended, was enacted to "promote effectual planning, development, maintenance, and coordination of wildlife, fish, and game conservation and rehabilitation in military reservations". It requires the Secretaries of the military departments to prepare and implement INRMPs for each military installation unless exempted due to the absence of significant natural resources. This INRMP includes all elements of natural resources management applicable to the installation and fulfills the statutory requirements under the SAIA, as amended. Marine Corps Order (MCO) P5090.2 also describes United States Marine Corps (USMC) policies on environmental protection and identifies relevant federal environmental statutes, regulations, executive orders (EOs), and military mandates required for environmental compliance. Pertinent laws and regulations applicable to natural resources management actions aboard the Combat Center are listed below in Table 1-1.

Table 1-1 Natural Resources Management Laws and Regulations	
7 USC 136-136y	Federal Insecticide, Fungicide, and Rodenticide Act
16 USC 668 *et. seq*.	Bald and Golden Eagle Protection Act of 1940, as amended
Public Law 93-452	Conservation and Rehabilitation Program on Military and Public Lands
16 USC 1531-1544	Endangered Species Act of 1973, as amended
43 USC 1701 *et. seq*.	Federal Land Policy and Management Act of 1976
7 USC 2801 *et. seq.*	Federal Noxious Weed Act of 1973
33 USC 1251 *et. seq.*	Federal Water Pollution Control Act Amendments of 1972
16 USC 670a-670o	Fish and Wildlife Conservation and Natural Resources Management Program on Military Reservations: Amends Public Law 86-797 (Sikes Act)
16 USC 2901-2911	Fish and Wildlife Conservation Act
16 USC 661-667	Fish and Wildlife Coordination Act
Title 10 USC2667	Leased, non-excess Property
42 USC 4321-4347	National Environmental Policy Act of 1969
42 USC 6901-6992k	Resource Conservation and Recovery Act
43 USC 4901 *et. seq.*	Noxious Plant Control Act
43 USC 9601-9675	Comprehensive Environmental Response, Compensation, and Liability Act
16 USC 703-712	Migratory Bird Treaty Act
10 USC 2671	Military Reservations and Facilities
16 USC 5901 *et. seq.*	Soil Conservation Act of 1935
Executive Order 11989	Off-Road Vehicles on Public Lands
Executive Order 11991	Protection and Enhancement of Environmental Quality: amends Executive Order 11514.
Executive Order 12608	Protection of Wetlands: amends Executive Order 11990
Executive Order 13045	Protection of Children from Environmental Health Risks and Safety Risks
Executive Order 13751	Safeguarding the Nation from the Impacts of Invasive Species
Executive Order 13186	Responsibilities of Federal Agencies to Protect Migratory Birds
Executive Order 13834	Efficient Federal Operations
Executive Order 13783	Promoting Energy Independence and Promoting Economic Growth
DoD Instruction 4715.03	Natural Resources Conservation Program
DoD Manual 4715.03	Integrated Natural Resources Management Plan (INRMP) Implementation Manual
DoD Directive 6050.2	Use of Off-Road Vehicles on DoD Lands
Marine Corps Order P5090.2A	Environmental Compliance and Protection Manual
Combat Center Order 5090.1D	Environmental Protection
Combat Center Order 5090.4B	National Environmental Policy Act Compliance
USC=U.S. Code, Department of Defense = DoD	

1.4 Responsibilities

Numerous internal and external stakeholders support various aspects of natural resources management, ensuring the military training mission and environmental management at the Combat Center are compatible and mutually supportive. In this section, internal and external stakeholders are identified, and their roles and responsibilities briefly discussed. The term Stakeholder is used to describe only parties that are directly involved with implementing the Natural Resources Program including planning, operation, and implementation monitoring of INRMP tasks. Non-mandatory, mutually beneficial partnerships are not identified.

1.4.1 Internal Stakeholders

In accordance with MCO P5090.2A, all USMC personnel at the Combat Center must be informed of and comply with the environmental rules and regulations that apply to their duties, and shall:

1. "Maintain a general awareness of all applicable USMC environmental policies and goals
2. Apply the principles of Total Quality Leadership to incorporate environmentally safe practices and procedures into daily operations
3. Take advantage of pollution prevention opportunities in everything we do
4. Emphasize environmental awareness and incorporate environmental compliance into every aspect of operation practices
5. Promote pollution prevention as the primary means of achieving and maintain compliance with environmental requirements
6. Address environmental problems, rather than ignore them."

Roles and responsibilities of Department of Defense (DoD) administrators for natural resources protection are also identified and discussed below.

Headquarters Marine Corps

The Headquarters Marine Corps (HQMC), located in Washington, D.C., is responsible for developing general policy and providing Marine Corps Orders as well as funding to implement Natural Resources Program at the Combat Center. HQMC conducts onsite Environmental Compliance Evaluations of the Combat Center Natural Resources Program at least once every three years.

MAGTFTC, Twentynine Palms

Commanding General

The MAGTFTC Commanding General is directly responsible for accomplishing the MAGTFTC mission, including the administration and conduct of military training programs, and is also responsible for all property, facilities, and assigned personnel aboard the Combat Center. The Commanding General also has the overall responsibility for ensuring that installation land management and law enforcement policies, regulations, and activities are consistent and compliant with the federal environmental laws, policies, and standards, and that natural resources quality is sustained for the continued benefit of the military mission. The Commanding General is personally responsible for complying with all environmental laws and regulations and executes

these responsibilities through a combination of operational and administrative controls and technical direction.

Marine Air Ground Task Force Training Directorate

The MAGTF Training Directorate (MTD) Range Management Division maintains administrative and operational control of the training ranges, manages the MAGTFTC TP, conducts service-level MAGTF combined arms training in order to enhance the combat readiness of the operating forces and supports the Commandant of the Marine Corps responsibilities to national security.

Range Management Division (RMD) within the MTD is responsible for all range operations excluding rifle and pistol ranges. The Director of the Range Management Division runs the division and is ultimately responsible for all range training functions, including day-to-day operations, scheduling, safe validation, and real-time management of unit and service level readiness training. This section also maintains data on actual range use, maintains Range Training Area and Airspace (RTAA) control of all communications, enforces safety and inspection standards and regulations throughout the RTAA, provides all safety briefs, has the authority to halt all training and direct any required corrective action before the resumption of live fire, supervises exercise-police cleanup of the training areas, provides target construction and emplacement, and coordinates and designs new ranges and enhancements to current ranges and processes including all necessary NEPA documentation in conjunction Environmental Affairs. The Range Management Division is also responsible for the preparation, administration and coordination of the MAGTFTC 5-year Range Management Plan, including ensuring compatibility with the Combat Center's 5-year INRMP.

Installation Support Directorate

The Installation Support Directorate (ISD) is overseen by the Assistant Chief of Staff (AC/S) and is responsible for planning, controlling and coordinates the essential Combat Center functions of supply, motor transport, billeting, food services, purchasing and contracting, public works and facilities management, construction of new facilities and major repairs to existing facilities, and support of the Assistant Chief of Staff (AC/S), MAGTF Training, operational exercises. The directorate is subdivided into several divisions, two of which are particularly involved with INRMP implementation and are discussed further, below.

The **Environmental Affairs** (EA) within the Installation Support Directorate is responsible for natural and cultural resources management aboard the Combat Center, as well as conservation law enforcement, pollution prevention, installation and environmental restoration, environmental compliance, management of solid waste, hazardous wastes and range related waste, monitoring ground water and air quality, and encroachment issues. The EA Division is the Combat Center liaison for these matters with HQMC, other DoD agencies, federal, state and local regulatory agencies, non-governmental agencies, and scientific and academic communities.

The Natural and Cultural Resources Branch (NCRB), under the direction of the Natural and Cultural Resources Officer, is the branch of EA responsible for the day-to-day operations and long-term management of natural and cultural resources within the Combat Center boundaries. Specific focuses of NCRB management include soils, vegetation, wildlife, paleontological, archaeological, historic resources and conservation law enforcement. The Natural and Cultural

Resources Branch provides a liaison between the Combat Center and other Federal landholders and consults with state and Federal regulatory agencies regarding threatened and endangered species, and cultural resources. This branch also holds the primary responsibility for the planning and implementation of the INRMP, ensures that the Combat Center land use is monitored and that the best scientific practices for resources management are implemented to sustain the Marine Corps training mission.

The **Public Works Division (PWD)** is managed by the Public Works Officer (PWO), who is the head of PWD and the principal staff assistant to the AC/S at ISD. The PWO controls all planning, coordination and supervision of facilities acquisition management, sustainment, restoration and modernization, and provision of all utility services to facilities. All space planning, construction, repair, alterations, site approvals and dig permits must be approved by PWD prior to the start of work. PWD is divided into five distinct branches, including:

- The Asset Management Branch (AMB), which is comprised of Planning, Geospatial Information & Services, and Requirements;
- The Facilities Maintenance Branch, which is comprised of Roads and Grounds, Facilities Services, HVAC, and Electrical shop;
- Utilities (UTL), which are comprised of Utilities/Energy Management (UEM), heat plant, cogeneration (COGEN) plant, potable/non-potable water wells, natural gas, water and wastewater treatment plants;
- The Facilities Engineering & Acquisition Division (FEAD), which is comprised of the Project Management and Engineering, Facilities Support Contracts (FSC), and Acquisition sections;
- The Resource Management Branch (RMB), which is comprised of PWD's funds management programs, the Supply Officer, allocation and obligation plans, and manage to payroll.

PWD's purview is broad and complexly interwoven with the Natural Resources (NR) Program. Planning sections are responsible for siting facilities in accordance with land use, and general construction, maintenance, repairs, alterations, site approvals, dig permits, and all work that affects land, buildings, utilities and infrastructure can have significant impacts on natural resources. Geospatial databases provide beneficial information support to the planning and coordination of NR Program activities. PWD Planning sections responsible for maintaining real property records indirectly assist Natural Resources with tracking ownership, easements, and historical information often of value in the Natural Resources planning process. Once work begins on government funded construction and facilities maintenance projects, FEAD provides quality control and ensures compliance with prescribed biological avoidance, minimization, and monitoring measures and special conservation measures required by the NR Program. Facilities sustainment, restoration, and modernization (FSRM) is performed by PWD or by contract and the Planning section incorporates various conservation initiatives of the NR Program while developing broader planning documents such as the installation facilities down to more specific operations such as the Pest Control Program and Base Exterior Architectural Plan. Utilities and energy related services support installation demands for power, potable water, non-potable water, natural gas, wastewater services, and hot and cold water by operating and maintaining

infrastructure for the generation/acquisition, treatment, storage, and distribution of these resources across large areas of the Combat Center.

Mission Assurance
This directorate provides programs for the protection of life and property, and restoration of resources affecting the Combat Center mission. They provide emergency services, an active security posture and mission assurance programs designed to deter, detect, delay, defend, and mitigate natural or man-made crisis events. Protection of this installation and supporting infrastructure preserves our capability to generate, project, and sustain combat power essential to execute the National Military Strategy. Some divisions within this directorate are directly involved with higher-priority or emergency management aspects of INRMP implementation, such as the development of a Wildland Fire Management Plan and Predator Management Plan.

1.4.2 External Stakeholders

U.S. Army Corps of Engineers
The U.S. Army Corps of Engineers infrequently assists the Combat Center with contracting activities and the preparation of natural resources studies. Past publications have included Identification and Characterization of Waters of the United States, Delineation of Deadman Dry Lake and Mesquite Dry Lake at the Marine Corps Air Ground Combat Center, Twentynine Palms, California, and the 1996 Biodiversity and Wildlife Management Plan.

Other Military Installations
The Combat Center coordinates and cooperates with other military installations within the Mojave Desert on various initiatives. Participating installations include Edwards Air Force Base, National Training Center (NTC) at Fort Irwin, Marine Corps Logistics Base Barstow, Marine Corps Air Station Yuma (including Chocolate Mountain Aerial Gunnery Range), and Naval Air Weapons Station China Lake. The California Desert Mangers Group is comprised of representatives from these installations along with representatives from the Department of Interior agencies, Department of Agriculture, state, county and local government agencies.

U.S. Fish and Wildlife Service
The USFWS is responsible for administering the Endangered Species Act (ESA) and all related components of the Act, such as compliance, permitting, and consultation. USFWS Endangered species permitting operations are conducted under the authority of the regional office in Sacramento, California with the exception of Section 10 (recovery) Permits, including the Combat Center - EA's permit (17730-3) for desert tortoises. Currently, the only resident, ESA-protected species aboard the Combat Center is the desert tortoise. The USFWS-Combat Center partnership in the management of the desert tortoise will continue to be critical during FY 2018-2022.

The USFWS is also responsible for administering the MBTA, the Bald and Golden Eagle Protection Act, and they regularly review candidate species for future ESA listing. The USFWS Migratory Bird Office is located at the Sacramento regional office and the Combat Center coordinates directly with the Region 8 Sacramento USFWS office for issues involving the

MBTA and BGEPA. The Combat Center also coordinates closely with USFWS when species known to reside on base are identified as candidates for ESA listing.

The USFWS, Pacific Southwest region (Region 8), field office at Palm Springs, California, provides technical advice and regulatory guidance for the management endangered and threatened species aboard the Combat Center. The USFWS is a signatory cooperator in implementation of this INRMP, in accordance with the SAIA, and the 2018-2022 INRMP contains specific items of agreement among the USFWS, CDFW, and the Combat Center. The USFWS is also a partner in regional initiatives and cooperative ventures with the Combat Center.

National Park Service

Joshua Tree National Park is located in the Morongo Basin and has many of the same natural and cultural resources issues as the Combat Center. The Park and EA personnel share information when possible and serve together on similar management groups such as the Mojave Weed Management Area and Desert Managers Group.

Bureau of Land Management

The Bureau of Land Management (BLM) administers much of the land surrounding the Combat Center. The agency is an important partner in the management of natural resources and the sharing of pertinent databases. BLM has the lead responsibility for the West Mojave Plan, and is a partner of other regional initiatives and cooperative ventures with the Combat Center.

The management of BLM lands adjacent to the Combat Center fall under two separate BLM offices. The Barstow Field Office manages land along the northwestern, western, and southern boundaries. The Needles Field Office manages land along the northeastern and eastern boundaries. Military units occasionally need to cross this land to access the training ranges.

California Department of Fish and Wildlife

The California Department of Fish and Wildlife is the primary state agency responsible for the management of fish and wildlife in the state of California. In 1992, CDFW and the Combat Center worked together to relocate a herd of 20 bighorn sheep (*Ovis canadensis nelsoni*) to the Combat Center. The sheep were relocated to the Bullion Mountains as a part of a reintroduction program. CDFW, the Society for the Conservation of Bighorn Sheep, and the Combat Center have formed a partnership for the monitoring of bighorn sheep and the maintenance of water guzzlers on the Combat Center. The role of the CDFW in this project has evolved from the primary action agency to project oversight. The CDFW also maintains a list of state-sensitive species, and a California Natural Diversity Database, both of which are useful for management of bighorn sheep and other natural resources at the Combat Center.

CDFW is a signatory/cooperator in the implementation of this INRMP. The 2018-2022 INRMP contains specific items of agreement among the CDFW, USFWS, and the Combat Center, as required by the SAIA. The Combat Center EA also holds a CDFW scientific collecting permit (#SCP-10112) to research the desert tortoise.

Native American Tribes

The United States has a unique legal relationship with Indian tribal governments as set forth in the Constitution of the United States, treaties, statutes, executive orders, and court decisions. Since the formation of the Union, the United States has recognized Indian tribes as domestic dependent nations under its protection (*Cherokee Nation v. Georgia*, 30 U.S. (5 Pet.) 1 (1831). DoDI 4710.02: DOD Interactions with Federally recognized Tribes, SECNAVINST 11010.14: Department of the Navy Policy for Consultation with Federally Recognized Indian Tribes, and Executive Order 13175, American Indian and Alaska Native Policy require regular and meaningful consultation and collaboration with Indian tribal governments.

The Combat Center follows a process established by Department of Defense policy, pursuant to Section 106 of the National Historic Preservation Act (NHPA) as amended that permits elected officials and other representatives of Indian tribal governments to provide meaningful and timely input on actions or policies that might be of tribal interest. These interests may be those that affect Indian sacred sites or traditional cultural properties (TCPs). In addition, tribes consult as necessary under NEPA, the Native American Graves Protection and Repatriation Act (NAGPRA), and other laws and situations implicating concerns of the Native American community. During consultation regarding the development of a Programmatic Agreement (PA) local Tribes have expressed a desire to have surveys conducted to locate plant species that are of religious and cultural significance to the Tribes and to be granted access to collect these plants.

Local Tribes consulted in regards to Native American cultural issues and for input into the development of this INRMP for the Combat Center include:

- **Agua Caliente Band of Cahuilla Indians,** Palm Springs, CA.
- **Augustine Band of Cahuilla Indians,** Coachella, CA.
- **Cabazon Band of Mission Indians,** Indio, CA.
- **Cahuilla Band of Mission Indians of the Cahuilla Reservation,** Anza, CA.
- **Chemehuevi Indian Tribe,** Havasu Lake, CA.
- **Colorado River Indian Tribes,** Parker, AZ.
- **Fort Mojave Indian Tribe,** Needles, CA.
- **Morongo Band of Mission Indians,** Banning, CA.
- **Twenty-Nine Palms Band of Mission Indians,** Coachella, CA.
- **San Manuel Band of Mission Indians,** Highland, CA.

Universities

Military installations cover vast acreages that are conducive to large research endeavors. The Combat Center commissions or otherwise supports the research projects of numerous universities focusing on desert flora and fauna via contracts and agreements, and these studies frequently inform and otherwise guide various aspects of INRMP implementation. Most notably, the University of California, Los Angeles (UCLA) operates the Desert Tortoise Head Start Project, holds the permit for the Tortoise Research and Captive Rearing Site (TRACRS) and operates the facility with UCLA personnel. A Cooperative Agreement with the University of California, Riverside, facilitated species niche modeling for the Combat Center's desert tortoises, common chuckwallas, Mojave fringe-toed lizards and burrowing owls. The results from this work indicate the need to provide habitat refugia in the face of climate change, to

preserve ecosystem processes and these associated indicator animal species. The EA Division also collaborates with the University of Ontario and Royal Ontario Museum to analyze tortoise paternity genetics, landscape genetics, and diversity of headstarted animals, and works with the local Copper Mountain College to facilitate regional genetic, disease and health assessment evaluations. The use of universities to assist the Combat Center in researching and conducting natural resources management will continue under this INRMP.

Other Interested Parties

Non-Governmental Organizations (NGO) that are involved in natural resources often take an interest in natural resources management aboard the Combat Center, including (but not limited to) the California Native Plant Society, Society for the Conservation of Bighorn Sheep, Desert Protection Council, Desert Tortoise Council, and Bat Conservation International. NGOs can often offer valuable insights on resources management and are given the opportunity to review and comment on this INRMP during the public comment period.

1.5 Management Strategy

The management strategy employed in this INRMP prioritizes biological diversity using ecosystem management principles and an adaptive management framework to target responsive, natural resources management efforts that ensure no let loss in the capability of military lands to support military mission readiness.

Biological diversity (biodiversity) is defined as the variety of life and the processes that occur to sustain it. Biodiversity includes the variety of living organisms, their genetic differences, the communities and ecosystems in which they occur, and the ecological and evolutionary processes that allow them to continue functioning (DoD Instruction 4715.03).

Biodiversity is found at all levels, including landscapes, community assemblages of various species, and genetic variability within individual species populations. The Department of Defense has developed *A Department of Defense (DoD) Biodiversity Management Strategy (*Keystone Center 1996) which identifies five reasons to conserve biodiversity on military lands:

1) Sustain natural landscapes required for the training and testing necessary to maintain military readiness
2) Provide the greatest return on the defense investment to preserve and protect the environment
3) Expedite the compliance process and help avoid conflicts
4) Encourage public support for the military mission
5) Improve the quality of life for military personnel

The Keystone Center strategy report (1996) notes that the challenge is "*to manage for biodiversity in a way that supports the military mission.*" This strategy identifies the INRMP as the primary vehicle to implement biodiversity protection on military installations. The model process developed within the strategy includes the following principles:

- Support the military mission
- Use joint planning between natural resources managers and military personnel
- Integrate biodiversity conservation into INRMP and other planning protocols

- Involve internal and external stakeholders
- Emphasize the regional (ecosystem) context
- Use adaptive management
- Involve scientists and use the best science available
- Concentrate on results

Ecosystem management is a goal-driven approach to managing natural and cultural resources that considers the environment as a complex system functioning as a whole, not as a collection of parts, and that recognizes that people and their social and economic needs are a part of that whole. The DoD describes the importance of ecosystem management on military lands as a means "to support present and future training and testing requirements while preserving, improving, and enhancing ecosystem integrity. Over the long term, this approach maintains and improves the sustainability and biological diversity of terrestrial and aquatic ecosystems while supporting sustainable economies, human use, and the environments required for realistic military training operation (DoD 2013). The guiding principles of ecosystem management are as follows (DoD Instruction 4715.03):

- Maintain and Improve the Sustainability and Native Biodiversity of Ecosystems.
- Administer with Consideration of Ecological Units and Timeframes.
- Support Sustainable Human Activities.
- Develop a Vision of Ecosystem Health.
- Develop Priorities and Reconcile Conflicts.
- Develop Coordinated Approaches to Work Toward Ecosystem Health.
- Rely on the Best Science and Data Available.
- Use Benchmarks to Monitor and Evaluate Outcomes.
- Use Adaptive Management.
- Implement Through Installation Plans and Programs.

This INRMP employs ecosystem management principles and an adaptive management framework to guide the Natural Resources Program. Adaptive management is an interactive process which evaluates current management practices deployed on the landscape, identifies any limitations or unaddressed problems resulting from these practices, develops alternative recommendations for improving management actions, and these recommendations are then included in new management plans and implemented on the landscape for further review and analysis. The adaptive management feedback loop ensures natural resources management is flexible and responsive, improving activities through the integration of new information under changing military needs.

1.6 Stewardship and Compliance

Environmental stewardship is the management of natural resources to protect the intrinsic value of those resources to meet the needs of present and future generations. Environmental stewardship is critical for range sustainability because when properly implemented, it provides a means to meet ongoing training requirements through the sustainment of environmental quality over time. DoD Instruction 4715.03 and MCO P5090.2A require an environmental stewardship ethic be incorporated into natural resources management plans by integrating environmental

considerations with DoD decision-making processes. Conducting required training operations while meeting regulatory requirements and effecting good stewardship practices was an underlying theme in the development of this INRMP.

Environmental compliance is the management of installation operations to meet all applicable federal and state environmental laws, most notably those associated with environmental documentation, water quality, endangered species, and general management of wildlife. The INRMP maintains environmental compliance of the Combat Center and is required by the SAIA, Department of Defense Instruction 4715.03 (*Natural Resources Conservation Program, March 2011*), and Marine Corps Order P50902.A (*Environmental Compliance and Protection Manual, July 1998 revised August 2013*).

1.7 Integration of Internal and External Plans

Effective planning for the sustainable management of natural resources on any property must involve a variety of considerations to be effective. These include considerations such as the landowner's purpose for the land (including past, present, and future uses), impacts these uses may have on the resources base, the historical and current conditions of the resources base as well as any notable trends, conditions on lands immediately adjacent to the property, applicable laws and legal agreements, any future opportunities and concerns stemming from proposed neighboring land uses, regional/watershed scale factors interconnected with conditions on the property, and the support available to affect the desired endpoint (such as levels of funding, staff, and potential partnerships). This INRMP takes into account many of these planning considerations via direct coordination with a variety of internal and regional partners, and by aligning with internal and external plans in order to select the most practical and effective strategies for implementation. Planning documents that have helped shape this INRMP revision are identified below.

1.7.1 Combat Center Master Plan

This master plan was last updated in 2009 and provides the Combat Center with a framework for facility and infrastructure planning for a five to ten-year period. The Master Plan charts the course of appropriate reuse and responsible new construction within Mainside and Camp Wilson, to ensure the Base is able to accomplish its mission well into the future.

1.7.2 Combat Center Order 3500.4K - Range, Training Area, and Airspace Programs

This order provides instruction and procedures for all agencies and units operating within the Combat Center RTAA Programs including descriptions of available training ranges, scheduling of ranges, safety regulations, consequences for violations, and in particular, all environmental procedures that must be adhered to when in a range training area.

1.7.3 Programmatic Agreement and Integrated Cultural Resources Management Plan

The PA is a formal and legal agreement between the United States Marine Air Ground Training Command, Marine Corps Air Ground Combat Center, the California State Historic Preservation Officer (SHPO), and the Advisory Council on Historic Preservation. The PA establishes a process for consultation, review, and compliance with the NHPA and applies to all entities conducting activities that could affect those properties. The ICRMP establishes procedures for

compliance with Federal laws, regulations, and executive orders requiring the protection and/or management of cultural resources with the least possible effect on military training and mission support activities.

The ICRMP primarily contains Standard Operating Procedures (SOPs) for cultural resource management activities conducted on the Combat Center and outlines the legal foundation and methodology on how to implement the plan, ensuring compliance with cultural resource laws. The EA Division, NCRB, maintains the PA and ICRMP documents.

1.7.4 Desert Tortoise Recovery Plan

The desert tortoise was Federally-listed as a threatened species in April 1990. An interagency team led by USFWS and comprised of land managers from the Mojave Desert prepared a plan outlining actions needed to recover and protect the species. This report, finalized in 1994 (USFWS 1994), was developed with input from CDFW, BLM, National Park Service (NPS), and DoD personnel from NTC at Fort Irwin and Naval Air Weapons Station China Lake. A comprehensive assessment of this Plan was completed in 2004 and the assessment identified the need for plan revision and update in 2006. The revised Recovery Plan was approved and released in 2011.

1.7.5 California Desert Conservation Area Plan

Section 601 of the Federal Land Policy and Management Act of 1976 required the BLM to develop a plan, entitled the California Desert Conservation Area Plan, for long-term protection and administration of public lands in the California desert. The California Desert Conservation Plan was finalized in 1980 and establishes general guidelines for management of all BLM-administered lands in the California desert (BLM 1997). Though the Combat Center is not BLM-administered, the California Desert Conservation Area Plan is important because it prescribes BLM management in the Mojave. The INRMP is, however, the DoD natural resources planning and implementation program document.

1.7.6 Northern and Eastern Mojave Planning Effort (NEMO)

The Northern and Eastern Mojave Planning Effort (NEMO) provides a regional perspective for the management of federal lands. It also updates agency-specific management plans to reflect changes made by the California Desert Protection Act of 1994. The planning areas southwestern boundary follows old Route 66, which is close to the Combat Center northern boundary and therefore is of interest to the installation. The Northern and Eastern Mojave interagency planning team consists of representatives from the NPS, BLM, and USFWS. Cooperating Federal agencies include the Bureau of Indian Affairs (BIA), Army Corps of Engineers, Environmental Protection Agency, as well as (NTC at Fort Irwin and Naval Air Weapons Station China Lake. State agencies include CDFW, California State Parks, California Department of Transportation, California and Nevada State Historic Preservation Office, Counties of San Bernardino, Inyo and Mono in California and Clark, Nye and Esmeralda counties in Nevada. Three Native American Tribal Councils are also involved.

1.7.7 Northern and Eastern Colorado Desert Coordinated Management Plan (NECO)

The Northern and Eastern Colorado Desert Coordinated Management Plan (NECO) is a regional landscape-scale planning effort for most of the California portion of the Sonoran Desert. The planning area encompasses over five million acres. The major driving force of the NECO plan is the need to promote desert tortoise conservation and recovery, and the planning area includes two desert tortoise recovery units. The plan includes the same agencies as the NEMO. The area covered by NECO is proximal to the Combat Center on the eastern boundary along Amboy Road; therefore, this plan is also of interest to the installation.

1.7.8 West Mojave Plan

The purpose of the West Mojave Plan is to develop management strategies for the desert tortoise, Mohave ground squirrel and over 100 other sensitive plants and animals that would conserve those species throughout the western Mojave Desert, while at the same time establish a streamlined program for compliance with the regulatory requirements of the Federal ESA and the California ESA. Agencies, local jurisdictions and others with a stake in the future of the western Mojave Desert have collaborated in the development of the West Mojave Plan.

1.7.9 California State Wildlife Action Plan

The State Wildlife Action Plan (SWAP) examines the health of wildlife and prescribes actions to conserve wildlife and vital habitat before their rarity increases and they become costlier to protect. The plan also promotes wildlife conservation while furthering responsible development and addressing the needs of a growing human population. The SWAP may influence natural resources management on the Combat Center.

1.7.10 Desert Managers Group

The Desert Managers Group (DMG) was established to provide a forum for government agencies to work together to conserve and enhance the California desert. The DMG originated as a Department of Interior initiative to implement the 1994 California Desert Protection Act. The DoD Coordinator is the co-chair and a voting member of the Group. The EA Division Head represents the Combat Center at DMG meetings, which are held twice each year. Other members of EA participate in various working groups and ad-hoc committees

1.8 Program Summary

Military installations are entrusted by the federal government to provide good stewardship of their natural lands, and sound natural resources management directly benefits the military mission by providing high-quality realistic training conditions. However, managing for natural resources opens installations to potential spatial, temporal, and/or residual/indirect conflicts with military needs. The mission of the Natural Resources Management Program at the Combat Center is:

"*To ensure that the Combat Center mission and support activities are compliant with environmental regulatory requirements and that all training lands are effectively managed to meet existing and future training demands*".

Sound planning is critical to identifying and offsetting conflicts between resources and military management needs and realizing this mission. As described in section 2.4 History of the Natural Resources Management Program, the Combat Center employed a comprehensive planning process and produced the first Integrated Natural Resources Management Plan for the installation in the late 1990s, which is now formally updated on a 5-year cycle. INRMPs review how soil, air, water, plant and animal resources are managed in concert with the military mission for the mutual benefit of both interests, as feasible.

1.8.1 Program Drivers

Military training generates the majority of impacts to natural resources at the Combat Center, although support facilities and infrastructure contribute as well. Program "drivers" present the fundamental needs which must be satisfied for the military mission to continue without disruption. Drivers are defined by the military mission, land use requirements, and natural resource impacts (USMC 1999), and provide the guidance from which management goals can be developed. The following drivers were identified for the Combat Center's Natural Resources Management Program:

- Maintain compliance with federal laws, such as the SAIA, ESA, Clean Water Act, and Clean Air Act, in such a fashion as to not impede mission activities
- Maintain ability of the Combat Center to support its military mission (SAIA) and ensure that lands are continuously available for military training
- Manage the Combat Center natural resources consistent with DoD and the Combat Center policies
- Participate in regional ecosystem initiatives
- Provide stewardship of public lands

These drivers were used to develop the goals and supporting elements, objectives and tasks identified in the 5 Year Workplan of this document.

1.8.2 Program Organization

Under the INRMP's formal revision, the goal-driven framework of the Natural Resources Program was reorganized into a more streamlined format which more clearly addresses the drivers necessitating the program's existence. With this framework, four overarching goals are used to group an assortment of critical program Elements required to manage natural resources across the Combat Center. Most but not all of these Elements were retained from the previous program structure but some were removed or merged together, and a few new Elements were created. A full accounting of this transition is available in a programmatic crosswalk and can be requested from the Natural Resources staff at EA if desired.

As previously, the Elements of the Natural Resources Program are the pillars under which the program operates. The various Elements identified address different critical aspects of the Program operations and they include but are not limited to things such as minimizing and containing degradation of training lands, landscape level planning, supporting grounds maintenance, having a desert tortoise management plan, managing habitat and non-listed wildlife, and having a conservation law enforcement program. Under each Element, one or more Objectives are presented to fully address all aspects of each Element. These Objectives also

serve to guide the development of projects and tasks. The new framework may be summarized with the following outline:

- Goal 1
  - Element 1.1
    - Objective 1.1.1
      - Task 1.1.1-A
    - Objective 1.1.2
      - Task 1.1.2-A

Future adjustments are anticipated in coming years to improve program flexibility, project justifications, and reduce burdens associated with budgeting and reporting. This INRMP identifies compliance requirements mandated by federal laws; regulations, and policies, and some projects and programs within it are used to mitigate various military activities. The 1997 Sikes Act requires implementation of INRMPs, and therefore they are a priority for funding. Biological Opinion (BO) implementation and sustainment funds are critical to support BO and conservation of the desert tortoise. Environmental Management Funds are important for the implementation of INRMPs.

1.8.3 Project Prioritization

Budget development and INRMP implementation are continuing, interrelated processes. Natural resources funding requests should support INRMP planned actions and vice versa. While not all natural resources-related expenditures are identified within the INRMP, all planned actions within the INRMP that require funding should be incorporated into budget planning documentation such as the Program Objectives Memorandum and biannual budgets. As budgets are re-evaluated and funding allocations change, so must INRMP planned actions, prioritization, and implementation years be adjusted, re-evaluated, and possibly reprioritized. The 5-year workplan will be informally revised annually in consultation with USFWS, CDFW and HQMC to ensure accurate tracking, progress monitoring, application of adaptive management strategies, and corresponding budget request updates.

Not all projects under this INRMP require funding. When funding is required a project is classified into COLS 1, 2 or 3 funding priorities. These budget classes may be described as follows:

COLS 3: Recurring natural resource conservation management requirements activities needed to cover the recurring administrative, personnel, and other costs associated with managing DoDs conservation programs that are necessary to meet applicable compliance requirements (federal and state laws, regulations, Presidential Executive Orders, and DoD policies) or that are in direct support of the military mission.

COLS 2: Current Compliance projects and activities needed because an installation is currently out of compliance and has received an enforcement action from a Federal or state agency. COLS 2 also includes projects and activities needed that are not currently out of compliance.

COLS 1: Maintenance Requirements projects and activities needed that are not currently out of compliance, but deadlines have not passed, or requirements are not in force, but will be out of compliance if projects or activities are not implemented in time to meet established deadlines.

The Combat Center will seek appropriate levels of project funding and will set final priorities based on the amount of funds actually received. COLS 3 projects within this INRMP are those actions that the Combat Center commits to implementing within the duration of the plan. COLS 3 projects must be funded in the current fiscal year in order to maintain compliance with compliance agreement or put the installation back into a compliance status after becoming noncompliant. COLS 2 projects include those projects needed that are not currently out of compliance and the deadlines for compliance either have not passed or are not established. COLS 1 projects are those above compliance and not explicitly required by law but support natural resources management goals and objectives. Only a portion of all Natural resources funding requests are received each year. Therefore, in addition to the COLS classification, an additional ranking scheme is also applied at the beginning of each fiscal year by the collective branches within Environmental Affairs. Once a year, the branch heads gather and rank their combined COLS 3 projects by individual priority (in ordinal priority), then rank COLS 2, then COLS 1, and the received funding is applied to the project list in descending order of priority.

The Marine Corps budgetary process requires funding projection for a seven-year period. Thus, the Combat Center budget requests for natural resources management through the 2018-2022 are already in the system. However, budget requests are periodically updated and often are sufficiently flexible to meet emergent requirements and needs.

Under the scope of this INRMP, projects currently funded with prior year budgets and with ongoing activities are identified in the 5-year Workplan.

1.9 Review and Revisions Process

The preparation of this INRMP was guided by the *Handbook for Preparing, Revising, and Implementing Integrated Natural Resources Management Plans for Marine Corps Installations* (October 2007) and the Department of Defense Manual 4715.03 (*Integrated Natural Resources Management Plan (INRMP) Implementation Manual, November* 2013). This INRMP is intended to replace the 2011-2016 Plan and fulfills the minimum 5-year review requirement for INRMP documents, identified in Section 101(b)(2) of the Sikes Act.

The revisions process involves the DoD Components, USFWS, and appropriate State fish and wildlife agencies. Parties collectively determined the existing INRMP required a formal revision, due to the expiration of the previous document and realignment of the base boundaries, which significantly increased the installation acreage. Once the initial revision to the expired INRMP is made, consultation will be initiated with USFWS and CDFW. Their feedback on the early draft will inform the development of a revision to the Plan, as well as a new or supplemental environmental impact analysis for the proposed action to ensure NEPA compliance.

1.9.1 INRMP and NEPA Integration

INRMP and NEPA integration will be required. NEPA is a federal law that mandates federal agencies consider the environmental consequences of their actions before committing to their actions. It is a procedural planning tool which requires a clear evaluation of all federal decisions potentially affecting the human and natural environment. Environmental Quality Implementing Guidelines for NEPA (40 Code of Federal Regulations [CFR] Parts 1500-1508) require environmental analyses and documentation be integrated as much as practicable with other environmental reviews, laws, and executive orders. In past years, the INRMP was determined compliant with NEPA by integrating the Fiscal Year (FY) 2002-2006 INRMP with the associated Environmental Assessment, producing a single document. The FY 2012-2016 INRMP was a review of limited scope and was based off the previous INRMP, therefore a lower threshold of NEPA compliance was required. However, the FY 2018-2022 INRMP requires an Environmental Assessment as additional lands have been added to the installation (Appendix B).

The purpose of the Environmental Assessment in the FY 2002-2006 INRMP was to identify and evaluate environmental consequences of implementing the proposed plan, in accordance with NEPA, the Council on Environmental Quality regulations, Marine Corps Order P5090.2A, and Combat Center Order 5090.4, *Environmental Impact Review Procedures.* The purpose of the FY 2018-2022 Environmental Assessment (Appendix B) is to analyze potential impacts associated with implementation of the revised INRMP, which addresses legacy lands as well as expansion areas of the installation, streamlines and diversifies the NR Program at the Combat Center, reduces encroachment of natural resources management on the military mission, and ensures high-quality natural resources are sustained aboard Marine Corps training lands.

The revised INRMP and resulting environmental assessment were made available for public review and comment, and comments were directly solicited from seven regional Native American Tribes, the Bureau of Land Management, and relevant NGOs across the region. After the commenting period closed, the installation afforded USFWS and CDFW the opportunity to review all comments received before the Combat Center incorporates and finalizes the Plan, and Environmental Assessment. The INRMP is considered final once the relevant installation(s), USFWS, and CDFW have signed the document, or provided signed record of coordination.

1.9.2 Tribal Consultation and Collaboration

All federally recognized Indian Tribes identified in the external stakeholder section have known traditional interests in the lands managed by the Combat Center. These Tribes have a government-to-government relationship with the Combat Center and formally consult on this level (SECNACINST 4000.35A). During the consultation process for this INRMP, the Chemehuevi identified those desert plant species traditionally used for medicine, ceremonial, and ritual practices, many of which may be found aboard the Combat Center and are commonly used by the Serrano, Cahuilla and Mojave cultures as well. The Chemehuevi have also expressed an interest in collaborating with the Combat Center to survey and locate plant species that are of religious and/or cultural significance, and the San Manuel Band of Mission Indians (Serrano culture) have expressed a desire to gather Mesquite (*Prosopis juliflora*) and possibly additional plants that have religious or cultural significance if locations are known and shared.

1.10 Tracking and Reporting

Implementation of this INRMP shall be monitored annually, with a Progress Report delivered to the USFWS, CDFW by January 1st of every calendar year of INRMP coverage. The Progress Report will be in adobe acrobat format and shall include information about the previous year's activities, as well as all work to be performed during the upcoming year. The Progress Report shall be developed in coordination with USFWS and CDFW and adopted by the Natural and Cultural Resources Branch of Environmental Affairs prior to finalization. Coordination with USFWS and CDFW is intended to include face-to-face meetings and discussions of activities, lessons learned, and provide opportunities for questions and input into the upcoming year's work. Progress Reports were not submitted to USFWS and CDFW prior to the 2018-2022 INRMP therefore a format will be developed and agreed upon with CDFW and USFWS for fiscal year 2018. General information to be included in the Progress Report is provided below:

1) A minimum 1-paragraph summary of each task that was performed during the previous year. The paragraph shall include but not be limited to summary information such as the intent of the task, associated costs and timeframe for implementation, lead entity, and any measurable benefits received if completed;

2) A minimum 1-paragraph discussion of any tasks scheduled but not performed during the previous year, including a review of why the task wasn't accomplished, and recommendation on how to direct further effort (i.e. should the task be removed from the workplan? Should a new strategy be pursued? Etc…).

3) A minimum 1-paragraph discussion of any necessary changes to management and monitoring priorities resulting from information learned during the previous year, or from changing installation priorities;

4) An annual workplan revision with any modifications to the work proposed for the upcoming year of coverage (by fiscal year). This shall include an update to the tabular summary table from the 5-Year Workplan presented in Appendix A, as well as a minimum 1-paragraph summary of each of the tasks proposed for the year.

5) An appendix (or appendices) including all final survey reports and/or raw data and photographs from work performed during the reporting timeframe, if and only if the information was not submitted to the agency points of contact earlier in the year. USFWS and CDFW should receive copies of all reports produced by contractors for species monitoring and management activities performed throughout the year.

This page is left intentionally blank.

2.0 LAND USE AND THE MILITARY MISSION

2.1 Installation Location and Neighboring Land Use

The Combat Center is located in the Mojave Desert of San Bernardino County, California. The base is approximately five miles north of the city of Twentynine Palms, 54 miles northeast of Palm Springs, and 150 miles east of Los Angeles. Surrounding the installation are large extents of undeveloped public land, several unincorporated rural communities, small towns, and commercial mining operations. Communities are mostly heavily focused in the Morongo Basin which lays south and west of the base and include Twentynine Palms, Joshua Tree, Yucca Valley, Morongo Valley, and Landers. The Combat Center's northern boundary lies three miles south of Interstate 40; the southern boundary is six miles north of Highway 62 (Figure 2-1).

2.2 Pre-Military Land Use

The land that is currently occupied by the Combat Center has a long history of human presence dating back some 13,000 years BP. This desert environment was once lush with vegetation, playas were filled with water, and fauna was abound for hunting by the ancestral peoples of the Serrano, the Cahuilla, the Chemehuevi, and the Mojave cultures. For thousands of years, these Uto-Aztecan - Takic and Numic language speaking peoples hunted and foraged in this region. The Cultural Resources branch of EA researches, monitors, and at times archives these materials aboard the Base, and the most notable artifact discovered to date includes a Clovis projectile point found in the northeast section of Noble Pass in 2013.

Post-western contact, the Morongo Basin was relatively unexplored by the Spanish colonials as the California Mission System was established mainly along the coast (1769-1823). In 1776 the Spanish did establish a trail through the Mojave Desert called the “Old Spanish Trail” or the “Mojave Road” later used by other explorers in the early 1800’s that crossed-country to California.

By the time of the California Gold Rush (1848-1852), an influx of newcomers into the state demanded a greater food supply. As a result, cattle and other livestock were driven into California from the east. Some ranching is evidenced through material culture and historical records in the area the Combat Center occupies today, including the Surprise Springs and Sunshine Peak areas. However, from a regional perspective, most ranching activities were predominately located at Warren’s Ranch in what is present day Morongo Valley.

The California Gold Rush not only indirectly bolstered the level of ranching activity in California, it also triggered a significant migration of miners into this region. These miners were primarily looking for silver. By the 1880’s mining exploration and production in the Mojave Desert intensified and the construction of the Southern Pacific Railroad- Mojave to Needles rail line expanded their reach. The earliest mining in the area of the Combat Center began in November 1882; with the most productive mining claims filed in the Lava Bed Mountains and the Bullion Mountains between 1884 and 1901. The Combat Center’s earliest mining district was the Lava Beds Mining District, organized in 1884. Mining peaked and lulled in the region over the decades but operations closed in 1952 after the establishment of the Marine base.

Figure 2-1: Combat Center Location

2.3 Installation History

The Combat Center has grown over time to reach the approximately 761,247 acres, or 1,102 square miles of land it encompasses today. Major acquisition and growth events are identified below:

- Public Land Order (PLO) No. 985, 26 July 1954, withdrew 200 acres of public land for the Department of Navy to use as "an artillery and anti-aircraft weapons training area" (thought to be the area now occupied by Mainside).
- PLO No. 1860, 25 May 1959, withdrew more land (PLO and subsequent documents disagree at either 443,000 or 472,000 acres) for use as "an artillery range and Fleet Marine force support training area in connection with the Marine Corps Training Center at Twentynine Palms."
- 112,970 acres were acquired from the Southern Pacific Railroad.
- 10,633 acres were acquired from other private landowners.
- The Navy tried to annex the America Mine Training Area (approximately 8,000 acres) back to BLM, but they refused to take possession due to clean-up costs and safety hazard posed by range residue.
- 1,920 acres were acquired from Catellus Corporation to become part of the Lavic Lake Training Area.
- The National Defense Authorization Act of Fiscal Year 2014 established 107,489 acres acquired west and south of the traditional boundary, comprised of 88,130 acres west and 19,359 acres south of the previous boundary. The acreage was acquired from BLM, private property owners, and State of California.

The U.S. Army first used the lands now associated with the Combat Center in 1941 as a glider training base known as Condor Field. Over the next 10 years, control and use of the facility was transferred several times and included a seven-year period of no use. However, by the early 50s the development and production of larger and more sophisticated weaponry warranted the reactivation of the military facility as Headquarters Detachment. The installation was named Camp Detachment Marine Corps Training Center, and a total of 120 Marines were stationed there by early 1953.

The installation became the world's largest Marine Corps base on 1 February 1957, which is a distinction it still maintains, and it has continued to grow in capacity and size since then. The Communications-Electronic School was relocated from San Diego in September 1967 and renamed as the Marine Corps Communications Electronics School (MCCES) three years later. The Training Center was redesignated as the Marine Corps Air Ground Combat Training Center on 1 October 1978, and formally renamed as the Marine Corps Air Ground Combat Center on 16 February 1979. In April 1980, the Combined Arms Command was activated, in 1990 the 7th Marine Regiment moved their Regimental Colors from Camp Pendleton to the Combat Center, and in October 2000, the Combat Center was designated home of the Marine Air Ground Task Force Training Command. In 2013, the installation once again expanded its boundary to support the increased need for training lands.

2.4 Natural Resources Program History

The Marine Corps commitment to natural resources management is long and steadfast. Land management planning is referenced to go as far back as 1956 at the Combat Center, although the oldest hardcopy Plan known to exist is the 1962 *Land Management Plan for Marine Corps Base Twentynine Palms, California* report. This 1962 Plan was prepared by the Soil Conservation Service (now Natural Resources Conservation Service), in cooperation with Naval Facilities Engineering Command (NAVFAC) Southwest Division. Since this time, there has always been coverage and guidance from a Natural Resources Management Plan for the installation. Over time these Plans evolved with the addition of new authorities, responsibilities and internal and external stakeholders. Wildlife agency participation and concurrence became a standard requirement, internal environmental oversight committees and boards were formed, and external partnerships with neighboring federal, state and local agencies were formalized to better implement sustainable natural resources management to best support the military mission.

In 2000, the Marine Corps Installations Campaign Plan (USMC 2000) formally reaffirmed its commitment to natural resources management, promising the continuance of Natural Resources Program, by stating "*We will enhance our environmental and encroachment prevention programs because these programs serve as tools for installation and operating force commanders to meet federal, state and local laws and preclude downgrading or loss of training or operational opportunities. We will enhance our 'good neighbor' policy with surrounding communities to ensure mutual support of both our needs and concerns."*

2.5 Military Mission

The Combat Center is comprised of both the Marine Air Ground Task Force Training Command, and the Marine Corp Air Ground Combat Center. While separate, both entities work together to effect training exercises and operations to support the battle-readiness of United States Marines.

The MAGTFTC mission is *"To manage the Marine Air Ground Task Force Training Program (TP) and conduct service-level MAGTF combined arms training in order to enhance the combat readiness of the operating forces and support the Marine Corps responsibilities to Geographic Combatant Commanders."*

The MCAGCC mission is *"To provide and manage facilities, services, and support to forces and families permanently assigned or participating in training aboard the Combat Center in order to ensure readiness of the MAGTFTC as well as the welfare of personnel and families."*

2.5.1 Military Population

Active duty military personnel currently assigned to the Combat Center include 15,000 Marines supported by 1,627 civilian personnel. There are 7,492 military dependents. About 35,000-50,000 Department of Defense military personnel annually train during integrated training, MAGTF Training and other exercises at the Combat Center, and an additional 7,000 Marines train at the MCCES.

The Combat Center has both Fleet Marine Forces (FMF) and Tenant Units. Additional transient units that schedule training at the Combat Center include Marine Corps, Air Force, Army, and Navy units (Snover and Kellogg 1999).

2.5.2 Land Management Units

Land use on the Combat Center includes infrastructure in support of Marine Corps live fire training in 27 range training areas (TA) plus "Mainside", which is the developed range training area that supports administration, maintenance, housing areas, and community support facilities. Land use on the Combat Center is presented in Figure 2-2 and described in more detail, below.

Mainside

Mainside, encompassing 5,260 acres, is located in the southernmost part of the Combat Center. It is the developed portion of the base that houses administrative, maintenance, housing areas, and community support facilities.

Training Areas

The Combat Center is currently divided into 27 training areas plus Mainside. In 1998, these training areas were realigned to alleviate scheduling problems, with 23 range training areas used up until 2017 when four additional ranges were added during the expansion of the Combat Center. Today in most cases, training area boundaries are defined by natural topographic features, which reduce the risk of stray fire. Each training area varies by size, use, terrain type and training restrictions (Figure 2-2). Descriptions below are taken from Snover and Kellogg (1999) with acreages from the EA Geographical Information System (GIS) database.

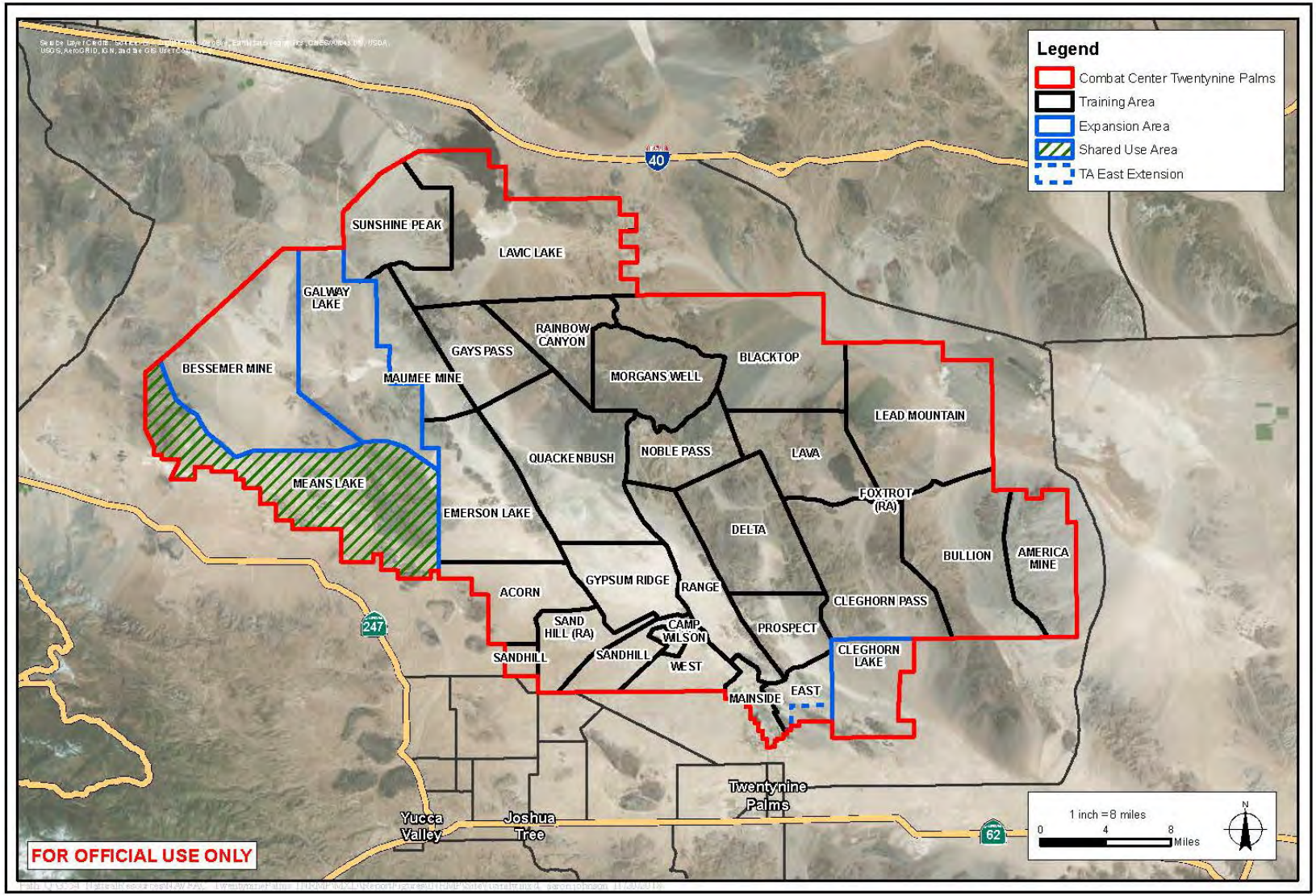
Acorn Training Area (17,369 acres) is in the western portion of the installation. This area is currently used as a non-live-fire maneuver area.

America Mine Training Area (20,808 acres) is located on the eastern boundary of the Combat Center. America Mine is primarily used for patrolling, mortar firing, infantry training, and light armored vehicle training. Use is limited mainly due to lack of direct ground access. Its physical character is a combination of mountainous (37%) and rolling terrain.

Bessemer Mine Training Area (49,818 acres) is located in the northwestern portion of the Combat Center. This training area is used for aviation, artillery, live fire and maneuver exercises involving tanks and heavy wheeled vehicles in support of unit and major exercises. Primary use occurs during large scale exercises.

Black Top Training Area (44,014 acres) is located on the northern boundary of the Combat Center. It is a live-fire and/or maneuver area. Topography is gently sloping (13% mountainous or rough). Black Top is mainly used for tank gunnery, artillery, and small arms training and major exercises.

Figure 2-2: Combat Center Training Areas



Bullion Training Area (35,681 acres), in the eastern portion, is non-accessible from the south due to the Cleghorn Lakes Wilderness Area and the Bullion Mountain Range to the southwest. About 44% of the area is mountainous. It is used for aviation bombing and strafing, gunnery practice, artillery firing, and infantry maneuvers. Fixed Ranges 603, 605, and 607 are located here and Range 210 Military Operations in Urban Terrain (MOUT) facility is also located in this RTAA.

Cleghorn Lake Training Area (17,646 acres) is located in the southeastern portion of the Combat Center, is non-live fire, and used primarily for staging and marshaling by units taking part in large scale exercises.

Cleghorn Pass Training Area (36,338 acres) consists of mountains surrounding a valley (40% mountainous or rough terrain). The 400 series and Range 500 are located here. Cleghorn Pass is used primarily for small arms, tank gunnery, light armored vehicle live-fire, and maneuvers. Off-road vehicle transit is not permitted, and the only area authorized for bivouacking is west of Universal Transverse Mercator (UTM) Grid UTM 11 S 0599000E and south of UTM Grid UTM 11 S 3797000N. Range 500 is the Armor Multi-Purpose Range Complex (MPRC). The MPRC conducts live-fire tank gunnery qualifications up to Table VIII. Light armored vehicles also conduct live-fire training at Range 500.

Delta Training Area (29,791 acres) is used for live-fire maneuver and major exercises. OP Crampton and Prospect Hill (also known as VIP Hill) are located here. The training area is 48% gently sloping land and 52% mountainous. It is essentially a narrow valley with the Bullion Mountains defining both sides of the corridor. Delta is heavily used for transit to other training areas, and 2 main supply routes (MSRs) form the Delta T in the northern portion of the training area.

East Training Area (8,263) is gently sloping (12% mountainous or rough) and currently used for staging for major exercises, MOUT operations, non-live fire activities, and live-fire activities that impact in Prospect and Delta training Areas. This area is limited to these uses due to its proximity to Mainside. Range 100 is located in East Training Area.

Emerson Lake Training Area (32,287 acres) is located on the western boundary of the Combat Center with 70 percent of the land being gently sloping and the remaining comprised of low rolling terrain (13% mountainous or rough). This area is mainly used for tank maneuvers, aviation bombardment, and aerial targetry.

Galway Lake Training Area (38,582 acres) is located in the northwestern portion of the Combat Center. This training area is used for aviation, artillery, live fire and maneuver exercises involving tanks and heavy wheeled vehicles in support of unit and major exercises. Primary use occurs during large scale exercises. The majority of Galway Lake is gently sloping with 23% of this area being mountainous.

Gays Pass Training Area (18,320 acres) is used for ground-based, live-fire exercises and artillery. Its physical characteristics are denoted with the pass as gently sloping land with mountains (44%) straddling each side.

Gypsum Ridge Training Area (18,265 acres) is mostly low rolling terrain and contains the northern part of Deadman Lake. The essentially non-live fire training is used for bivouac, artillery fire out of Gypsum Ridge, wheeled vehicle maneuvers and occasionally live-fire demonstrations are allowed in this area.

Lava Training Area (22,925 acres) is in the northern portion of the Combat Center. The area, as its name indicates, has exposed lava rock with 26% mountainous or rough terrain. Lava is used primarily for battalion tactical training (including both ground-based and combined ground/air live-fire) and artillery.

Lavic Lake Training Area (56,985 acres, the largest training area) is the primary training area for aviation training exercises and is also used for live-fire maneuvers with major exercises. Most of the area is gently sloping and is made up of lava rock (17% mountainous or rough).

Lead Mountain Training Area (45,792 acres) is located at the northeastern boundary of the Combat Center. Lead Mountain is composed of mostly gently sloping land (only 8% rough), lava flows from Amboy Crater, and Dry Lake. Its training exercises consist of aviation, artillery, and ground-based live-fire. A dummy airfield is located in the southern portion of the training area.

Maumee Mine Training Area (16,141 acres) is located on the western boundary of the Combat Center. It is 19% mountainous or rough and is mainly used for artillery and maneuver training exercises.

Means Lake Training Area (56,058) is located on the southwestern boundary of the Combat Center. This training area is classified as a “Shared Use Area”. Means Lake will only belong to the USMC for (2) periods per year and for 24 days each period. The primary use for Means Lake is to support full scale Marine Expeditionary Brigade (MEB) Exercises conducted twice per year for 24 continuous days each. All live fire conducted within Means Lake Training Area must be from direct fire weapons and non-dud producing ordnance. All fires must impact on company designated Company Objectives.

Morgans Well Training Area (23,361 acres) in the center of the Combat Center, is composed mostly of mountains. This area is commonly used for aviation and/or ground-based live-fire, tank maneuvers, infantry training, and artillery. Due to the mountainous terrain, there is limited vehicle cross-country mobility.

Noble Pass Training Area (16,834 acres), in the center of the Combat Center, is composed mostly of mountains. This area is commonly used for aviation and/or ground-based live-fire, tank maneuvers, infantry training, and artillery. Due to the mountainous terrain (59%), there is limited vehicle cross-country mobility.

Prospect Training Area (13,188 acres) was the southern one-third of Delta before the 1998 realignment. Prospect is 22% mountainous or rough terrain and is used primarily for battalion- and company-level training.

Quackenbush Training Area (41,814 acres) has low, slightly rolling terrain (13% mountainous or rough terrain). Ground-based live-fire, artillery, aviation, and maneuvers are the most common training exercises for this area. Also, Range 220 Combine Arms Military Operations in Urban Terrain (CAMOUT) facility is located in this range training area.

Rainbow Canyon Training Area (16,569 acres) is used as a live-fire maneuver area. It is 63% mountainous terrain and 37% maneuver area. The Bullion Mountains run through the southern portion of the area. It is used for maneuvers and artillery. Located within the Rainbow Canyon Training Area is Range 601 (Sensitive Fuse Impact Area), an abandoned air-to-ground range. Range 601 is a no-maneuver area in which neither personnel nor vehicles are authorized at this time.

Range Training Area (20,161 acres) is located in the central part of the Combat Center, directly north of Mainside. The training area is most gently sloping and rolling terrain with 19% being mountainous or rough terrain. The majority of the fixed ranges are located in Range Training Area.

Sandhill Training Area (11,904 acres) is off-limits to live-fire due to its proximity to Mainside and surrounding communities. It is used for maneuvers, and the Exercise Support Base and Expeditionary Air Field are partially located here along with the Assault Landing Zone Sandhill.

Sunshine Peak Training Area (22,860 acres) is 38% mountainous. This training area is one of the least used due to its location in the upper northwestern boundary of the Combat Center. Its primary use is as an emergency ordnance drop zone.

West Training Area (9,966 acres) is generally gently sloping and contains Drop Zone Sandhill, portions of the Expeditionary Air Field and Exercise Support Base, and the Assault Landing Zone. West is used for non-live fire maneuvers and major exercise staging. West also has the Range 225, Range 705 and the Range 800 training facilities.

Special Use Areas

The Combat Center designates Special Use Areas (SUAs) in training lands to meet a variety of military or conservation objectives. All SUA designations are made within the military range training area system to avoid the need for military personnel to use a dual set of land units. Within SUAs, military training activities are either completely restricted or specific limitations are prescribed, depending on the resource(s) present and site-specific conditions. SUAs designated primarily for the protection of natural resources are sometimes referred to unofficially as Natural Resources Management Areas but typically Natural Resources Management Areas are grouped together and presented with those SUAs established for cultural resources protection, since the disciplines are closely interconnected with one resource almost always benefitting from the protection of the other. Combat Center Order (CCO) 3500.4k and CCO 5090.1F identify two levels of natural/cultural SUAs, including Category 1 Restricted Use Areas, and Category 2 Environmentally Sensitive Areas.

Category 1 SUAs - Restricted Use Areas

Restricted Use Areas (also known as Category 1 Special Use Areas) are no impact zones where mechanized maneuvers, bivouacs, off-road vehicles, and training involving vehicle activity is prohibited at all times. Transit on authorized Supply Routes is authorized, so long as established speed limits are followed. The oldest and most well-recognized restricted area established for natural resources protection currently covers 11,801 acres in the Sandhill TA and protects the installations water supply, archeological resources, and the desert tortoise, where tortoise densities are predominately 21-50 animals per square mile (as per Woodman *et al.* 2001). A full list of Restricted Areas established for conservation purposes is provided below and may be viewed in Figure 2-3:

- Delta/Prospect *(1,022.3 acres)*
- Lavic Lake *(2,319.3 acres)*
- Delta *(18.4 acres)*
- Emerson/Quackenbush *(23.4 acres)*
- War Eagle *(75.1 acres)*
- Sunshine Peak (*1,314.6 acres)*
- Lead Mountain *(249.7 acres)*
- America Mine *(37.8 acres)*
- Lavic/Sunshine *(8,901.5 acres)*
- Emerson Lake *(2,049.2 acres)*
- Lava (*265.3 acres)*
- Foxtrot *(965.9 acres)*
- Bess/Galway *(6.983.9 acres)*
- Deadman *(2,830.2 acres)*
- Crystal *(2.1 acres)*
- Sunshine Peak *(1,987.0 acres)*
- Sandhill *(11,801.2 acres)*
- Cleghorn Lakes *(2,934.9 acres)*
- Bullion *(25,482.6 acres)*

Category 2 SUAs - Environmentally Sensitive Areas

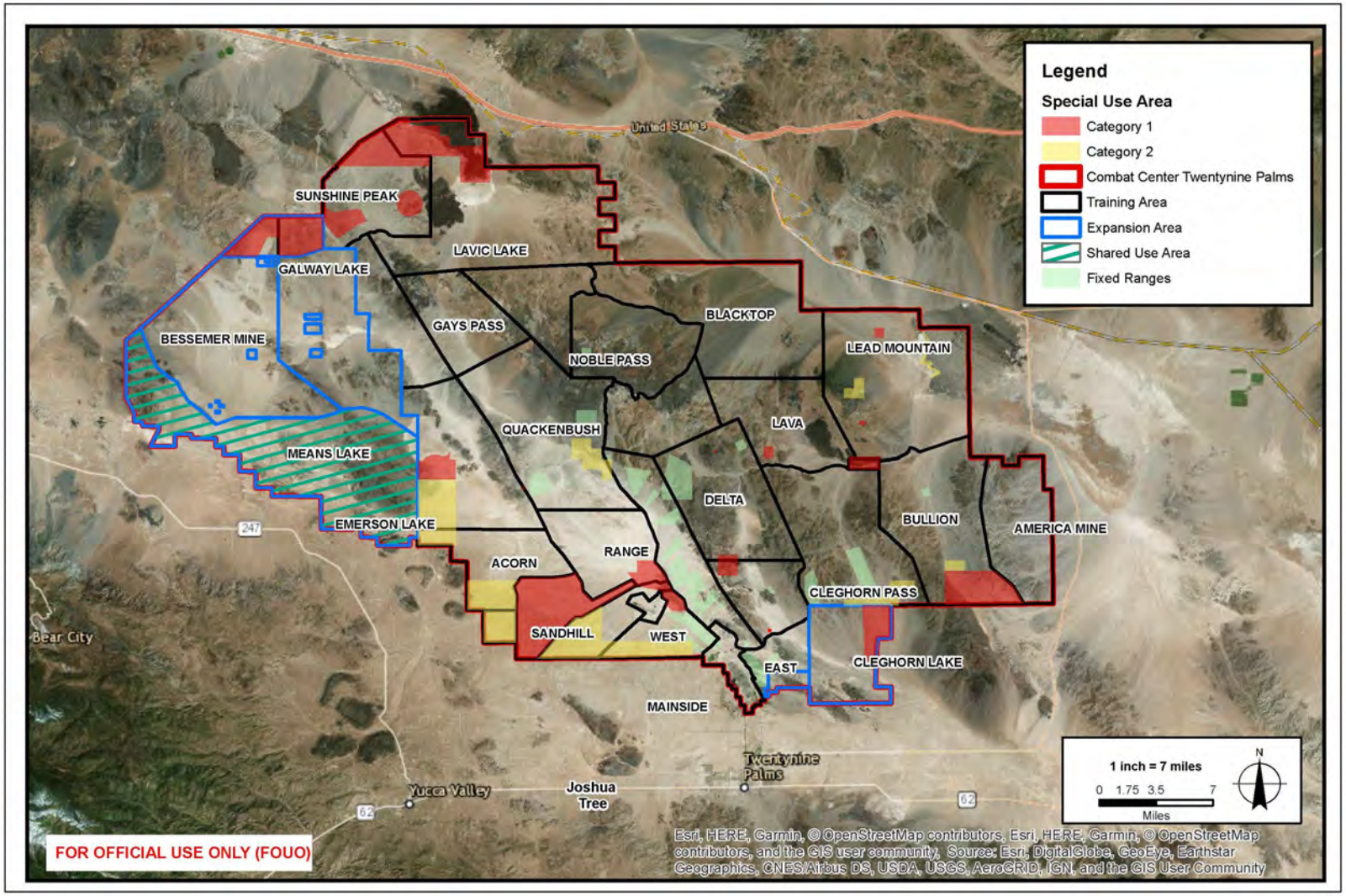
Environmentally Sensitive Areas do not limit training, however military units are cautioned to be aware of sensitive natural and cultural resources present. The CCO 5090.1F discusses SUAs in detail and cautions that improper use may result in future environmental constraints. A full list of Environmentally Sensitive or Category 2 SUAs is provided below and may be viewed in Figure 2-3:

- Wood Canyon SUA (*2,212.1 acres*)
- Cleghorn *(1,934.3 acres)*
- Lead Mountain *(738.6 acres)*
- Acorn/Emerson *(6,082.1 acres)*
- Amboy Crater *(591.4 acres)*
- Sandhill/West *(8,341.7 acres)*
- Acorn *(3,465.6 acres)*

- Sandhill *(2,550.4 acres)*
- Bullion *(491.8 acres)*

As discussed earlier in this section, the management of natural resources is an integrated and interrelated process with cultural resources management. Figure 2-3 shows the locations of all Special Use Areas established for the conservation of natural or cultural resources, as well as all fixed-range facilities aboard the Combat Center.

Figure 2-3: Combat Center SUAs and Fixed Ranges



2.5.3 Training Lands Management

This section is intended to help identify the impacts of training and operations on natural resources by reviewing the various aspects of marine training and support functions necessary to achieve the military mission at the Combat Center. Training activities are defined as individual physical actions conducted by Marines or machines. An operation consists of a combination of individual physical actions and activities. Activities common to many operations and training exercises at the Combat Center fall into the vehicular, dismounted, and aircraft activities, and use ordnance, earthmoving, weaponry, targetry and permanent and expeditionary facilities to achieve their objectives. The primary military training exercises conducted at the Combat Center are listed below and discussed in detail later in this section. These exercises do not necessarily take place each year, but their typical frequencies are identified.

- Integrated Training Exercise (6 annually)
- MAGTFTC level Training (up to 10 annually)
- Fire Support Coordination Application Course (annually)
- Steel Knight exercise (annually)
- Desert Fire Exercise (twice annually)
- Desert Scimitar (as required)
- Tactical Air Control Party training (10 annually)
- Fallbrook and Barstow shoot
- Annual tank gunnery qualifications
- Independent air support training flights by Marine, Navy, Army, and Air Force aircraft
- Low altitude air defense firing exercises
- Air schools proficiency training
- Joint airborne-air transportability training and aerial delivery missions
- Additional training needs and requirements of Marine Expeditionary Force tenant units located aboard the base
- Large Scale Exercise (MEB) conducted several times annually

Prior to discussing specific functions of each exercise, a review of the basic components of training exercises is given below.

Vehicular Activities

Vehicle use is a crucial element in training and operations. Discussions of military training exercises will focus only on vehicles that are used off of primary and secondary paved roads, and off of designated tracked vehicle crossings. All vehicles are capable of producing noise, dust, and altering native soil structure. As a result, vehicular use does impact natural resources at the Combat Center. The type and level of impacts are dependent on many factors including location, time of year and frequency of use. The types of vehicles using training ranges include:

- Tracked vehicles, which have non-rubber wheels (e.g., tanks, amphibious assault vehicles [AAVs], expeditionary fighting vehicles [EFVs], multiple launch rocket systems [MLRSs] or self-propelled artillery;
- Heavy-wheeled vehicles, which have multiple axles and more than four rubber tires (e.g., light armored vehicles [LAVs], amphibious combat vehicles [ACVs], 5- and 7-ton trucks

and personnel carriers, and the entire series of Mine Resistant Ambush Protected [MRAP] vehicles); and
- Light-wheeled vehicles, which have four rubber tires (e.g., utility vehicles, high mobility multi-purpose wheeled vehicles [HMMWVs], joint light tactical vehicles [JLTVs], and small trucks).

Dismounted Activities

Dismounted activities are classified into two categories: *individual*, with seven or fewer people on foot, and *group*, with eight or more people on foot. Movement associated with a group of people generally creates greater noise levels and has more physical impacts (trampling effects) on the land than movement of individuals. Movement is often extensive in combat training situations, and training exercises typically involve accessing by foot and by vehicle.

Aircraft Activities

The following aircraft activities are conducted in Restricted Airspace R2501, as compiled from Restricted Area / Military Operations Area Utilization Reports (USMC 1990, 1991, and 1993):

Table 2-1 Aircraft Activities

• Alpha Strikes	• Rocket launching
• Close Air Support	• Air Combat Maneuvers
• Parachute Operations	• Target Marking
• Electronic Warfare	• Aerobatic Flights
• Tactical Air Control Party	• Troop Lifts
• Low Altitude Training	• Spotter Training and / or Air Strikes
• Low Level Bombing	• Strafing
• Limited Ground Controlled Intercepts	• Dissimilar Air Combat Training
• Close-in Fire Support	• Forward Air Controller
• Visual Reconnaissance	• Troop Inserts
• Medical Evacuation Support	• Re-supply Missions
• Night Vision Goggle Training	• Photo and Photoflash Runs
• Rotary-Wing Operations	• Small Caliber-Direct Fire Weapons Systems
• Low Altitude Refueling Operations	• Fixed-Wing Tactical Operations
• Airborne Refueling Operations	• Flight Activities Associated with MEB Exercises
• High-Altitude Indirect Fire Systems	• Remotely controlled aircraft (Unmanned Aerial Vehicle [UAV]) operations

The following aircraft are currently or shortly projected to train at the Combat Center (USMC 2017):

Table 2-2 List of Aircraft		
Designation	**Name**	**Aircraft Type**
A-10	Warthog	Fixed Wing
AV-8B	Harrier II	Fixed Wing
B-1	Lancer	Fixed Wing
C-130 (KC-130)	Hercules	Fixed Wing
F-5E	Tiger 2	Fixed Wing
F-15	Eagle	Fixed Wing
F-16	Falcon	Fixed Wing
F-22	Raptor	Fixed Wing
F/A-18 C/D	Hornet	Fixed Wing
F35	JSF	Fixed Wing
AH-1	Cobra	Rotor Wing
CH-46	Sea Knight	Rotor Wing
CH-53	Sea Stallion	Rotor Wing
MV-22	Osprey	Tilt Rotor
UAV - Various	n/a	n/a

Aircraft over flights generally have little direct impact on natural resources. Air ordnance delivery operations are conducted by both fixed- and rotary-wing aircraft. Some aircraft flights originate and / or terminate at the Strategic Expeditionary Landing Field (SELF). Unmanned Aerial Vehicles operate from a facility near Assault Landing Zone Sandhill. Parachute drops of personnel and cargo may occur in all training areas with prior coordination.

Ordnance Use

Ordnance use is prohibited within 1,000 meters of the Combat Center boundary. The use of air-to-ground ordnance (bombing and strafing) is a characteristic and integral part of training at the Combat Center. The manner of aerial ordnance delivery varies due to differences in aircraft, weapons systems, and missions. Live-fire is strictly prohibited in Mainside and Camp Wilson. The East training area is a non-impact area, and Acorn, West, Sandhill and East may only be used for blanks and pyrotechnics.

Digging and Earthmoving

When in a stationary position for an extended period of time, such as in defense or in preparation for an enemy attack or ambush, vehicles must be dug into the ground. “Digging in” is the act of constructing a fighting position below the surface of the ground to provide the vehicle and crew

protection against direct and indirect enemy fire and to conceal their position from the enemy forces. This critical skill typically utilizes engineering equipment or other heavy machinery to prepare the fighting positions. To reduce environmental impacts, all disturbed areas are returned to their natural grade at the end of each training event.

Digging in is normally done during defensive operations and takes place in numerous training areas aboard the Combat Center. Digging in also involves building obstacles to channelize, slow down, or stop the forward movement of enemy forces. There are various types of natural and mechanical obstacles that can be constructed, the most common of which is a tank ditch. A tank ditch is a large berm-and-trench system that extends across the entire front of the defensive position. Tank ditch berms can be from 3,280 feet (1,000 33 meters) to 11,480 feet (3,500 meters) in length; the chosen size and placement is based on the Commander's current tactical situation.

Targetry

There are three general types of targets used for military training exercises aboard the Combat Center. These include permanent targets, laser targets, and small arms remote target systems, and are discussed below.

Permanent Targets include non-automated and automated systems. Non-automated targets consist of either stationary plywood (presenting a tank or other military target silhouette), stacks of tires, or old military vehicles. Two types of automated target systems include the Infantry Remote Engagement Target System (pop-up Stationary Infantry Targets and pop-up Moving Infantry Targets attached to aluminum rails), and the MAGTF Target System, located throughout training areas.

The MAGTFTC Target Systems are automated target systems consisting of stationary pop-up armor targets (Target Holding Mechanism-Tank Gunnery). There are 172 stationary pop-up armor targets throughout the training areas and at three ranges. The MAGTFTC Target Systems are designed to support training of tank gunnery personnel and anti-tank Marines in identifying and firing on hostile targets. The MAGTFTC Target Systems are expected to increase dramatically with an increase of approximately 243 new Target Holding Mechanisms in seven training areas.

Laser Targets are found in 15 training areas and consist of the Simulated Laser Target and the Mobile Independent Target System. The Simulated Laser Target provides a laser splash when aimed at an object or point on the ground; aircraft and other instruments capable of identifying laser targets register the splash to complete their warfare exercises. The Mobile Independent Target System uses a strobe light system to determine hits and misses on vehicular targets and is used for laser ground-to-ground and air-to-ground firing.

Small Arms Remote Target Systems are portable, remote, radio-controlled marksmanship trainers designed for outdoors, live-fire ranges. Their main purpose is for honing battle skills, reaction times, and small arms firing techniques in all weather, day and night exercises.

Permanent and Expeditionary Facilities

The following is a review of the various temporary and permanent training facilities, and fixed and laser ranges, which are used in Marine Corps training aboard the installation. The majority of the Combat Center training facilities are expeditionary and temporary in nature, to provide a realistic replication of a combat situation.

The ***SELF (Strategic Expeditionary Landing Field)*** is a temporary support base for the aviation combat element of Marine units engaged in MTD Training. The SELF is approximately eight miles northwest of Mainside, has an 8,000-foot aluminum matting runway, aircraft parking area, tactical airfield dispensing system, expeditionary control tower, weather facilities, and crash/fire/rescue services.

The ***Exercise Logistical Coordination Center (ELCC)*** supports deployed units during MAGTF training operations. The Exercise Support Base is northeast of the ELCC and lies partially within both Sandhill and West training areas. Permanent facilities include a fire station, a field kitchen, an all-ranks club, an exchange, shower facilities, a fitness center, a telephone center, laundry, and chapel. K-Spans are on-site fabricated metal buildings constructed by military engineers as part of their training performance standards. The K-Spans are used for berthing, administration, maintenance, and warehousing. There is typically a high level of foot and vehicle traffic within Camp Wilson.

The ***Field Ammunition Supply Point*** is near Camp Wilson. It is used by individual units to stage ammunition for field exercises.

Pre-Designated Range Training Support Sites (PRTSS) are permanent combat support sites permanently authorized for uses such as bivouacking, berm construction, trenching, field mess, field showers, Forward Ammunition Resupply Point (FARP) and Forward Logistics Base (FLB). PRTSSs were established as a means to reduce environmental burden on training units, ensure environmental compliance, and extend the use of valuable training land. PRTSSs range from 3 to 595 acres and encourage military units to concentrate ground-disturbing activities to the same area. Fourteen PRTSSs currently exist in the following training areas:

- Cleghorn Pass (1)
- Camp Wilson (1)
- East (1)
- Emerson (1)
- Gypsum Ridge (2)
- Lavic Lake (1)
- Noble Pass (1)
- Lead Mountain (2)
- Prospect (1)
- Quackenbush (2)
- West (1)

The ***Assault Landing Zone***, an unimproved dirt airfield, is located in the Sandhill Training Area. The airfield runway length is 5,000 feet and qualifies for Air Force C-130 aircraft.

Drop Zone Sandhill, approximately one kilometer southeast of Assault Landing Zone Sandhill, is a designated drop zone for personnel and cargo parachute drops. Parachute drops are permitted in other parts of the training areas.

Helicopter Landing Pads exist at 96 locations across the Combat Center. Ninety-two landing zones are scattered throughout the Training Range with four at Mainside. Another 54 tilt-rotor landing sites were developed and surveyed. Four Landing Zones in the Lavic Lake and Lead Mountain Range Training Areas were constructed and covered with road base.

Observation Posts are located on strategic high points throughout the training areas; there are 15 in total. They are used by Tactical Training Exercise Control Group, communication units, and command units during training exercises. These areas are designated as no fire and / or maneuver areas.

Range Control (call sign BEARMAT) consists of a building for personnel and antennas, and a control tower at Mainside. Range Control's mission is to monitor radio frequencies to maintain positive control and management of the Combat Center range / training areas and restricted air space. This includes R-2501 and the two Military Operation Areas, which are Special Use Airspace under Federal Aviation Administration (FAA) control that may be activated by the Combat Center for military use. Range Control is responsible for ensuring that maneuvering units are not in another unit's impact area. It coordinates with the Federal Aviation Administration and the Expeditionary Airfield (EAF) Control Tower; advises all unit activities, monitors activities, notifies appropriate authorities in case of a medical evacuation, and gives clearance to arrivals and departures of aircraft using landing zones at Mainside.

Repeater Towers support radio communications and there are 7 located on various mountaintops throughout the training range. These repeater towers are built within fiberglass shelters and are powered by solar and / or battery energy.

Fixed Ranges are numbered, permanent ranges covering approximately 16,000 acres (Figure 2-3). There are 39 fixed ranges in the Combat Center, with some overlap between boundaries. These ranges are described below (EDAW 1994), however greater detail and modifications may be found in Snover and Kellogg (1999):

Range 051, Explosive Ordnance Device (EOD) Range.
Range 100, Squad Maneuver Range is a land navigation range.
Range 101, Small Arms Battle Sight Zero (BZO) Range.
Range 102, Squad Maneuver Range is a land navigation range.
Range 103, Squad Defensive Fire Range is designed to improve squad defensive tactics by incorporating changing deployment requirements and scenarios.
Range 104, Anti-Mechanized / Grenade Range is designed to develop confidence of unit members in their abilities to use grenades and special weapons.
Range 105, Gas Chamber is designed to train units in the use of CS gas and develop confidence of unit members in the use of gas masks.
Range 105A, Small Arms BZO Range.
Range 106, Multi-Purpose range complex consisting of a Combat Marksmanship range & Mortar Range

Range 106A, Light, Medium and Heavy machinegun range.
Range 107, Infantry Squad Battle Course, is a live-fire range that incorporates quick reaction scenarios, such as ambushes, raids, and reconnaissance.
Range 108, Infantry Squad Assault Range, is designed to improve offensive tactics during changing deployment requirements and scenarios.
Range 109, Anti-Armor Live-Fire Tracking Range is designed primarily for use by JAVALINE or TOW weapons systems.
Range 110, MK-19 Range is designed to train use of the MK-19 machine gun.
Range 110A, M-203 Qualification Course.
Range 111, MOUT Assault Course train units for MOUT operations and features automated stationary and moving targets, three story Sniper Tower.
Range 112, EOD Demolition Range.
Range 113, Multi-Purpose Machine Gun Range is designed to train units in the offensive and defensive use of all machine guns systems in the Marine Corps arsenal also has a four story Sniper Tower which provides Snipers and Designated Marksman an environment to engage targets in an Urban Setting.
Range 113A, Small Arms BZO Range.
Range 114, Combat Engineer Demolition Range is designed to accommodate mine and countermine operations at the company level and can be used for demonstrating protective, tactical, point, interdictions, and simulated mine fields.
Range 200, MOUT Town simulates urban warfare in a town or city setting.
Range 205, Convoy Course allows Marines to practice both offensive and defensive maneuvers during convoy operations.
Range 205A, Training for MOUT operations and features automated stationary and moving targets.
Range 210, MOUT Live Fire allows Marines to practice warfare in an urban setting using live ammunition.
Range 215, MOUT Town simulates urban warfare in a town or city setting.
Range 215A, Tactical Exploitation Site to train small groups in battlefield intelligence skills in an urban environment.
Range 220, CAMOUT Combined arms town simulates urban warfare in a city setting
Range 225, Non-Live Fire MOUT used for urban warfare in a city setting and K-9 patrols
Range 230, MOUT Live Fire allows Marines to practice warfare in an urban setting using live fire ammunition.
Range 400, Company Live-Fire and Maneuver Range is designed to provide a rifle company with the opportunity to conduct a live-fire attack on enemy strongholds.
Range 401, Company Live-Fire and maneuver range for rifle companies conduct live fire attack on enemy strongholds.
Range 410, Platoon Live-Fire and Maneuver Range is designed to provide the opportunity for a rifle platoon to attack enemy positions and practice wire breaching and trench clearing procedures.
Range 410A, Rifle Platoon Attack is designed to provide the opportunity for a rifle platoon to conduct a minefield breach, and a dismounted, live attack against a hastily defending enemy squad.
Range 500, Armored Live Fire and Maneuver Range provide the site and supporting facilities for armor and anti-armor training.

Range 601, Super Sensitive Fuse Impact Range, is restricted to only critical fuse ordnance that can be delivered by indirect fire weapons or aircraft.
Range 630, Indirect Range specifically designed to allow the release of inert GBU-31, 33, and 35 Joint Directed Attack Munitions (JDAM) as well as other inert aviation delivered ordnance
Range 700, Helicopter suspension and Rappelling tower
Range 705, Combat Vehicle Operator Training Course (CVOT) consists of 11 miles of varied road conditions from improved roads to soft sand to develop driving skills for combat vehicle operators.
Range 705A, CVOT Intermediate/Advanced.
Range 706, CVOT
Range 800, Improvised Explosive Device (IED) Range provides MOUT facilities for tactical engagement simulations involving the use of IEDs.

Laser Ranges

Fifteen training areas contain ***Laser Target Areas***, which are used for laser ground-to-ground and air-to-ground firing. Strict regulations and guidelines are enforced to prevent exposure to hazardous levels of laser radiation.

There are various ***Training /Low Power Laser Systems***. A few examples include the Multiple Integrated Laser Engagement System, Air-to-Ground Engagement System / Air Defense, and the Near Infrared Pointers and Signaling Devices. A brief description of each system is described below:

- The ***Multiple Integrated Laser Engagement System*** is a scoring system for tactical exercises that emits infrared beams from each weapon that are then detected by target sensors fixed upon a person or a vehicle. These devices do not present a hazard at normal operational (engagement) distances.
- ***Air to Ground Engagement System/Air Defense*** emits an infrared laser beam to simulate various air defense and airborne weapons systems to increase realism during training. Air-to-ground laser firing also utilizes land features as its backstop.

The ***Laser Evaluator System*** is used by air or ground units. When illuminated by laser beams, the system emits a low power signal back to the pilot or unit, verifying that it was struck by a laser.

2.5.4 Primary Training Activities

Training exercises combine individual and group training activities into events that test unit capabilities under real-world scenarios. Various live-fire exercises are conducted at the Combat Center each year, including Integrated Training Exercises (ITX), MAGTF Training, MEB Training, Steel Knight, Desert Fire Exercise (DESFIREX), and Desert scimitar. Major exercises occur for approximately 90 percent of the year. Many other types of smaller exercises are also scheduled, separately and sometimes simultaneously, throughout the year. This section reviews the typical training exercises aboard the installation.

Integrated Training Exercise

The primary function of the Combat Center is to develop, conduct, administer, and evaluate the ITX Program. The ITX program, formerly known as the Combined Arms Exercise (CAX) Program and Enhanced Mojave Viper, is the longest-lasting activity that occurs at the Combat Center and takes priority over all other types of training exercises. This live-fire training exercise trains units to synchronize air / ground live fire operations in desert and urban environments. Each ITX lasts approximately 30 days and is controlled by the Tactical Training Exercise Control Group (TTECG) using a building block approach. Training begins at the unit level and culminates with a Final Exercise (FINEX) in which the entire battalion participates, operating in an urban setting for a 72-hour period.

A general sequence of events for an Integrated Training Exercise follows:

- The ITX Force arrives at the Combat Center and conducts unit level training involving live fire and maneuvers in the "100-series" ranges.
- The ITX Force then receives an orientation including a program overview, general procedures, and briefings on range safety and environmental regulations.
- The battalion (800 marines) commences field training on the Range 400 series. Infantry squads, platoons, and companies practice attacking enemy defenses using organic weapons (*e.g.*, mortars, machine guns, etc.); no air or artillery support is provided.
- Fire Support Coordination Exercises are conducted simultaneously with the Range 400 series infantry troop training. During Fire Support Coordination Exercises, Forward Air Controllers and Artillery Forward Observers work together to bring coordinated aircraft and artillery fire on enemy targets.
- Convoy Operations, Combat Patrolling, Mobile Assault and Helicopter Assault complete the training received during the Combined Arms portion of the ITX. Based on the units proposed mission, the exercise force chooses "packages" of training that will best prepare them for their deployment. Each package combines movement – either mechanized or via helicopter – with live fire in a desert environment. An infantry battalion will receive a slightly different package from a Service Support unit or a Provisional Military Police battalion, but all units are trained to collective skill sets that are tailored to individual battalion needs.
- The unit next conducts Urban Warfare Training. Located primarily in Range 200, 205, 210, 215 and 220 in the Training Areas, this package is a ten-day evolution that encompasses Cordon and Knock, Vehicle Checkpoint, Urban Patrol and Urban Assault training. A FINEX is conducted during the last three days, during which time the entire battalion participates in a free-flowing series of events that are predicated and driven by a presiding intelligence picture. Three hundred role players, many of them native Arabic speakers, provide credence to the exercise by interacting directly with the Marines during the FINEX.

MAGTF Level Training

This exercise includes live-fire training that combines ground, air, and support elements of a Marine Air Ground Task Force, referred to as the exercise force. The MAGTF exercise force involved in ITX include a Command Element, Ground Combat Element, Aviation Combat Element and a Logistical Command Element:

- The Command Element is normally made up of an Infantry Regiment.
- Ground Combat Element normally consists of two infantry battalions (approximately 2,000 Marines) reinforced by a tank/LAR platoon (14 M1A1/15 LAVs and 2 M-88 tanks) and an artillery battalion (12-18 howitzers and support trucks).
- The Air Combat Element consists of a fixed-wing squadron (approximately 12 F/A-18s, 18 AV-8Bs or F35 JSF), an attack helicopter squadron (6-8 AH-1 Cobras), and a composite helicopter/tilt rotor squadron (CH-46s/CH-53s/MV-22s) for transportation and heavy lift
- The Logistical Command Element includes approximately 320 Marines and provides supplies and repair services to the Ground and Air Combat Elements

The TTECG, based at the Combat Center, coordinates all ITX Combined Arms Live Fire Training. TTECG sets up various situations that require an exercise force to effectively coordinate a combined arms response. The MAGTF Level Training can last approximately 30 days and is controlled by the TTECG using a building block approach. An additional ITX program is also conducted each year for reserve units that last 15 days. Training begins at the staff and unit level and culminates with a FINEX in which the entire MAGTF participates, operating in the field for a 72-hour period.

A general sequence of events for MAGTF Training is presented below:

- The Exercise Force receives an orientation including a program overview, general procedures, and briefings on range safety and environmental regulations.
- The Ground Combat Element commences field training on the Range 400 series. Infantry squads, platoons, and companies practice attacking enemy defenses using their organic weapons (*e.g.*, mortars, machine guns, etc.); there is no air or artillery support provided at this time.
- Air Support Coordination Exercises are conducted simultaneously with the Range 400 series infantry troop training. During Air Support Coordination Exercises, Forward Air Controllers and Artillery Forward Observers work together to bring coordinated aircraft and artillery fire on enemy targets.
- Maneuver complexity increases during Mobile Assault Course exercises, during which a company-level attack and defense is performed using infantry Marines and mechanized equipment. Armor, artillery and motors, fixed-wing aircraft and attack helicopters support the attack. The Mobile Assault Course incorporates movement under fire, with battle drills including breaching an anti-armor obstacle, mounted and dismounted attacks through an objective, synchronized planning, and employment of all assets (infantry, armor, artillery, and air fire).
- Before conducting the final exercise, the exercise staff rehearses operations and refines tactical plans in the Combined Arms Staff Trainer, an indoor, electronic system that includes three-dimensional terrain boards of the various Combat Center exercise areas, a laser light system to simulate impacts on the boards, and communications / electronic warfare systems simulators.
- The Fire Support Coordination Exercises (FSCEXs) involve maneuver commanders using Forward Air Controllers and mortar and artillery Forward Observers for live air and artillery fire. FSCEX-1 is a company-level tactical exercise. The team attacks an enemy

defense utilizing artillery, fixed-wing aircraft, and attack helicopter support. FSCEX-2 is a battalion movement-to-contact, live-fire tactical exercise. FSCEX-3 is a battalion delay-and-defend live-fire exercise that emphasizes continuous fire support during rearward movements. FSCEX-4 and FSCEX-5 are conducted only during Enhanced MAGTF Training when a regiment (two or three battalions) acts as the Ground Combat Element.

- The FINEX is the culmination of the MAGTF Training. It is an exercise that brings together the tactics, techniques, and procedures developed during the previous training period. During the three-day FINEX, the Ground Combat Element, supported by the Air Combat element and the Combat Service Support Element, execute numerous missions (attack, defend, delay) in a live-fire environment.
- Upon completion of the FINEX, the Tactical Training Exercise Control Group conducts occupational specialty debriefs and a comprehensive debrief covering all aspects of the exercise force's performance.

Marine Expeditionary Brigade Exercise Training Program

Also known as the "MEB" exercise, this program uses targeting, intelligence, and electronic warfare operations to develop and implement a comprehensive plan to achieve the training objectives. The MEB training exercises use a framework of progressively larger and more challenging training events that build in successive evolutions designed to reinforce learning through assessment of established levels of performance. Training events are driven by mission essential tasks that incorporate the command, ground, aviation, and logistics combat elements.

Steel Knight

The Steel Knight training exercise is a two-week, Division-level training event. Steel Knight training scenarios change but exercise events include: deliberate attack, counterattack, day / night deliberate defense, withdrawal, battlefield interdiction, direct air support, close air support, and night tactical withdrawal not-under-enemy-fire. Exercises also include aerial reconnaissance / surveillance and long-range artillery missions. Most training areas at the Combat Center are employed for Steel Knight.

DESFIREX

This primarily artillery training exercise at the Regimental level involves 2,000 Marines for 7-14 days twice per year. It normally consists of a Regimental Headquarters, two M777A2 cannon battalions, and one high mobility artillery rocket system (HIMARS) battalion. HIMARS units range from a battery (9 launchers) to a battalion (27 launchers). DESFIREX is sometimes combined with Mission Rehearsal Exercise. When HIMARS are incorporated into DESFIREX, the HIMARS batteries routinely fire the MLRS M28A1 practice rocket.

Other DESFIREX training scenarios can include an EXCALIBER Shoot, Helicopter-borne raids, and Unmanned Aerial Vehicle operations. The scenario for a DESFIREX is variable and can encompass most of the training areas. The heaviest artillery use occurs in Quackenbush, Gays Pass, Lavic Lake, Blacktop, Lava, and Lead Mountain, with moderate artillery firing into Emerson Lake, Maumee Mine, Prospect, Delta, Noble Pass, Cleghorn Pass, Bullion and America Mine.

Desert Scimitar

Primarily a Division-level training exercise (7,000 Marines), Desert Scimitar emphasizes artillery maneuvers with infantry and tanks that are supported by air and rotary-wing live-fire. It is conducted once each year for 1-2 weeks.

Desert Scimitar normally consists of the following units: Division Headquarters, Regimental Headquarters, two M777A2 cannon battalions, and one HIMARS battery (9 launchers) or battalion (27 launchers). Desert Scimitar is sometimes combined with a Mission Rehearsal Exercise. When HIMARS are incorporated into Desert Scimitar, the HIMARS batteries routinely fire the MLRS M28A1 practice rocket. In addition, one firing battery will also take part in an EXCALIBER shoot. Similar to Steel Knight, Division-level forces involved in a Desert Scimitar can encompass a wide array of forces, including Division Headquarters, two 1 Regimental Headquarters, Artillery Regimental Headquarters, three infantry battalions, a tank battalion, 2 two LAR battalions, one AAV battalion, and a Logistical Command Element.

Other Desert Scimitar training scenarios can include helicopter-borne raids and Unmanned Aerial Vehicle (UAV) operations. The scenario for a Desert Scimitar is variable and can encompass most of the training areas. The heaviest artillery use occurs in Quackenbush, Gays Pass, Lavic Lake, Blacktop, Lava, and Lead Mountain, with moderate artillery firing into Emerson Lake, Maumee Mine, Prospect, Delta, Noble Pass, Cleghorn Pass, Bullion, and America Mine.

2.5.5 Other Training Activities

Allied Forces

Forces from various allied nations occasionally train at the Combat center; two regularly-occurring exercises involving the United Arab Emirates and United Kingdom are provided as examples.

A United Arab Emirates (UAE) exercise occurs four times each year. This training is conducted by 500 personnel from the UAE and is designed to provide them the opportunity to sharpen their skills in the art of live-fire and maneuvers involving ground infantry and mechanized forces. These exercises typically last 20 days and can occur in any Training Area.

Black Alligator is a company level exercise conducted once each year and is executed by 180 personnel from the United Kingdom (Commando Units). This exercise normally last 42 days, can occur in any Training Area, and involves the employment of air, artillery, mortars and ground maneuver.

Formal Schools

Many different types of training exercises regularly occur at the Combat Center to support formal school training activities; some these exercises (not all inclusive) are described below.

The ***Fire Support Coordination Application Course*** (FSCAC) occurs four times per year for 12-14 days and involves 100 Marines. This exercise involves live-fire, most of which is aircraft-

delivered ordnance in the Delta, Quackenbush, Lead Mountain, and Prospect Training Areas, with non-live-fire activities occurring in the Gypsum Ridge Training Area.

The ***Tactical Air Control Party*** (TACP) live-fire evolutions are the primary means by which the Marine Corps is able to provide Marines the requisite qualifications to be a Forward Air Controller (FAC). TACP training occurs over a 4-5 day period, is held 10 times per year, and involves 150 Marines. TACP training involves an 81mm mortar platoon, an artillery battery, and one section of aircraft support. This training normally takes place in, but is not limited to, the Quackenbush, Lead Mountain, and Bullion Training Areas.

The Infantry Officer Course consists of approximately 95 infantry officers and a supporting staff of 25 Marines. Training events occur four times per year to train infantry officers in the operations and employment of all crew-served weapons in both offensive and defensive situations. In addition, infantry officers also learn the art of calling in and adjusting mortars, artillery, and aircraft-delivered ordnance. This training lasts approximately 18 days and usually takes place in the following Training Areas: America Mine, Bullion, Lead Mountain, Delta, Prospect, and Quackenbush. In addition, building block training also takes place on the following fixed ranges: R400/401 series, R220, and R104 –R113.

Weapons/Equipment Testing

The ***Fallbrook Shoot*** is a highly valuable exercise that typically involves 150 Marines that occurs when the Naval Ordnance Center, Pacific Division, Fallbrook, brings sample lots of ammunition, fuses, or propellants in order to verify the integrity and performance of each lot and to ensure that the lots are capable of meeting manufacture's tolerances. These exercises occur as needed and only at select ranges that are suitable for these types of artillery. This type of exercise is normally conducted in, but not limited to, Quackenbush or Lead Mountain Training Areas.

The ***Barstow Shoot*** occurs periodically as needed to test fire Howitzers that have been rebuilt by the Marine Corps Logistical Base, Barstow, and also typically involves 150 Marines. The nature of this test requires the gun be fired horizontally into the side of a mountain. Tests like this are normally conducted in, but not limited to, the Delta Training Area.

Unit Level Training

Unit level training of active and reserve Marines consists of a building block process wherein units begin at the squad level and progress through a series of exercise scenarios, ending with a battalion-level exercise. Training at the squad through company level is continuous and takes place in all Training Areas throughout the year. Battalion-level exercises combine various units and attachments, normally take place four times per year, and involve anywhere from 1,500 to 2,000 Marines. Unit level training events can occur in any Area but typically occur in the following Training Areas: America Mine, Bullion, Morgans Well, Lead Mountain, Black Top, Delta, Prospect, Quackenbush, Gays Pass, Lavic Lake, Rainbow Canyon, Maumee Mine, and Noble Pass. Early stages of unit-level training normally will take place on the following 6 fixed ranges: Ranges 103-R113, R400/401 series, R210, R230, R220, R215, and the East and West Training Areas.

Additional Exercises

Several other similar or ancillary training programs, exercises, and activities occur on an annual or semi-annual basis at the Combat Center. Transient commands (those not stationed permanently at the Combat Center) that schedule training at the Combat Center include numerous Marine Corps, Air Force, Army, and Navy Units.

2.6 Natural Resources Management and the Military Mission

2.6.1 Impact Minimization Strategies

The Combat Center is committed to managing natural resources for the benefit of both the installation as well as regional resources and communities. Krzysik and Trumbull's (1996) discussion on military training impacts on natural resources identified several key mechanisms of impact from military training operations on the environment, including direct disturbance to soils, vegetation, and wildlife, as well as secondary disturbances caused by noise and vibration, smoke and obscurants, and habitat fragmentation. Their study concluded that the military mission has potential to cause disturbance to natural resources aboard the Combat Center. Additional discussion of potential impacts from military training was provided in subsequent environmental analyses (USMC 2003; USMC 2012).

The Combat Center also recognizes military training aboard the installation precludes potential impacts to natural resources from other land uses. See, for example, discussion MCAGCC (2012) regarding expansion of the installation.

Live-Fire and Maneuvers

Military training activities that employ live-fire and ground maneuvers represent two major sources of natural resource disturbance at the Combat Center. These activities could injure or kill wildlife, disturb or damage soil structure and vegetation, and generate considerable dust. Most of the measured disturbance at the Combat Center occurs in valley floors. Potential effects of the military mission on the desert vegetation of the Combat Center include a reduction in shrub densities; impaired growth, leaf and root injury; reduction in annual and perennial species, and increased mortality. Potential effects of the military mission on wildlife include possible death or injury from direct contact with vehicles or munitions.

Air-to-ground and ground-to-ground live-fire training and maneuvers will continue to cause most of the disturbance to natural resources on the Combat Center in those areas that are heavily disturbed. This disturbance is cumulative and is intensified with repeated long-term use. To manage for heavy, sustained impacts over time, the Combat Center employs a strict ground disturbance minimization strategy.

Ground Disturbance

The Combat Center significantly limits ground impacts from military training. Most training operations occur within the same sites and corridors, even between different visiting units. Fixed ranges and Pre-Designated Range Training Support Sites provide for recurring, high-intensity activities, allowing other areas to remain relatively pristine and untouched. Sensitive high-value natural resource sites are also formally recognized, signed, and maintained as training-free zones, further protecting natural resources in those locations. Generally, valley floors and wide flat

areas are used more often for wheeled and tracked vehicular travel and maneuvers. More rugged areas may sometimes be disturbed by direct shell and bomb impacts. Areas minimally affected by military activities are usually inaccessible to vehicular traffic, are isolated, or are not critical to current training scenarios. These areas include most of the mountain ranges on the Combat Center, particularly in their higher reaches; the one-kilometer (km) buffer zone around the perimeter of the installation, and the Sunshine Peak Training Area which is off-limits to all personnel as it is used as a hung-ordnance delivery area.

Ordnance Residue and Range Maintenance

At the conclusion of all major training exercises, Explosive Ordnance personnel sweep ranges to neutralize unexploded ordnance and reduce safety risks. Residual wastes from training activities are also removed from the landscape and brought back to Mainside for recycling or disposal. Regular maintenance, repair and replacement of targets is done throughout the year, and typical maintenance activities include the upkeep of firing berms for tanks on Fixed Range 500, tank trap maintenance, and repair of other berms and trenches as required.

2.6.2 Benefits from the Military Mission

Military management of natural resources can have positive effects. The presence of the military excludes other land uses that could impact natural resources. Land put into military training is rendered unavailable for development, and military impacts are finite and contained within repetitive events, which establishes maximum disturbance levels to the landscape. Poaching and other illegal activities that potentially affect wildlife resources are relatively insignificant due to military training and military conservation law enforcement. Perhaps most significant, however, is that lands under military management retain most of the vast desert ecosystem as open space. By focusing disturbances, military management gives wildlife greater ranges across large tracts of land, especially when installations are adjacent to one another in undeveloped areas.

2.7 Anticipated Changes to Military Tempo

The Combat Center revises training exercise scenarios to better prepare Marines for changing world conditions and threats. Such changes in training scenarios can change the impact of training on the environment. The most recent evolution of the Combat Center was described in the 2012 Land Expansion Environmental Impact Statement (LandEx EIS). The Combat Center will continue to evolve and may increase in scope to meet increasingly complex, worldwide commitments of USMC forces.

2.8 Support Facilities and the Built Environment

The Mainside cantonment area is built out to contain a full range of facilities, infrastructure and services that support an almost completely self-reliant human development, with industrial, utility, housing, and commercial elements. Both utilities and roads have been expanded since the bases initial development. Utilities include distribution systems for non-potable water, potable water, sanitary sewer, sewer disposal, electricity, high temperature water, and natural gas. As new buildings are being constructed, sidewalks and xeriscaping are being incorporated. Recently completed construction in the “North Mainside” area included new Bachelor Enlisted Quarters (BEQ), chow halls, range management facilities, administrative buildings, warehouses,

maintenance facilities communications and electronic support facilities, parking areas, training and simulation facilities, new utilities and infrastructure (sewer, water, power, high-temperature hot water, chilled water, natural gas, communications, roads, and storm water management systems). No further construction is planned for "North Mainside", with the exception of possible road and/or sidewalk projects. The USMC's current facilities utilization climate is one of infrastructure reset, leaning on Maximum Utilization & Demolition projects for existing facilities.

2.8.1 Transportation

Regional Access - Regional access to the Twentynine Palms area is provided by State Route 62 (Twentynine Palms Highway), a four-lane highway that connects to Interstate 10. The Main Gate at Adobe Road is the busiest access point. In addition to the Main Gate, there are two auxiliary gates, with limited access times, near the housing areas.

Main Supply Routes (MSR) - The road system through the Training Areas is made up of MSRs and smaller unimproved roads, or jeep trails. MSRs average 32 feet wide, and are maintained by grading and laying down gravel. There are approximately 354 miles of MSRs. Improvements are on-going to prevent erosion and maintain the MSRs.

Secondary Roads - There are about 665 miles of secondary unimproved roads on the Combat Center that average 16 feet in width and cover about 0.2% of the total land area. The secondary road system has developed over time to meet the needs of the evolving military mission (Snover and Kellogg 1999). Jeep trails are generally not graded or repaired after flooding and are only maintained through use by military units. Remnants of old jeep trails that are no longer used can be seen throughout the Combat Center. New trails are occasionally made if training objectives are changed. For the most part, the MSR and jeep trail system adequately serve training needs and military units tend to limit travel to these routes.

2.8.2 Potable, Storm, and Waste Water Management

Potable water for the Combat Center is supplied via 11 wells in the Deadman Valley-Surprise Spring Basin, located in the southwestern part of the Combat Center. The Deadman Valley-Surprise Spring Basin is bounded by the Emerson and Copper Mountain Faults to the west and the Surprise Spring Fault on the east, which separates this subbasin from the Deadman Valley-Deadman Lake Basin. Most groundwater found in the basins underneath the Combat Center are fossil water (i.e., from previous geologic times) and very little recharge occurs within the Deadman Valley-Surprise Spring Basin; the only recharge source for this basin is the San Bernardino Mountains, located to the west of the Combat Center. Depth to groundwater in the Deadman Valley-Surprise Spring Basin ranges from 200 to over 400 feet (60-120 meters) below the surface (U.S. Geological Survey [USGS] 2003). Depths to groundwater typically range from 125 to 200 feet (38 to 61 m), although perched zones exist near Bristol Dry Lake and Dry Lake, where water levels range from 14 to 89 feet (4 to 27 meters). Recharge occurs via percolation of surface runoff through stream beds and washes.

Three other groundwater subbasins are known to exist beneath the southwestern part of the Combat Center. In the Ames Valley Basin, located west of the Deadman Valley-Surprise Spring Basin, groundwater is found at depths of 175 feet (53 meters) and greater. In the Deadman

Valley-Deadman Lake Subbasin, located east of the Deadman Valley-Surprise Spring Basin, groundwater has been measured at depths of 30 feet (9 meters) to 280 feet (85 meters). In the Twentynine Palms Basin, located to the east of the Mesquite Subbasin beneath the Mainside Area, groundwater has been encountered at 75 feet (23 meters) in one well but is more commonly found at more than 200 feet (60 meters) below ground surface (bgs) (USGS 2003). A new blended drinking water treatment facility is currently in the design/bid/build process to blend groundwater from Surprise Spring and Deadman Lake Subbasins. At the time of this INRMP revision, the associated Environmental Assessment for this project is being finalized.

Stormwater management is vital for maintaining and lowering risks to human life, especially in desert regions which are prone to flash flood events. Although annual precipitation at the Combat Center averages approximately 4.1 inches (10 centimeter [cm]) a year, the majority of rainfall occurs during summer and early fall thunderstorms (Lato *et al.* 1999 and USMC 2001). Surface drainage systems at the Combat Center are internal, channeling runoff flows inward from all directions into natural dry lakebed playas (Lato *et al.* 1999). No naturally-occurring permanent water bodies exist at the Combat Center (USMC 2001) and runoff collected in these lake beds is slowly lost to evaporation and limited infiltration into the soil. However, since 1996 the Combat Center has been implementing a program to eliminate all industrial stormwater discharges to desert playas. This program uses a series of stormwater conveyance and retention systems that preclude the entry of potentially polluted stormwater to the environment by seeping into the ground. A natural clay barrier precludes contaminates from entering the aquifer (USMC 1997). All stormwater runoff, including industrial, goes into retention ponds. A primary storm-water retention pond contains civilian industrial runoff (*e.g.*, gas station, automobile hobby shop), and offers landscaping with native vegetation, a wildlife viewing area, and educational signage. Three other industrial stormwater retention ponds also exist for military-related runoff and are generally dry except after significant precipitation events. Finally, Camp Wilson also has a stormwater retention basin for facilities protection.

Domestic wastewater generated by the Combat Center is required by the Regional Water Quality Control Board to be disposed of within the boundaries of the installation; wastewaters must therefore be disposed of through solar evaporation or irrigation. Wastewater from treatment facilities is collected in two specific retention pond systems. Two ponds service the Golf Course by storing recycled water (up to 12-million-gallon capacity) and waters are used primarily to irrigate the golf course. The Mainside Wastewater Treatment Plant uses three active retention ponds for receiving effluent; any overflow from these three ponds enters four storage ponds that retain water during the winter for summer use. The size of the seven ponds supporting the Wastewater Treatment Plant is approximately 135 acres. Retention ponds generally contribute to biodiversity of wildlife species at the Combat Center (Section 3.3.1) and are heavily used by migratory birds. Zones exist near Bristol Dry Lake and Dry Lake, where water levels range from 14 to 89 feet (4 to 27 meters). Recharge occurs via percolation of surface runoff through stream beds and washes.

2.8.3 Projected Changes in Facilities and the Built Environment

Mainside is continually changing to meet the needs of the Combat Center. Many buildings are approaching 50 years old and are slated to be modernized and or replaced with new buildings consistent with the facilities Master Plan. Facility changes are accomplished using a master

planning process through PWD. The current Master Plan projects out approximately 10 years and the master planning process identifies existing land use compatibilities and conflicts, and establishes a framework for future facility sitting and land development. The proposed land use plan is a synthesis of existing conditions, proposed projects, probable land area needs based on increased loading projections, and efficient, functional interrelationships between uses. All projects and activities identified in the Master Plan are required to undergo a NEPA review process at the time of their initiation.

3.0 PHYSICAL ENVIRONMENT

3.1 Topography and Geology

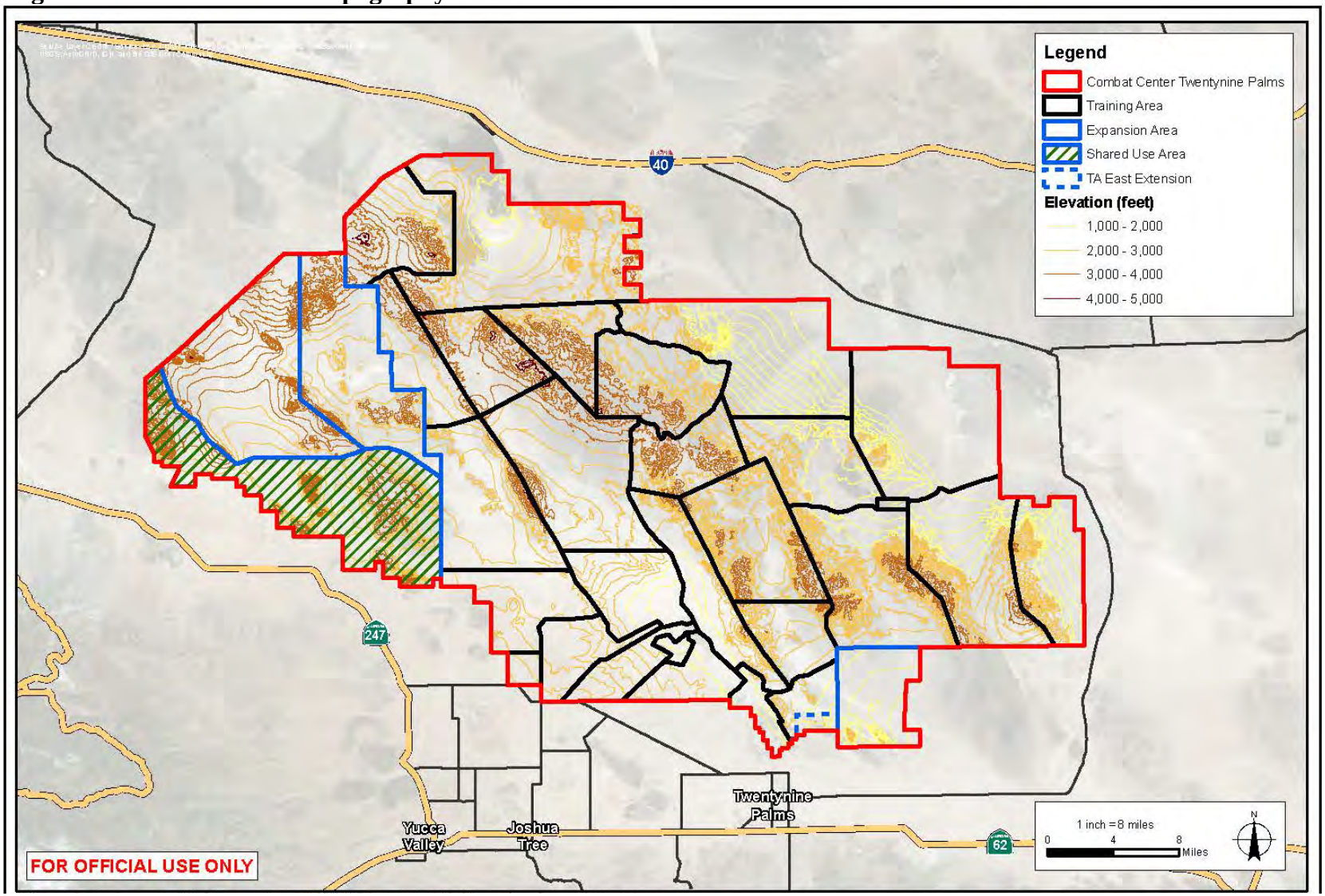
The Combat Center is located in the Mojave Desert, a part of the larger Basin and Range Physiographic Province. Terrain is characterized by alternating rocky uplands with slopes up to 90 percent, and low valleys with broad alluvial plains, washes, and dry lakebeds. Mountain ranges and valleys run mostly parallel along a northwest/southeast trending axis and most of the terrain lies on the intermountain basin between 1,500 and 3,000 feet above mean sea level (Figure 3-1). Ancient lava fields are significant features in some training areas. Several volcanic craters are in the general proximity of the Combat Center; Amboy Crater and Pisgah Crater (just outside of the Combat Center) are the most evident. Sunshine Peak Crater lies within the Sunshine Peak Training Area. The highest elevation in the Combat Center is 4,699 feet at OP Round in the Bullion Mountains, and the lowest is 604 feet at Dry Lake in the Lead Mountain Training Area.

Area geology is classified as Mojave Bedrock, and the oldest geological elements are the Bullion Mountains, which consist of primarily quartz monzonite and granite. Layers of blown sand, called sand ramps, contribute to lower elevation soils of mountains adjacent to Mainside. The Combat Center geological make-up consists of tertiary basement rock with overlying quaternary alluvial deposits. The basement rock is nearly impermeable except where it has been fractured or weathered.

Seismicity - The Combat Center is located in a highly active seismic region. The San Andreas Fault is in close proximity to the southwest, the Pinto Mountains Fault lays to the south, the Garlock Fault to the north, and approximately 50 named and unnamed faults run within the Combat Center boundary. The most prominent active fault system is the Calico-Mesquite Lake Fault System. Mainside is situated between the Mesquite Lake and Bullion Mountain fault which is certified as potentially active by the US Geological Survey. Numerous small earthquakes have been recorded across the installation, as well as several larger ones, including the Lander's Earthquake (registering 7.5) and Hector Mine Earthquake (registering 7.1). Open fissures and surface ruptures from previous seismic events are well documented on the landscape.

Petroleum and Minerals - There is a rich history of mining activity both on and adjacent to the Combat Center. Mineral deposits include lead, zinc, copper, silver, and gold and abandoned mines are present in Emerson Lake, Bullion, Delta, Prospect, Maumee Mine, Sunshine Peak, Lavic Lake, and Lead Mountain Training Areas. The Department of the Navy has the authority to reject mining claims with the exception of "certain hardrock minerals known as locatables" (DoD Directive 4700.3). "Locatables" include gold and silver. However, military reservations have historically not been open to any type of mining and the possibility of having to suspend or curtail the Combat Center training exercises due to mining activities is very unlikely. In recent years, military installations have been open to mining of certain minerals, most notable oil and gas but given the geology of the area, the possibility of oil and gas mining is extremely remote.

Figure 3-1: Combat Center Topography



Geothermal Resources - The U.S. Geological Survey and Katzenstein and Whelan (1987) investigated the geothermal potential of steam trapped underground at the Combat Center and concluded that temperatures were not high enough to make development economically feasible. In 2009-10 the US Navy Geothermal Program Office sampled the Sandhill and West range training areas. The conclusion was that hydrothermal alteration suggests the resource temperature is not high enough for commercial grade power generation (DoN Geothermal Program Office 2011).

3.2 Soils

3.2.1 Formation

Soils are formed through the chemical and mechanical weathering of parent rock materials, and from biological processes. Soil materials originate from parent rock substrates often found on the strong to very steep upland slopes at the higher elevations of the Combat Center, where conditions are excessively drained, stony or rocky. Weathering generates cobbles, gravels, sands and sandy loams which are slowly flushed downslope and across the landscape during aeolian and alluvial events. Bajadas typically consist of coarse gravels grading into loamy sands, sandy loams, to finer loamy materials. Playas located at the bottom of the basins accumulate silts and clays and generally develop salt pans. Plant root systems (as well as lichens and fungi) also break down rocky substrates. Plants (and associated wildlife) deposit biomatter in the form of plant leaves and branches, and plants often attract animals which deposit animal waste, all of which facilitates the production of detritus and ultimately creates "islands" of enriched soil nutrients, improved water holding capacity, and amplified ecological functioning (productivity).

Compared to other soils found in other climates, desert soils are more fragile and form slowly, thus they are vulnerable to erosion from wind and water, and compaction and displacement from vehicles. The ecology of desert soils is also more sensitive to changes in bioavailable nutrient levels, which can be influenced by indirect anthropogenic activities. The time required for desert soils to develop is not well understood. Webb *et. al.* (1986) estimated it takes a minimum of 50 years for vegetation to recover from impacts of a vehicle pass, but 100 years for soil, and over 1,000 years for total recovery.

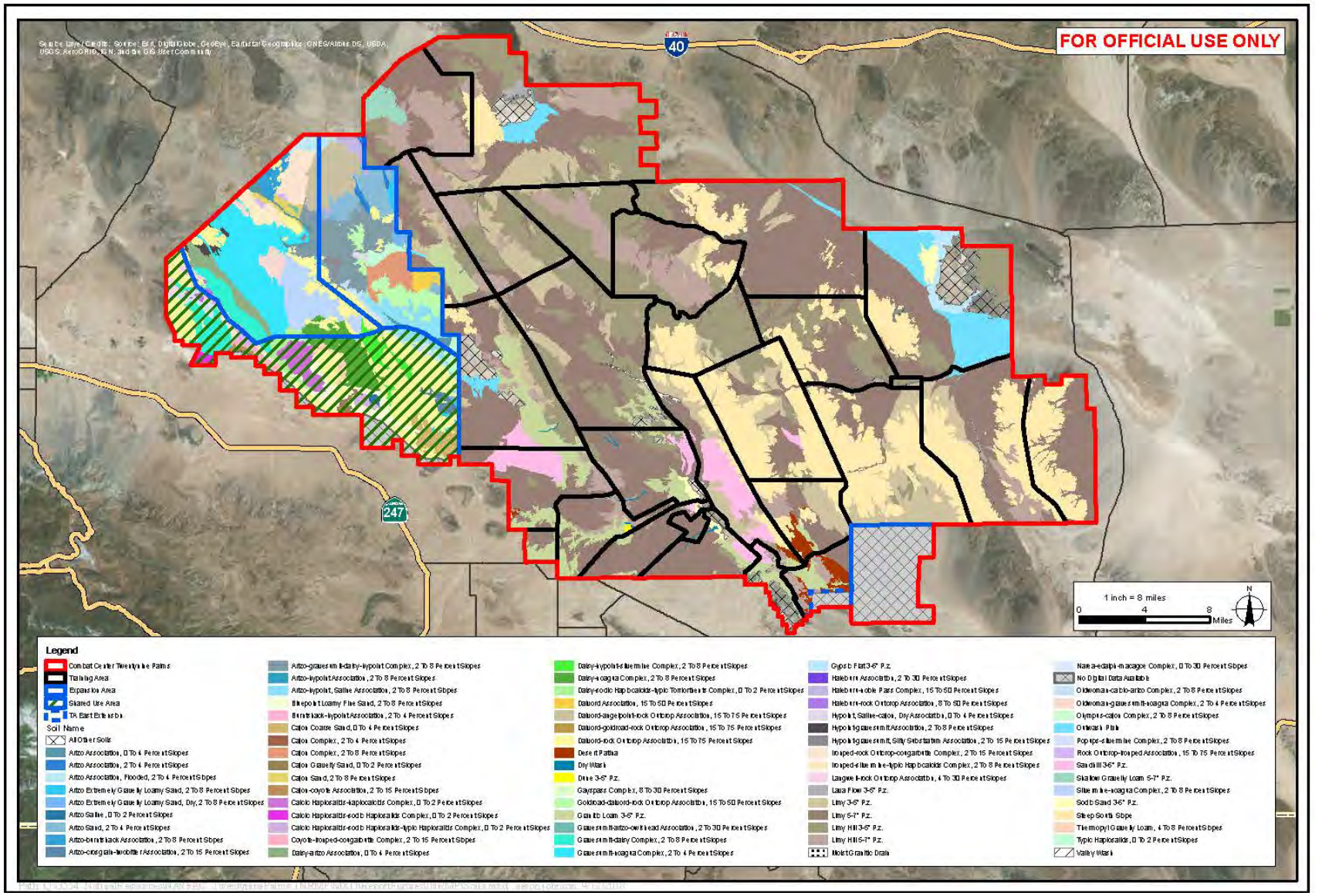
3.2.2 Composition

Soil data from the Natural Resources Conservation Service (NRCS 2018) was used to map soils occurring on the Combat Center, including the legacy lands as well as expansion areas of the installation, as available. Soils data is currently not available for the entire Combat Center, including the southern expansion area among a few other smaller areas. Major soil types identified include primarily alluvium and colluvium materials with some lacustrine deposits and residuum; Figure 3-2 shows the distribution of various soils types in the final Soils Map.

Arizo soils are very deep, sandy-skeletal soils formed in mixed alluvium. They occur in the northwestern, central, and southeastern parts of the Combat Center on recent fan piedmonts and occupy about 20% of the Combat Center.

Carrizo soils are very deep, sandy-skeletal soils formed in mixed alluvium. They are found in the northeast on recent fan piedmonts and occupy about 16% of the Combat Center.

Figure 3-2: Combat Center Soils



Cajon-Blueprint soils are very deep and formed in sandy materials. They occupy about 9% of the Combat Center and are found in the southwestern portion smooth granitic fan piedmonts.

Dalvord-Goldroad-Rock-Outcrop soils are very shallow to shallow, loamy-skeletal soils formed in residuum and colluvium from granitic and metamorphic sources. They are found mostly in the southeastern part of the Combat Center on granitic mountains and cover about 18% of the total area.

Eastrange-Owlshead-Gayspass soils are very shallow to very deep soils formed in alluvium from mixed sources. These soils are found throughout the Combat center on older fan piedmonts and occupy about 6% of the area.

Edalph-Narea-Calico soils are very deep, sandy soils formed in granitic alluvium. They are found in the southwestern portion of the Combat Center and occupy about 9% of the total land.

Haleburu soils are very shallow to shallow, loamy-skeletal soils formed in residuum and colluvium from mainly volcanic sources. They occur in the northwestern part of the Combat Center on volcanic mountains and comprise about 13% of the total land.

Playa soils are very deep, salt-effected soils formed in lacustrine deposits. These soils occur on basin floors and occupy about 3% of the Combat Center.

Sunrock-Haleburu-Lava Flows are very shallow to shallow, loamy-skeletal soils formed in residuum and colluvium from mainly volcanic sources. They are found in the northern areas and occupy about 6% of the Combat Center

Cryptogamic soil crusts are a feature of some desert soils. They form when moisture is retained by soils long enough to foster bacteria, algae, and lichen growth. These organisms through their presence or through their exudates hold soil particles together in a crust form. Cryptogamic crusts stabilize the soil surface and improve resistance to wind and water erosion. Biologic activity associated with cryptogamic crust converts inorganic atmospheric nitrogen into biologically available forms, increasing nitrogen pools available to the ecosystem. Patches of cryptogamic crust are found in certain areas of the Combat Center and may include many different soil associations; however, they are usually visually characterized by a surface crust with pebbles and rocks, often rendered dark and shiny.

3.3 Water Resources

3.3.1 Surface Water

The Combat Center has 17 watersheds ranging in size from 2,819 acres to 52,178 acres. Quackenbush Lake and Upper Emerson watershed are the only units that lay entirely within the Combat Center boundary (traditional boundary and Exclusive Military Use Area [EMUA]). Combat Center watersheds contain playas, dry washes, seeps, springs, and man-made water bodies. There are no naturally occurring, permanent surface water resources on the Combat Center (Lato *et al*. 1999), all permanent water sources are man-made ponds.

Most surface drainage is internal; flowing inward from all directions, with water soon percolating into the sandy soil of dry washes and/or collecting on playas (Lato *et al*. 1999). All streams are intermittent, and all naturally occurring, standing water is ephemeral, occurring only during and after heavy rains or thunderstorms. When shallow ephemeral lakes have surface waters, they are eventually lost through ground water percolation or evaporation. Evaporation results in precipitation of alkali salts at or near the surface of the playa soils.

There are 14 playas throughout the Combat Center traditional boundary, five playas within EMUA West, and no playas within EMUA South. Two prominent (and the most heavily impacted) playas are Mesquite Lake (located near Mainside) and Deadman Lake (located in Sandhill, Gypsum Ridge, and West Training Areas). Both lakes source of water is seasonal precipitation and runoff from the surrounding watershed. Unlike Mesquite Lake, Deadman Lake does not have any appearance of uplifted and tufted soils, suggesting that the water table is near the surface.

There are 289 dry washes totaling 50,471 acres throughout the Combat Center, but only 12 are considered major washes. The largest dry washes are located in the three largest watersheds (Deadman Lake, Bristol Lake, and Dry Lake). Approximately 25 percent of all dry washes occur in the Bristol Lake watershed (U.S. Army Corps of Engineers 1994).

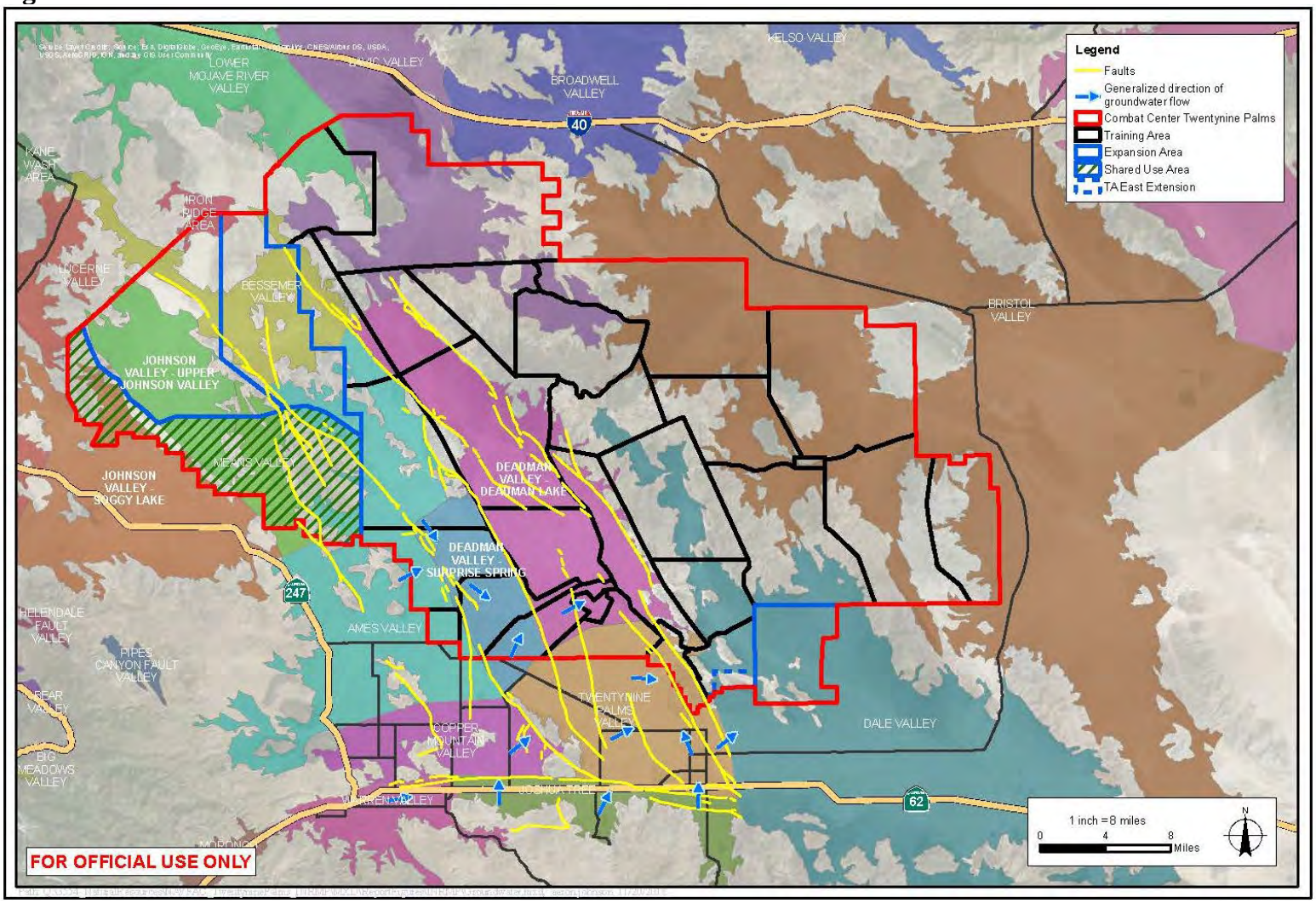
Seeps and springs are a valuable biological resource, particularly when standing or flowing water is available for wildlife. The U.S. Army Corps of Engineers (1994) found four wells and two springs recorded from U.S. Geological Survey topography maps of the Combat Center. Seasonal seeps are located in the Imperial Lode mining area, Lead Mountain area, and several mine shafts. The study also indicated a potential for other seeps to exist seasonally, depending on precipitation and exposed bedrock in the wash.

Man-made water bodies at the Combat Center include stormwater retention ponds to the northeast of Mesquite Lake, golf course ponds, and several sewage lagoons located near Deadman and Mesquite Lake, along with recycled water ponds near the golf course and several sewage lagoons located near Deadman and Mesquite Lakes. None of these waters are regulated under Section 404 of the Clean Water Act. Manmade water bodies are utilized by wildlife, most often migrating birds. In addition, a study by the U.S. Army of Corps Engineers (1994) noted that settling basins trap sediment that would otherwise flow into Mesquite Lake.

3.3.2 Ground Water

The groundwater basins within or partially within the Combat Center traditional boundary include Deadman Valley (Surprise Spring and Deadman Lake subbasins), Twentynine Palms Valley, Bristol Valley, Ames Valley, Lavic Valley, and Dale Valley (Figure 3-3). The groundwater basins in the EMUA West are the Johnson Valley Basin, Means Valley Basin, Ames Valley Basin, Bessemer Valley Basin, and the Este Subarea of the Adjudicated Mojave Basin Area. The groundwater basins in EMUA South is the Dale Valley Basin. The principal source of recharge to these basins is infiltration of run-off from the surrounding mountains in the washes and alluvial fans.

Figure 3-3: Combat Center Groundwater Basins and Fault Lines



The Mojave Water Agency and Bighorn Desert View Water Agency are responsible for managing the region's water resources to ensure a sustainable supply of water for present and future use. In addition, the Mojave Water Agency is the court-appointed Watermaster for the Mojave River Basin adjudication. Both provide domestic and retail water service and are cooperating to developing a water recharge plan for the groundwater basin.

Ames Valley Basin

The eastern portion of the Ames Valley Basin is within the Combat Center boundary. Groundwater in this basin flows eastward from the San Bernardino Mountains to the Emerson Fault and into the Surprise Spring subbasin and northeast toward Emerson (dry) Lake (Mendez and Christensen 1997). Groundwater quality is good, with total dissolved solids (TDS) levels generally below 500 milligrams per liter (mg/L) and no elevated concentrations of other constituents of concern. Ames Valley basin is a source of potable water for 8,300 individuals living in the Johnson and Ames Valley, southwest of the Combat Center (Kennedy/Jenks/Todd LLC 2007).

A small portion of the northern part of the Ames Valley Basin is within EMUA West. Groundwater in this basin flows eastward from the San Bernardino Mountains to the Emerson Fault and into the Surprise Spring subbasin and northeast toward Emerson (dry) Lake (Mendez and Christensen 1997). Groundwater quality is good, as represented by TDS concentrations generally below 500 mg/L.

Bessemer Valley Basin

EMUA West contains most of the Bessemer Valley Basin. This basin is bounded by nonwater-bearing rocks of the Iron Ridge Mountains on the north and bedrock highlands on the south, and by the West Calico fault on the east and the Emerson fault on the west (DWR 2004). Water quality of the basin is unknown (DWR 2004).

Bristol Valley Basin West of Bristol Lake

The Bristol Valley Basin west of Bristol Lake is located northeast of the Bullion Mountains within the Combat Center boundary. Groundwater exists in unconsolidated, upper and lower alluvial deposits. The upper and lower aquifers are separated by a discontinuous layer of silt and clay (DWR 2004). Depths to groundwater typically range from 125 to 200 ft (38 to 61 m), although perched zones exist near Bristol Dry Lake and Dry Lake, where water levels range from 14 to 89 ft (4 to 27 m). Recharge is from percolation of surface runoff through stream beds and washes. Groundwater moves towards Bristol Lake, where groundwater elevations are close to the ground surface. Koehler (1983) estimated that 640,000 acre-feet (AF) (789,000 megaliters [ML]) of water is stored in the alluvium west of the Ludlow fault, which runs diagonally through the Bristol Valley Basin west of Bristol Lake. (An AF is a unit of volume equal to an area of 1 acre with a depth of 1 foot and is equivalent to 325,851 gallons. As a rule of thumb, 1 AF is considered a typical annual water consumption rate for a suburban family household, whereas a household in an arid desert region may use 0.25 AF annually.) However, there are no drinking water wells in this portion of the Combat Center because groundwater quality does not appear to be suitable for human consumption due to the high TDS, chloride, and arsenic concentrations.

Dale Valley Basin

The Combat Center includes the northern portions of the Dale Valley Groundwater Basin. This basin is bounded by nonwater-bearing rocks of the Bullion Mountains to the north, Pinto Mountains to the south, Sheephole Mountains to the east, and the Mesquite fault to the west. Groundwater moves toward Dale Lake in the southeastern part of the valley. Analyses of water from 11 wells in the basin show an average TDS content of 53,457 mg/L with a range of 1,218 to 332,000 mg/L. The water quality in this basin is generally unsuitable for domestic and agricultural uses. Total dissolved solids and fluoride concentrations impair domestic use, and boron and sodium concentrations impair agricultural use of groundwater in this basin (DWR 2004).

In EMUA South, the groundwater conditions are expected to be similar to those in the Bristol Valley and Twentynine Palms basins, with the general exceptions that the water-bearing deposits may be comparatively thinner in proximity to bedrock deposits and average groundwater elevations may be shallower (HQMC 2008). Groundwater recharge is primarily from infiltration of runoff from the slopes of the surrounding mountains and subsurface flow of groundwater past the Mesquite fault to the west. Groundwater moves toward Dale Lake in the southeastern part of the valley.

Deadman Valley Basin – Deadman Lake Subbasin

The Deadman Lake subbasin groundwater within the Combat Center boundary is not potable and does not meet drinking water standards due to high concentrations of fluorides, sulfates, and boron. However, groundwater from this subbasin can be utilized for landscaping and other non-consumptive uses. Measurements of the water level in wells indicated a southward flow from the Deadman Lake area into Twentynine Palms Valley basin (DWR 2004).

Deadman Valley Basin – Surprise Spring Subbasin

Groundwater in the Surprise Spring subbasin within the Combat Center boundary flows from recharge areas near the end of Pipes Wash towards discharge areas at Surprise Spring near the Surprise Spring Fault (Londquist and Martin 1991). The Surprise Spring Fault is a barrier to groundwater flow and, under predevelopment conditions, water discharged at the land surface in this area. The depth to groundwater in the Surprise Spring subbasin ranges from 200 feet to over 400 ft (60 m to 120 m) bgs (USGS 2003). Groundwater levels have declined more than 190 ft (58 m) as a result of pumping since the 1950s and groundwater no longer discharges at the land surface (Li and Martin 2011). The alluvial deposits can be divided into upper and lower aquifers. The upper aquifer is unconfined and consists of unconsolidated sands with moderately high permeability, whereas the lower aquifer is confined and consists of consolidated sediments of low permeability. The groundwater from the Surprise Spring subbasin, which is used for potable water supply, is from the unconfined portions of the upper aquifer (Li and Martin 2011).

Groundwater within the Surprise Spring subbasin is the only source of potable water for the Combat Center. While it does not have a sole source designation, Surprise Spring would meet the criteria of sole source aquifer by providing over 50% of the water to the community (Combat Center). The sole source designation is meant to be used by communities to help prevent contamination of groundwater from federally-funded projects, and designations typically come

from the local communities. Because only the military pumps from Surprise Spring, it is unlikely that a sole source designation would be requested.

The Surprise Spring groundwater wells are located in a Restricted Area of the Combat Center where mechanized maneuvers, off-highway vehicles (OHV), and training using vehicles are not permitted. The Surprise Spring subbasin contains fossil water dated to be approximately 5,000 years old (Izbicki and Michel 2004). The primary source of recharge to Surprise Spring subbasin is subsurface flows from the adjacent Ames Valley Groundwater basin. The quality of groundwater in the Surprise Spring subbasin varies, but groundwater from the southern portion of the basin, where the Combat Center production wells are located, has TDS concentrations from 159 to 210 mg/L and meets criteria established under the Safe Drinking Water Act and associated amendments (DWR 2004). However, groundwater from the lower aquifer of the Surprise Spring subbasin contains relatively higher TDS, fluoride, and arsenic concentrations than those of the upper aquifer (Li and Martin 2011).

Este Subarea of the Adjudicated Mojave Basin Area

The western edge of the EMUA West includes part of the Este Subarea of the Mojave Basin Area. This area was adjudicated in 1996 in the Mojave Basin Judgment. The Judgment assigned Base Annual Production quotas to each producer using 10 AF per year (12 ML per year) or more, based on historical production. Users are assigned a variable Free Production Allowance (FPA), which is a uniform percentage of Base Annual Production set for each subarea. This percentage is reduced, or "ramped down" over time until total FPA comes into balance with available supplies. This percentage was set at 70% for most subareas as of June 2003. Any water user that pumps more than their FPA is compelled to purchase replenishment water from Mojave Water Agency equal to the amount of production in excess of the FPA. Water levels in Este have remained stable for the past several years, indicating a relative balance between recharge and discharge.

Lavic Valley Basin

This groundwater basin underlies Lavic Valley in central San Bernardino County and is within the boundary of the Combat Center. The basin is bounded by nonwater-bearing rocks of the Cady Mountains on the north and east, the Bullion Mountains on the south and east, the Lava Bed Mountains on the southwest, and the Pisgah fault on the west. Total dissolved solids concentrations in groundwaters range from 278 to 1,721 mg/L. Water at one well in the basin also exceeds drinking water standards for sulfate and chloride content (DWR 2004). The water quality in this basin is generally unsuitable for domestic and agricultural uses.

Johnson Valley Basin

Northwest-trending faults divide this basin into two subbasins referred to by DWR as Upper Johnson and Soggy Lake. The U.S. Geological Survey (USGS) further divides the Soggy Lake subbasin into the Fry and Johnson subbasins. EMUA West includes the Upper Johnson subbasin and small portions of the northern parts of the Soggy Lake subbasin. Groundwater generally flows from southern recharge areas to the north toward the groundwater basin discharge areas at the Means Valley Groundwater Basin and Melville and Soggy dry lakes. Groundwater leaves the basin as subsurface outflow and evaporation beneath the dry lakes. Total dissolved solids concentrations in the Upper Johnson subbasin within EMUA West are up to 3,000 mg/L (DWR

2004), whereas TDS concentrations in the southern portion of the Johnson Valley basin south of the west study area are less than 500 mg/L (Kennedy/Jenks/Todd LLC 2007).

Means Valley Basin

The Means Valley Basin is located between Johnson Valley and Ames Valley basins in EMUA West. The alluvial sediments are less than 500 ft (150 m) thick and much thinner in the southern portion of the basin. Natural recharge occurs from runoff from the adjacent mountains, which percolates in the Means Wash to the groundwater. Recharge from precipitation that falls directly on the basin is considered negligible.

Groundwater generally flows from the southern recharge area to the north where it evaporates from Means Dry Lake. The basin is characterized by relatively poor water quality (Kennedy/Jenks/Todd LLC 2007).

Twentynine Palms Valley Basin

The Twentynine Palms Valley Groundwater Basin (also known as the Mesquite and Mainside subbasins by the USGS [Londquist and Martin 1991]) includes the water-bearing sediments below Mesquite Lake and the City of Twentynine Palms and is within the boundary of the Combat Center. This basin contains water that exceeds federal limits for concentrations of sulfates, fluorides, and TDS. Water quality in this basin, primarily a sodium sulfate type, is inferior to water from both the Surprise Spring and Deadman Lake subbasins. The Combat Center utilizes the non-potable groundwater from the Mainside subbasin for golf course irrigation. South of the Combat Center, Twentynine Palms Water District pumps groundwater from the Mesquite subbasin. Twentynine Palms Water District increased groundwater pumping and treats the high fluoride levels to reduce the groundwater overdraft in the Joshua Tree Basin, where they currently pump the majority of their water (Twentynine Palms Water District [TPWD] 2008). The Twentynine Palms Basin groundwater also supports mesquite trees near the ecologically sensitive Mesquite Dry Lake (Li and Martin 2011).

3.4 Climate

The Combat Center is situated in the Morongo Basin of the Mojave Desert and has an arid, upland desert climate characterized by hot days and cool nights, with low humidity and low annual rainfall. Summers have especially high temperatures, low humidity, and clear, sunny days. On average, the sun shines 97% of the day time in the summer, and 65% in winter (Lato *et al*. 1999). Temperature extremes range from an average daily high of 105.4° Fahrenheit (F) in July to an average daily low of 51.6° F in January. The highest and lowest recorded temperatures at Twentynine Palms were 118° and 10° F, respectively (Lato *et al*. 1999).

Average annual precipitation is variable across the installation and was estimated at generally 4.16 inches, with roughly 1.90 inches (46%) falling between November and March, and about 1.80 inches falling between July and September during regular seasonal storm events. Snowfall is uncommon. Winter storms tend to be relatively gentle and may last up to two days. Between July and September, thunderstorms can be violent and discharge large volumes of water in short periods of time, causing flash floods and significant soil erosion.

The direction and strength of prevailing winds vary with the season. Typically, winter months bring mild northwesterly winds that range from 5 - 10 miles per hour (mph). During the summer, winds are generally westerly to southwesterly, reaching speeds of 10 - 15 mph in the afternoons. The strongest winds occur in the fall, with gusts of up to 77 mph from the northwest.

Climate change is a significant concern for the desert ecosystem and the Combat Center. Scientific predictions identify longer periods of hot temperature extremes and reductions in annual precipitation totals, which will amplify water and heat stress experienced by desert life. Some scientific research has been performed aboard the installation to develop models of climate change impacts and best management approaches to conserve biodiversity on the landscape under the changing climate scenario. Preliminary findings have identified areas suitable as wildlife refugias, which may persist the longest under new climate scenarios and continue to provide valuable habitat to vulnerable species.

3.5 Ecosystems

3.5.1 Ecosystem Classification

Desert ecosystems, while giving the appearance of a harsh environment, are actually quite fragile. Desert soils are extremely vulnerable to disruption, and once disturbed, can easily be eroded by wind and water. The majority of desert plants are long-lived but slow-growing. Plant recovery depends on amount and frequency of rainfall events, and season conditions. Animals that survive and thrive on the landscapes are hardy and well adapted to challenging and extremely variable niche conditions. Identification, mapping and monitoring of ecosystem types provides the critical information necessary to develop appropriate strategies to effect ecosystem management and subsequent conservation of biodiversity on the landscape.

Ecosystem classification involves the inventory and association of landforms with plant species assemblages. Plant species are commonly used as surrogates to characterize and define ecological communities and landforms provide the abiotic constraints on the system. Krzysik and Trumbull described 14 Combat Center ecosystems with species-ecosystem associations in their 1996 report. The California Department of Forestry mapped the EMUA West and South in 2003, and the USGS mapped the same area in 2004, and both use ecosystem associations compatible with Krzysik and Trumbull (USMC 2012). In 2006-2008, Agri-Chemical & Supply remapped vegetation across the old installation boundary with a different system. Below is a brief summary of the major ecosystems identified:

Creosote / Bursage Scrub Series

Creosote bush and white bursage are dominant species in the Creosote / Bursage Series. This series is classified into five ecosystems:

- ***Creosote / Bursage Scrub: Valleys, Gentle Bajadas*** - This ecosystem includes 50% of the Combat Center, in valleys, rolling plains, flats, gentle bajadas and alluvial fans. In undisturbed valleys creosote bush forms elliptical mosaics of clones, with each clone consisting of genetically identical individuals whose ancestors germinated thousands of years ago, some of the oldest genotypes on earth. A total of 142 vertebrate wildlife

species (54 birds, 38 reptiles, and 50 mammals) are possible for this ecosystem type at the Combat Center.

- ***Creosote / Bursage Scrub: Disturbed*** - This ecosystem was originally the Valleys, Gentle Bajadas Ecosystem, but it has been subjected to extensive military training activities with moderate to high disturbance. This disturbed ecosystem covers 10% of the Combat Center. A total of 68 vertebrate species are associated with this ecosystem.
- ***Creosote / Bursage Scrub: Mountains*** - This ecosystem typically possesses moderate to high diversity of woody perennials. Creosote bush is predominantly found as small individuals, never clones. This ecosystem is found on steep slopes, alluvial fans, or bajadas; boulder fields, talus slopes, or rocky outcrops; steep broken ridges or hills; and canyons or arroyos. This ecosystem includes 24% of the Combat Center, mostly in the Bullion Mountains, and is used by 149 vertebrate species.
- ***Creosote / Bursage Scrub: Sand Dunes*** - The Sand Dune Ecosystem is dominated by creosote bush, white bursage, big galleta and Indian ricegrass (*Stipa hymenoides*), and sand dune annuals. It is found on 3% of the Combat Center, predominantly in the southwestern and northern portions. It supports 63 vertebrate species.
- ***Creosote / Bursage Scrub: Lava Flows*** - Lava flows, existing as solid basalt pavements, boulders, and rocky and coarse-gravel substrates, are this ecosystem's primary characteristics. This ecosystem is found on 5.4% of the Combat Center, on the northern boundaries and is used by 71 vertebrate species.

Other Vegetation Series Ecosystems

- ***Yucca woodlands: Joshua Trees and / or Mojave Yucca*** - This Joshua tree-dominated ecosystem is confined to the southwestern and northwestern corners of the Combat Center, covering only 0.4% of total land. This biodiversity-rich ecosystem supports 184 vertebrate species.
- ***Saltbush Scrub: Playa and Uplands*** - About 6% of the Combat Center (alkaline margins of dry lake beds) includes the saltbush ecosystem. This habitat supports 50 vertebrate species.
- ***Blackbrush Scrub*** - Blackbrush ecosystems are widespread on upper bajadas and rocky alluvial mountain slopes in the Mojave Desert, but they only comprise 0.7% of the Combat Center, primarily in the northwestern corner of the installation. A total of 154 vertebrate species may be found in this ecosystem.

Riparian, Wet Areas and Aquatic Ecosystems

There are five reasons for the ecological significance and biodiversity value of riparian, wet areas, and aquatic ecosystems in the Mojave Desert.

1. They include habitats of exceptional biological diversity and ecological processes.
2. They are landscape corridors for population dispersal, gene flow, and recolonization routes for local extinctions.
3. They are critical feeding and resting sites for migratory birds and bats.
4. Springs / seeps or canyon riparian ecosystems are habitat islands for rare, relict, or endemic habitat specialist species.

5. Due to severe impacts by humans and their animals, remaining native examples of these ecosystems possessing ecological integrity are becoming more significant for local and regional biodiversity.

The different types of riparian systems identified aboard the Combat Center are provided below:

- ***Desert Riparian (Xeroriparian)*** - These tree-dominated, desert wash ecosystems with ephemeral surface waters include less than 0.5% of the Combat Center. This biodiversity-rich ecosystem has up to 178 vertebrate species.
- ***Desert Wash with Ephemeral Flows*** - This smaller wash ecosystem can be consider a smaller scale xeroriparian ecosystem, similar to the Desert Riparian Ecosystem, but dominated by shrubs instead of trees. This system is found on 2 - 4% of the Combat Center and supports 146 species of vertebrate species.
- ***Springs and Seeps*** - This ecosystem is poorly represented at the Combat Center. There are no permanent springs known; only one intermittent spring with hydrophytic vegetation is known (Sunshine Peak) and one ephemeral spring without hydrophytic vegetation (north of Lead Mountain) is known. At least three 'tinajas,"or "highly ephemeral water pockets" are known. A total of 221 vertebrates are possible in this ecosystem.
- ***Dry Lake Beds (Playas)*** - Fourteen playas, 1.9% of the Combat Center, comprise this ecosystem, in EMUA West there are five playas, and in EMUA South there are no playas. Surface water in playas is ephemeral and highly episodic. Fifty species of birds may use playas, and 5 species of fairy, clam and tadpole shrimp have been found in some of the playas when surface waters are present.
- ***Wet Areas / Ponds / Riparian: Perennial*** - This man-made habitat type covers less than 0.1% of the base, all within and near Mainside. The area is heavily used by migratory birds, and it is critical to a number of resident and breeding birds as well as other animals. This ecosystem is used by 88% of the potential avian fauna of the southern Mojave Desert.
- ***Caves, Mines, and Rock Crevices*** - These subterranean habitats are critical for bats, and are used by other wildlife species for water, shelter, and protection from the heat. These are found on the Combat Center and in EMUA West. None are known from EMUA South.

The important feature to note with regard to ecosystems and biological diversity is that about 90% of the Combat Center is in the Creosote / Bursage Scrub Ecosystem. Yucca Woodlands, Desert Riparian, and Wet Areas/Ponds/Riparian: Perennial ecosystems, by far the richest in terms of wildlife biodiversity, include less than 1% of training land.

3.5.2 Ecological Sites

An ecological site is a distinctive subset within a given ecosystem that possesses one or more physical characteristics that differ from the surrounding landscape. They are visually identified by the occurrence of unique amounts and types of vegetation, which are products of the combination of all influencing environmental factors including parent material, landscape, climate, soils, biota, hydrology, fire, and time in place.

The following criteria were used to differentiate ecological sites at the installation:

- Significant differences in species or species groups in characteristic plant communities
- Significant differences in the relative proportion of species or species groups in characteristic plant communities
- Significant differences in total annual production of characteristic plant communities
- Soil factors that determine plant production and compositions, site hydrology, and functioning of ecological processes of the water cycle, mineral cycles, and energy flow

The following ecological sites were identified on the Combat Center:

Table 3-1 Ecological Sites		
Alluvial Plain	Lava Flow 3-5" P.Z.	Saline Hill 3-5" P.Z.
Cobbly Wash	Limy 3-5" P.Z.	Sand Hill 3-5" P.Z.
Desert Patina	Limy 5-7" P.Z.	Sandy Plain 3-5"
Dry Wash	Limy Hill 3-5" P.Z.	Shallow Gravelly Loam 5-7" P.Z.
Dune 3-5" P.Z.	Limy Hill 5-7" P.Z.	Sodic Dune 3-5" P.Z.
Granitic Drain 5-7" P.Z.	Loamy Hill 5-7"	Sodic Sand 3-5" P.Z.
Granitic Loam 3-5" P.Z.	Moist Granitic Drain	Steep South Slope
Gravelly Ridge 5-7" P.Z.	Outwash Plain	Valley Wash
Gypsic Flat 3-5" P.Z.	Saline Flat 3-5" P.Z.	
(Note: P.Z. = Precipitation Zone)		

3.6 Flora

The Mojave Desert is divided into five floristic regions (Rowlands *et al*. 1982). The Combat Center lies in the South-Central Region where temperature and rainfall patterns approach conditions more typical of the hotter, drier Sonoran Desert to the south.

3.6.1 Flora Inventory

The vegetation at the Combat Center is predominantly Creosote Bush Scrub and Saltbrush Scrub. A combination of vegetation mapping and monitoring efforts, plus sensitive plant surveys, build and refine plant datasets over time. To date, over 440 native and naturalized vascular plants have been recorded for the Combat Center (Appendix C). Of these, 391 are native and 52 are non-native.

3.6.2 Plant Communities

Creosote bush (*Larrea tridentata*) and desert annuals are the predominant vegetative species. Plant density and diversity increases in higher elevations and within desert wash systems. The four most prevalent vegetation types occurring on the Combat Center in the 2006-2008 mapping include: creosote bush scrub, Mohave yucca, saltbush scrub, and big galleta (Agri-Chemical & Supply 2008). Substantial areas of the EMUA South are also covered with desert dunes that have minimal vegetation. Additionally, a small area consists of the tree-dominated catclaw acacia community.

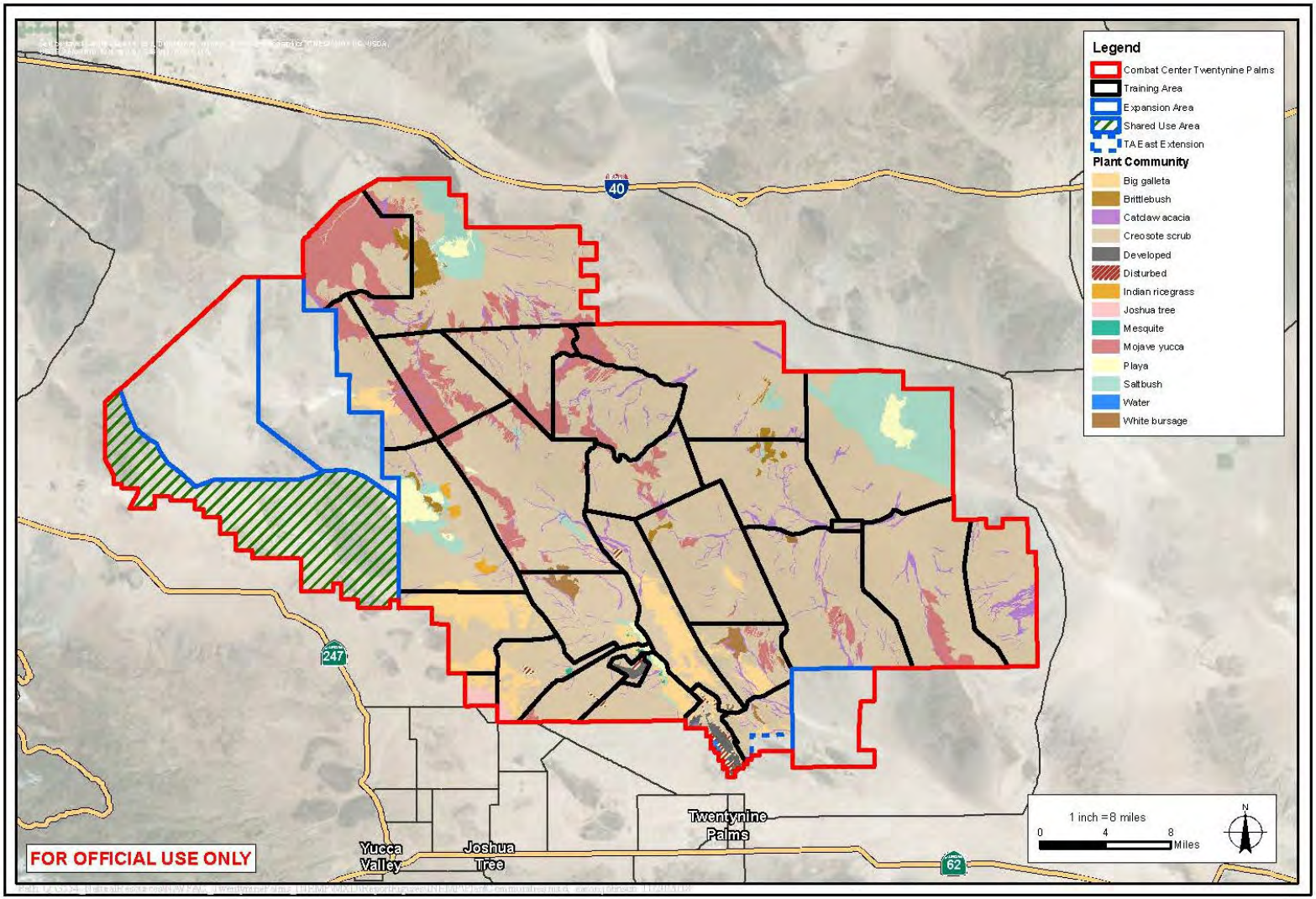
There exist variations in the classification and naming of vegetation types (plants communities) on the Combat Center over time. For example, Mojave creosote bush scrub (Lato *et al*. 1999)

was called creosote bush scrub by Krzysik and Trumbull (1996), which was broken into various groups by the UCR (1993), and later the Holland code was used to complete a vegetation community map for the installation. In 2016, the Combat Center established a standardized protocol for mapping vegetation using the California Manual of Vegetation (edition 2; CMV2) and completed an update to the vegetation map for the legacy base area. The mapping effort identified 18 plant communities at the alliance level (USMC 2016), which are presented in Table 3-2 and Figure 3-4. Plant community information for the land expansion areas was assessed for the 2012 EIS (USMC 2012) but were not collected using the same protocol, and are not readily available. Vegetation mapping is ongoing for the expansion area to ensure consistency between datasets. It is a goal of the vegetation mapping program at the Combat Center to update and revise the vegetation map every 5 years.

Table 3-2 Plant Communities

Vegetative Alliance	**Acres**
Senegalia (=Acacia) gregii	4,826.33
Ambrosia dumosa	472.24
Ambrosia salsola	4,662.59
Atriplex canescens	1,678.11
Atriplex hymenelytra	189.93
Atriplex polycarpa	9,132.97
Chilopsis linearis	1,005.55
Encelia farinosa	5,063.24
Ephedra californica	134.32
Condea (=Hyptis) emoryi	2,090.33
Larrea tridentata	224,640.05
Larrea tridentata-Ambrosia dumosa	243,899.18
Larrea tridentata-Encelia farinosa	62,601.88
Hilaria (=Pleuraphis) rigida	2,702.87
Prosopis glandulosa	326.52
Psorothamnus spinosus	9,973.06
Suaeda moquinii	201.47
Yucca schidigera	2,101.68
Total	***575,702.32***
Non-Vegetated Land Cover	
Developed	3,006.00
Disturbed	2,284.24
Mud Hills	146.18
Playa	8,107.70
Sparsely Vegetated Desert Pavement	7,865.87
Total	***21,409.98***
Grand Total	**597,112.30**

Figure 3-4: Combat Center Plant Communities - 2016 Dataset



3.6.3 Special Status Flora

Special status flora includes those species federally or state-listed as endangered or threatened; proposed or a candidate for such listing; included on List 1, 2, 3, or 4 in the California Rare Plant Ranks (CRPR) (formerly California Native Plant Society; Skinner and Pavlik 1994); or meet criteria to be considered on one of these lists. Congress has not waived sovereign immunity under the Federal ESA; therefore, MAGTFTC is not legally required to comply with California endangered species laws. However, it is the Marine Corps policy to consider state-listed species in the NEPA process. In addition, the Marine Corps is considering plants important to the culture of local Native American tribes as sensitive.

Thirty-nine special-status plant species have been detected during surveys on the Combat Center including the western and southern EMUA's (Table 3-3, Appendix C). None of these are listed as endangered or threatened by the federal government.

Table 3-3 Sensitive Status Plants Present

Scientific name	Common Name	Special Status*
Allium parishii	Parish's Onion	CRPR 4.3
Androstephium breviflorum	Small-flowered Androstephium	CRPR 2B.2
Castela emoryi	Emory's Crucifixion-thorn	CRPR 2B.2
Chilopsis linearis ssp. *arcuata*	Desert Willow	T1
Chorizanthe spinose	Mojave Spineflower	CRPR 4.2
Chorizanthe xanti var. *leucotheca*	Riverside Spineflower	CRPR 1B.2
Cryptantha costata	Ribbed Cryptantha	CRPR 4.3
Cryptantha holoptera	Winged Cryptantha	CRPR 4.3
Cymopterus multinervatus	Purple-nerve Cymopterus	CRPR 2B.2
Cylindropuntia wigginsii	Wiggin's Cholla	CRPR 3.3
Datura wrightii	Wright's Jimsonweed	T1
Dudleya saxosa ssp. *saxosa*	Panamint Liveforever	CRPR 1B.3
Eremothera boothii ssp. *boothii*	Booth's Evening-primrose	CRPR 2B.3
Eriophyllum mohavense	Mojave Woolly Sunflower	CRPR 1B.2
Eriastrum harwoodii	Harwood's Eriastrum	CRPR 1B.2
Eriastrum sparsiflorum	Few-flowered Eriastrum	CRPR 4.3
Euphorbia abramsiana	Abram's Spurge	CRPR 2B.2
Euphorbia parryi	Parry's Spurge	CRPR 2B.3
Euphorbia revolute	Revolute Spurge	CRPR 4.3
Funastrum utahense	Utah Vine Milkweed	CRPR 4.2
Galium angustifolium spp. gracillimum	Slender Bedstraw	CRPR 4.2
Larrea tridentata	Creosote Bush	T1
Lasthenia glabrata ssp. *coulteri*	Coulter's Goldfields	CRPR 1B.1
Matelea parvifolia	Spearleaf	CRPR 2B.3
Monardella robisonii	Robison's Monardella	CRPR 1B
Muilla coronate	Crowned Muilla	CRPR 4.2
Nicotiana obtusifolia	Desert Tobacco	T1

Table 3-3 Sensitive Status Plants Present		
Scientific name	**Common Name**	**Special Status***
Penstemon albomarginatus	White-margined Beardtongue	CRPR 1B.1
Penstemon pseudospectabilis	Desert Beardtongue	CRPR 2B.2
Penstemon thurberi	Thurber's Penstemon	CRPR 4.2
Physalis lobate	Lobed Ground-cherry	CRPR 2B.3
Populus fremontii ssp. *fremontii*	Fremont's Cottonwood	T1
Portulaca halimoides	Desert Portulaca	CRPR 4.2
Prosopis glandulosa var. torreyana	Honey Mesquite	T1
Salvia columbariae	Chia	T1
Sclerocactus polyancistrus	Mohave (Red-spined) Fishhook Cactus	CRPR 4.2
Sidalcea neomexicana	Salt Spring checkerbloom	CRPR 2B.2
Simmondsia chinensis	Jojoba	T1
Wislizenia refracta ssp. *refracta*	Jackass-clover	CRPR 2B.2

*Definitions:

Tribes

T1 Species of interest/concern as identified by tribes.

.

California Rare Plant Ranks (CRPR)

Inventory of Rare and Endangered Vascular Plants of California:

1B Rare or endangered in California and elsewhere.
2 Rare or endangered in California, but more common elsewhere.
3 Need more information (a review list).
4 Plants of limited distribution (watch list).

CRPR Threat Ranks

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

There are two rare plants potentially present or with a potential to occur on the Combat Center that have not been detected during surveys (Table 3-4). Twelve species that were included in this table in previous INRMP's have been confirmed present (UCR 1993; Elvin 2000).

Table 3-4 Sensitive Status Plants Potentially Present		
Scientific name	**Common Name**	**Special Status**
Gilia aliquanta spp. *aliquanta*	Puffcalyx gilia	CRPR 3
Quincula lobata	Chinese Lantern	CRPR 2

*Definitions:

California Rare Plant Ranks (CRPR)

Inventory of Rare and Endangered Vascular Plants of California:

1B Rare or endangered in California and elsewhere.
2 Rare or endangered in California, but more common elsewhere.
3 Need more information (a review list).
4 Plants of limited distribution (watch list).

CRPR Threat Ranks

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

One regionally sensitive species not discussed above, the Joshua tree (*Yucca brevifolia*), is currently a candidate for listing under the ESA by USFWS. An icon of the desert southwest, this species is particularly susceptible to the threat of climate change as well as other factors such as habitat disturbance, pollinator community changes, and the development of fire regimes from invasive plant establishment. The Combat Center recognizes this unique resource and has several occurrence maps for the species aboard installation. While no formal protections have been established for this species by the installation at this time, existing internal protections help to avoid and minimize impacts to this species. These protections include the 1 km-no-train buffer around base boundary which reduces any potential indirect impacts to Joshua trees near the Base boundary; the Sandhill, Acorn, West, and Restricted Area Training Areas do not support off-road travel so no impacts to Joshua trees should occur in these training areas; cross country travel is discouraged in the remainder of the training areas; and new actions including but not limited to training and ground disturbances are reviewed through the NEPA process which provides the opportunity to incorporate avoidance and minimization measures for Joshua tree impacts such as tree surveys, avoidance measures, and best management practices to minimize the introduction of invasive species, etc. Should the species become listed, the Combat Center would work with USFWS to develop a conservation plan for Joshua Trees that would include focused surveys and a threats assessment, and the development of management recommendations and best management practices to protect and reestablish the species.

3.7 Fauna

Wildlife species at the Combat Center are typical of Mojave Desert fauna except around Mainside, where a wide variety of non-desert adapted species can be found, particularly around areas with manmade water (Cutler *et al.* 1999). Most wildlife species on the installation (except those found only at Mainside) are adapted to desert scrub habitats that maintain xeric conditions with little cover.

In natural areas outside of the Mainside Cantonment Area, seeps, springs and ephemeral streams sustain more vegetation and thermal cover, more individuals of particular species, higher wildlife species richness, and overall more biotic activity. Man-made water sources also provide a valuable source of perennial water for wildlife; ongoing monitoring at these sources has documented large mammals such as the bighorn sheep, coyote (*Canis latrans*), and bobcat (*Lynx rufus*), using these water sources and returning to them regularly. Bats also typically feed over these areas because of increased abundance of invertebrate prey. Spring and fall migratory bird species, typically not associated with desert environments, forage and rest in these areas, particularly at sources of manmade water.

Rocky terrain provides habitat for many reptiles, rodents, and bird species. Along with different vegetation communities that normally occur with increasing elevation in these ranges, differences in slope and aspect result in microhabitats that support different species. Species that occur in these areas include bats that rely on rocky outcrops for roosting sites, and raptors, that use cliff faces and rocky ledges for roosting or nesting.

Playas provide little wildlife habitat because they are usually devoid of vegetation. However, they do support endemic microbiological communities of algae that can support brine shrimp

(*Artemia salina*). Migratory waterfowl and large mammals may visit these areas after periods of heavy rainfall for water and to forage.

As is typical of most desert systems, larger animal species are uncommon, widely dispersed and often nocturnal. Smaller mammals and reptiles, highly adapted to harsh desert conditions, are much more common but are often secretive, nocturnal, or only active for short periods of time during the year. Birds are among the most conspicuous species, usually occurring in greatest concentration in the vicinity of washes and springs where more structures and complex vegetative assemblages occur. With some exceptions, wildlife species (such as birds and larger mammals) are generally more mobile and not limited to a single habitat type. Some species (*e.g.*, fish, amphibians, and some reptiles and mammals) are highly adapted to one habitat type and restricted to these specialized areas.

The Natural Resources Management Plan (UCR 1993) included the first comprehensive inventory of vertebrate wildlife permanently or seasonally present at the Combat Center. This list included permanent residents, winter residents, summer residents, and species that do not occur regularly. Cutler *et al*. (1999) observed 256 species of vertebrates aboard the Combat Center. Table 3-8 lists sensitive vertebrate species known or suspected at the Combat Center.

3.7.1 Invertebrates

Although wildlife surveys typically do not focus on invertebrate species, invertebrates are an essential component of desert ecosystems, providing food for numerous vertebrate species and acting as pollinators for a large number of plant species. The seasonal reproductive cycle of some insect species results in an "explosion" of the population in a relatively short period of time. These insect swarms provide an important prey base for insectivores, such as smaller birds, reptiles, amphibians, and bats. UCR concluded a terrestrial invertebrate survey in 2005 that identified more than 1,500 species, though no listed species were detected (Pratt 2005).

Simovich (2006) investigated all nine of the Combat Center's dry lakes for presence of aquatic invertebrates. Six species of fairy shrimp, clam shrimp and tadpole shrimp were detected. Nearly all expected species were detected in either their live or desiccated forms; no species detected were considered rare or otherwise sensitive.

3.7.2 Fish

There currently are no active perennial springs located aboard the Combat Center. No documentation of native fish species occurring at any location exists. The introduced mosquito fish (*Gambusia affinis*) occurs in some of the manmade treatment ponds. However, no other native, introduced or non-native fish species are known to occur on the installation.

3.7.3 Amphibians and Reptiles

Five amphibian species and more than 40 reptile species have been detected at the Combat Center (Appendix D). Cutler *et al*. (1999) found that rocky areas may have lower species richness and abundance than washes, canyons, and sandy flats, particularly during years following low winter / spring precipitation. Circle Mountain Biological Consulting, LLC completed the general wildlife survey in 20 range training areas. The idea of the project was to provide a dependable and statistical baseline of all vertebrates found in the range training areas.

3.7.4 Birds

More than 215 species of birds have been detected at the Combat Center (Appendix D). In addition, the San Bernardino County Museum conducted a Neotropical Bird Survey for the Combat Center at Mainside and Wood Canyon, Gypsum Ridge Training Area. A Bird Airstrike Hazard (BASH) plan was completed in 2003. In general, it determined that the Combat Center and the Expeditionary Airfield have a low risk of airstrikes due to the remoteness of the airfield from any source of water.

Cutler *et al*. (1999) recorded 87 resident bird species aboard the Combat Center and another 122 migrants, vagrants, or other transient species of birds. These authors suspect, but did not prove, a greater bird species richness in washes and canyons than at other sites. Bird species richness and overall abundance were greater in 1998 following higher winter/spring precipitation than in 1997. Boarman and Chamblin (2005) completed a study focused on the roosting behavior of the common raven (*Corvus corax*), however, this study was completed primarily due to the known predatory impact of ravens on the desert tortoise (see Chapter 4, Goal 3 discussion).

3.7.5 Mammals

Almost 60 mammal species have been observed at the Combat Center (Appendix D). Cutler *et al*. (1999) found small mammal species richness to be greater at high elevation sites than all other types of sites except washes.

In November 1992, 20 bighorn sheep (five rams and 15 ewes) were introduced onto the Combat Center near the Bullion and Cleghorn Pass training areas boundary north of Cleghorn Lakes (UCR 1993). This population is considered an experimental population.

3.7.6 Agassiz Desert Tortoise (*Gopherus agassizii*)

Legal Status Federal Threatened – Listed April 1990

State Threatened – Listed August 1989

Agassiz's desert tortoise is a large, herbivorous reptile found throughout much of the Mojave and Colorado Deserts, and spends much of the year underground to avoid extreme summer and winter temperatures (Nagy and Medica 1986). They construct and maintain single-opening burrows, of which several may exist within an individual's home range. The desert tortoise is typically active above ground during the spring, summer, and autumn when daytime air temperatures are below 90° Fahrenheit. Most activity occurs during spring and early summer.

The USFWS determined that the Mojave Desert population warranted federal listing in response to documented population declines over large portions of its range (USFWS 1990). The decline was likely due to several causes, including loss and degradation of habitat, upper respiratory tract disease, predation by ravens and coyotes, vehicle strikes, livestock grazing, and direct disturbance and collection by humans. The tortoise was emergency-listed as Endangered on 4 August 1989, and the Mojave population was listed officially as Federally Threatened in April 1990 (USFWS 1990).

The Combat Center is within the southern Mojave subdivision of the Western Recovery Unit for the desert tortoise. Critical Habitat was not designated aboard the installation. However, it shares a 6.2 mile boundary with the Ord-Rodman Critical Habitat Unit to the northwest, and the Pinto Mountain Critical Habitat Unit is six miles southeast of the installation (Snover and Kellogg 1999).

The Upper Respiratory Tract Disease (URTD,), caused by the bacterium *Mycoplasma agassizii* (Brown *et al.* 1994), was a factor in the species listing as Threatened (USFWS 1990). A thick, nasal mucous discharge is a clinical sign of the disease, but URTD may present other sign, including raspy, difficult breathing, ocular discharge, swelling of the eyelids, inflamed eye membranes (such as conjunctivitis), and sunken eyes. Although a closely related bacterium (*Mycoplasma testudineum*) also occurs in desert tortoises, its role and specifically its pathogenicity has not been demonstrated. The primary external indicator of URTD, mucoid nasal discharge, may indicate other diseases (e.g., herpesvirus infection), so biological samples are analyzed to help diagnose URTD status.

Exposure to *Mycoplasma* is tested via Enzyme-Link ImmunoSorbent Assay (ELISA; anti-body response to *Mycoplasma* spp.), Quantitative Polymerase Chain Reaction (qPCR detection of *Mycoplasma* spp. DNA; Brown *et al.* 2002 and Braun *et al*. 2014), and bacterial culturing (Brown *et al.* 2002). The ELISA test detects an immune response by measuring concentrations of antibodies to *Mycoplasma* in blood samples. An immune response indicates a past exposure to, but does not confirm an active infection by, the bacteria of interest. Cultures of nasal exudate indicate the presence of live *Mycoplasma*, and qPCR tests of blood plasma indicate the presence of *Mycoplasma* DNA (indicating a more recent presence of the organism in the tortoise). Recent Combat Center surveys of tortoises included physical exams and diagnostic testing for health and disease assessments using both ELISA and qPCR tests.

Desert tortoises generally occur through much of the Combat Center (Woodman 2001) including the western and southern expansion areas. The most current density information for the installation is presented in Figure 3-5 Tortoise Density (USMC 2017; USMC 2018b). Areas of steep bedrock outcrop, lava flow, and dry lakes are not typically considered habitat and are frequently not surveyed (see USMC 2018b). The following summary reviews tortoise abundance and density for the legacy base (i.e., prior to expansion in 2013), and subsequent expansion areas to the west and south. Legacy and expansion areas were surveyed at different scales (Figure 3-5) but metrics will be standardized over time during future efforts.

Desert Tortoise Estimates in the Legacy Base

In 1997 and 1999 Woodman *et al.* (2001) surveyed the Combat Center's desert tortoise population across what is now the legacy base using survey protocols similar to Tortoise Regional Estimate of Density (TRED) surveys (Karl 2010). Like TRED protocols, Woodman's method performed calibration surveys as a means to generate calibration coefficients to reflect the abilities of individual surveyors to detect tortoise sign. However, TRED protocols calibrate based on the number of tortoise burrows detected during a survey transect, Woodman *et al.* 2001 also included observations of scat and burrows in the calibration, rendering detectability by this method more sensitive. Data from the Woodman *et al.* (2001) desert tortoise survey have provided the first established population baseline for the installation and are regularly used in a

variety of ways by the Natural Resources Management Program, including tracking desert tortoise population trends over time.

The Combat Center employs a consistent and comparable approach for tracking population changes over time by comparing the Woodman *et al.* (2001) data with later datasets collected from mark recapture analyses performed at permanent plots located in Bullion, Emerson Lake, and Sandhill TAs (Woodman *et al.* 2001, Woodman 2012, and Karl 2017). Although detailed trend analysis of all population data available is neither appropriate nor realistic for the purposes of this document, generally declines measuring 67%, 80% and 90% over 14, 12 and 16 years respectively have occurred at the Bullion, Emerson Lake, and Sandhill TAs (Woodman *et al.* 2001, Woodman 2012, and Karl 2017). These numbers represent total population reductions over decades, and when broken down into annual decline rates they are comparable to annual declines (ca. 8%) measured across the Western Mojave Recovery Unit from 2004 to 2014 (USFWS 2015).

Population declines may be attributed to a myriad of causes. At the Combat Center, incidence of URTD is low at these plots (Woodman *et al*. 2001, Woodman 2012, Karl 2017) but predation by canids has been a concern at all three sites, especially in the Sandhill TA (B.T. Henen, unpublished observations). Juvenile tortoises have been reported at the Bullion Plot, but less so at the other two sites, implicating poor recruitment at the Emerson Lake and Sandhill plots. The Sandhill TA should benefit from the tortoise headstart program contributing 100 to 140 mm long (carapace length) juveniles, for which releases began in the spring of 2017.

The Combat Center recently conducted a qualitative comparison (USMC 2017) between the Woodman results and data from LaRue (2013). In the LaRue study a survey team performed triangular transect surveys similar to those performed by Woodman *et al.* (2001); however, surveyors did not include calibration surveys in their data, and due to a lack of calibration, only regional patterns of tortoise abundance and their sign could be generally compared. Results from this analysis reflect tortoise sign had declined overall between the Woodman and LaRue surveys for the Prospect and South Lavic Lake TAs, and sign had increased in the Bullion TA and portions of the Delta TA. As a part of this comparison, the Combat Center created a new desert tortoise density map using a conservative analysis of LaRue (2013) data which only modified areas where the original 0-5 tortoises per square mile density provided by Woodman *et al.* (2001) may have increased, to better consider these areas during future planning efforts.

Table 3-5 Tortoise Densities and Abundances on the Combat Center				
Density (#/ mi^2)	Area (Acres)	Percent of Total	Average Density (#/ mi^2)	Abundance*
0 – 5	235,753	39.47%	2.5	921
Density may be > 0-5	34,326	5.75%	2.5	697
6 – 20	123,571	20.69%	13	2,510
21 – 50	67,290	11.26%	35.5	3,732
51 – 100	12,183	2.04%	75.5	1,437
Sub-total, Occupied Habitat	473,123	79.20%	n/a	9,297
Data Gaps	42,029	7.04%	2.5	164
Landforms, No Habitat	82,237	13.77%	2.5	321
Grand Total	**597,389**	**100.00%**	**n/a**	**9,782**
Notes: Tortoise data is from surveys conducted in 1997 and 1999 and updated with TCS data from 2013. Source: Final Environmental Assessment for Ongoing Training, (USMC 2018b).				

Marine Corps training impacts tortoise densities at the Combat Center (Henen 2012) but a new, formative analysis should quantify those impacts after identifying variation in tortoise densities and associating them with variation in habitat suitability (Barrows *et al.* 2016). The complex, interwoven import of habitat suitability (e.g., Barrows *et al.* 2016) and human disturbance on Combat Center desert tortoises (Henen 2012) is a key component of ongoing monitoring and analyses of tortoise distribution and density at the installation (INRMP Task 3.2.1-A, Appendix A). The new habitat suitability analyses proposed under this INRMP will evaluate human disturbance data (i.e., military training and other sources) from Woodman *et al.* 2001 and LaRue 2013, however the comparison between studies will be neither simple nor precise due to variations in the methods, numbers, and spatial distribution across the landscape (Barrows 2011, Barrows *et al.* 2016).

Desert Tortoise Estimates in the Western Expansion Area (WEA)

In 2008, surveys detected multiple types of desert tortoise sign throughout the Western Expansion Area, with sign for all sizes and sexes on most topographic features from low bajadas to mountains (Karl 2009). These surveys indicated approximately 9% of the area hosted no tortoises, mostly in unsuitable or disturbed habitat, and the greatest densities were observed in the valleys, bajadas, and foothills of upper Johnson Valley, especially in the north-central portion west of Emerson Dry Lake and west of the Fry Mountains (Table 3-6 and Figure 3-5). The number of desert tortoises in the WEA was estimated at 2,708 ± 780 adults (95% CI; Karl 2010).

Table 3-6 Tortoise Density in the Western Expansion Area		
Density (#/km^2)	Area (acres)	Percent of Total
0	13,931	9.5%
1-3	60,458	41.2%
4-6	57,105	38.9%
7-9	11,104	7.6%
10-12	1,970	1.3%
13-15	0	0%
Total	**144,567**	**98.6%**
Notes: Tortoise surveys conducted in 2009. Based on the TRED survey method GIS data (Karl 2010).		

Mark recapture and belt transect surveys from 1977 to 2008 offer comparative data (see Karl 2010 for review). The BLM and USGS used mark-recapture sampling to survey the 1-mile (mi)^2 (2.59 km^2) 'Trend Plot' in Upper Johnson Valley every four to six years since 1980. The density of adult tortoises (i.e., carapace length > 180 mm; Turner et al. 1987) was 179 per mile (mi)^2 (69 per km^2) in 1980 (BLM 2005), 39 per mi^2 in 1990, and about half that in 1994. The densities now are likely lower as densities have declined range-wide (Karl 2010; USFWS 2015).

From 1977 to 2002, biologists estimated tortoise abundance in the western Mojave Desert via belt transects, 10-meter wide and 2.4-km long, surveyed at two transects per 36 mi^2 (93 km^2; Karl 2010) and at one or two per mi^2 (2.6 km^2; between 1998 and 2002). The density of such transects would provide coarse estimates of tortoise abundance and density (Karl 2001), but more intense coverage (i.e., transects per unit area) should more accurately estimate abundance and density. The northern portion of Johnson Valley had relatively high tortoise abundance, with patterns similar to more recent surveys (2008 TRED surveys by Karl 2009), including above average sign counts north of the Western Expansion Area, and west of the Emerson Lake TA. Unlike earlier surveys, however, the recent surveys (Karl 2009) did not detect high tortoise abundance north of Means Dry Lake and west and northwest of the Fry Mountains and southern Johnson Valley. The differences between the earlier and later studies may be partially due to survey method (i.e., density of survey transects; Karl 2009), but the declines are consistent with range-wide declines (Karl 2010; USFWS 2015), suggesting other threats impacted densities.

Desert Tortoises in the Southern Expansion Area (SEA)

Although tortoise sign was detected in most of the Southern Expansion Area, tortoise densities were low, with the higher estimates in the northeast corner, and on bajadas in the south (Table 3-7). The number of desert tortoises in the SEA was estimated as 389 ± 115 (95% CI) adults (Karl 2010).

Table 3-7 Tortoise Density in the Southern Expansion Area		
Density Category (#/km^2)	Area (acres)	Percent of Total
0	0	0%
1-3	4,328	20.3%
4-6	11,202	52.6%
7-9	3,335	15.6%
10-12	296	1.4%
13-15	249	1.2%
Total	**19,409**	**91.1%**
Notes: Tortoise surveys conducted in 2009. Based on the TRED survey method GIS data (Karl 2010).		

BLM (2005) belt transects provided estimates between 1998 and 2002 but did not detect high sign counts. Nearby on the Combat Center, calibrated belt transect surveys indicated relatively high tortoise density (8 to 39 per km^2; Woodman *et al.* 2001) for tortoise of all sizes.

Initial Results of 2017 Desert Tortoise Translocation

As a part of the recent land and airspace acquisition project, the Combat Center conducted a large-scale desert tortoise translocation to minimize the effects of military training exercises on the desert tortoise population in the newly acquired lands. Regulatory authorizations received from the USFWS for this effort included a Biological Opinion (USFWS 2017) and Supplemental Environmental Impact Statement (USMC 2017). Under these authorities, the Combat Center has translocated 1043 tortoises (871 large [carapace length, CL > 159 mm] and 172 small [CL < 160]) to four recipient sites including the Lucerne-Ord, Rodman Sunshine Peak North, Siberia, and the Constrained Release Area. As of December 2017, another 557 tortoises were placed in the TRACRS holding facility due to their smaller size (CL < 120) preventing the use of longer-term monitoring transmitters. Of those translocated, 929 (786 large, 143 small) were moved during the period of 8 to 22 April 2017 and 114 (85 large, 29 small) were moved during the period of 2 to 4 October 2017. To monitor translocation efficacy (e.g., survivorship and integration), we used radiotelemetry to monitor approximately 20% of translocated tortoises (158 large, 33 small) and similar numbers of resident tortoises (172 large, 14 small at recipient sites) and control tortoises (222 large, 32 small; at control sites Broadwell, Bullion, Calico, Cleghorn, Daggett, Ludlow, and Rodman Sunshine Peak South). None of the 79 small, monitored tortoises died post translocation. Of the large tortoises tracked in 2017, 15 (9.49%) translocated, 3 (1.74%) residents, and 8 (3.60%) controls died post translocation. Annual clearance surveys will continue on 1-km^2 (by UTM) grid cells until less than two large tortoises (per 1-km^2 grid) are detected (USFWS 2017 and USMC 2017), after which we will be complete with clearance surveys for tortoise translocation.

Figure 3-5: Combat Center Desert Tortoise Densities

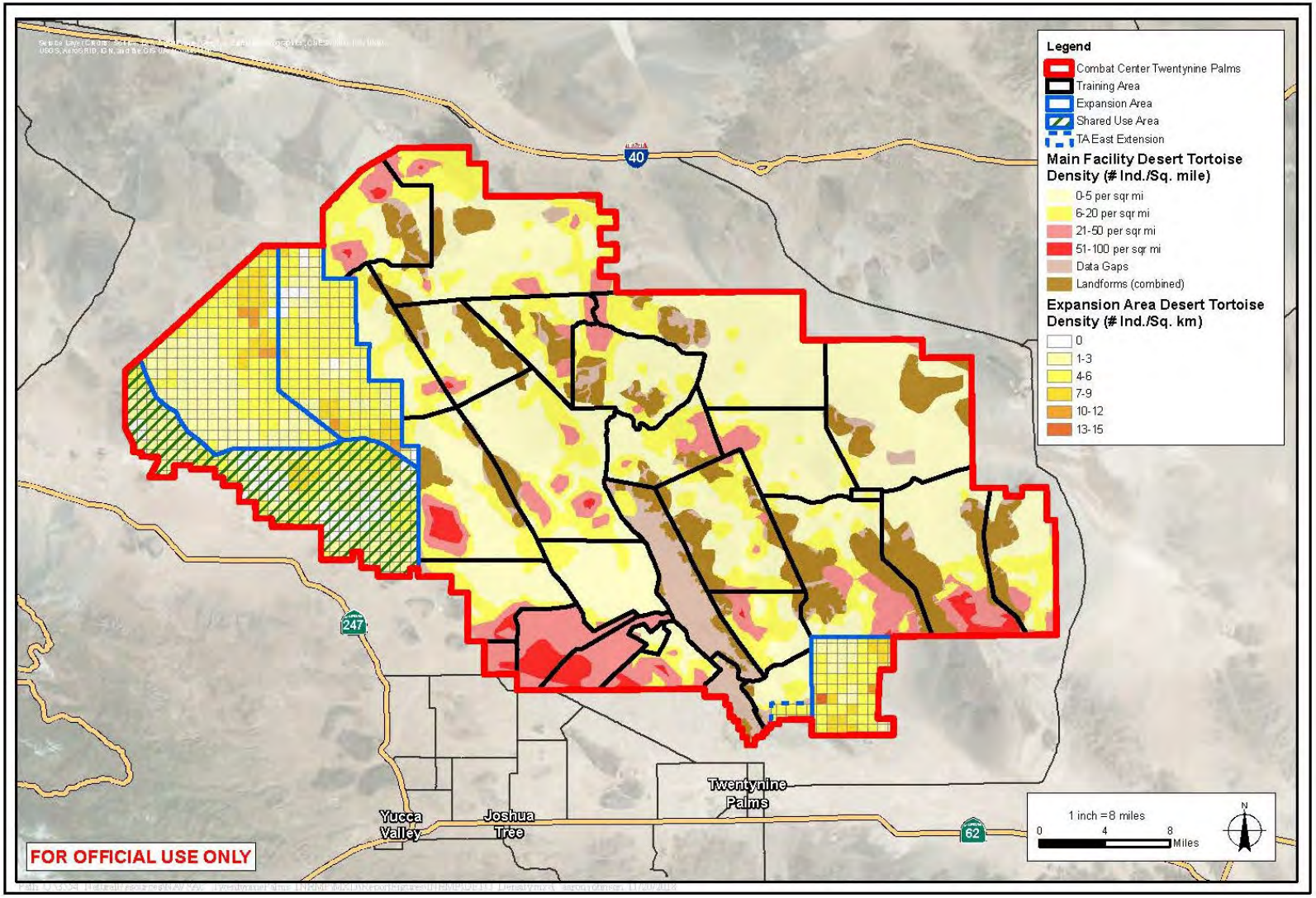


Figure 3-5 reflects the two desert tortoise density datasets providing full coverage across the installation.

3.7.7 Migratory Birds

The Regional Internal Review Procedures prepared by Chief of Naval Operations (July 31, 2001) state that "INRMPs should be assessed to evaluate their compatibility and contribution to the conservation of migratory birds." In general, the Combat Center has a lack of high-quality habitat for migratory and resident bird species. With no known perennial seeps or springs, most bird sightings occur in developed areas of Mainside, including the golf course and wastewater treatment ponds, with a limited number of sightings at ephemeral surface water sources. No formal surveys have been recently conducted at the golf course or treatment ponds but they are considered viewing ponds and periodic avian surveys have documented MBTA use in years past, and surveys are anticipated again, at a low frequency, in future years. The Combat Center also maintains a volunteer monitoring initiative with the Marine community which seasonally performs informal bird counts at the ponds. The activity is dependent on the interest, availability, and skillset of the individual volunteers and helps to improve the community awareness and connection with the natural resources aboard the installation.

The following list includes descriptions of many past and current actions completed to benefit migratory birds (future projects are detailed in the 5 Year Workplan presented in Appendix A):

- In 1999, MAGTFTC completed a comprehensive survey of all vertebrates, including birds. The study (Cutler *et al.* 1999) determined that at least 87 species of birds are resident and an additional 122 species are migratory through this area.
- In 1998, MAGTFTC and the San Bernardino County Museum completed a comprehensive survey of neotropical migratory birds at the Combat Center. This study (McKernan 1998) primarily focused on the developed areas of the Combat Center, including the golf course and sewage treatment facilities.
- In 1998, the Combat Center completed construction of a ten-acre stormwater retention pond. Though this facility serves other purposes, specific design changes were implemented to increase its use by both migratory and resident species. Educational signs and bird viewing blinds have also been installed around the pond, now informally called the "Wildlife Viewing Area." At least 70 species of birds have been documented using this area.
- The Combat Center developed a "Guidance" document that details allowed and prohibited actions that Marines, family members, contractors and civilian employees of the U.S. Marine Corps can do to reduce "Take" of migratory birds (CCO 5090.1F, Appendix F). This guidance is incorporated in a Combat Center Order, which is signed by the Commanding General of the installation. This guidance also includes regulations and recommendations on the proper timing of tree-trimming within the Mainside area.
- EA staff regularly cooperates with organizations such as Partners in Flight, The Wildlife Society, the American Bird Conservancy's "Cats Indoors" campaign and others. MAGTFTC also cooperates with the regional, interagency Raven Project team led by USFWS Palm Springs Field Office.
- The Marine Corps has worked to improve habitat quality of xeroriparian washes for migratory and resident birds (and other wildlife) through an aggressive saltcedar

(tamarisk) eradication program (refer to section 4.12). The Combat Center has treated more than 40,000 saltcedar since 1997.

- The USFWS Migratory Bird Treaty Office (MBTO) - Region 8 in Sacramento has issued the Combat Center a Special Purpose Permit. This permit allows the limited removal of nests of mourning dove (*Zenaida macroura*), greater roadrunner (*Geococcyx californianus*), common raven, mallard (*Anas platyrhynchos*), house finch (*Carpodacus mexicanus*), great horned owl (*Bubo virginianus*), and barn owl (*Tyto alba*), "when nests are built on or near tactical vehicles, pose a health or safety threat or the nests are in a location where birds are in danger." Actions taken under authority of this permit are reported to the MBTO on an annual basis. The current permit expires in March of 2019. The Combat Center intends to apply for a renewal of this permit in calendar year (CY) 2019.
- A BASH Plan was completed in 2003. In general, it determined that MAGTFTC and the Expeditionary Airfield have a low risk of airstrikes due to the distance between the airfield and any source of water.
- Educational Outreach and briefings (Chapter 4, Goal 4) include information on migratory birds, specifically directing Marines to not feed ravens. Additionally, guidance from USFWS to ensure that any new utility poles not be compatible for raven nesting (existing poles will be modified by MAGTFTC and Southern California Edison on a conditional basis).
- Boarman and Chamblin (2005) completed a study focused on the roosting behavior of the common raven; however, this study was completed primarily due to the known predatory impact of ravens on the desert tortoise (Chapter 4, Goal 3). A similar survey in 2010 by Boarman (2014) indicated the similar patterns of high Raven numbers near subsidies at Mainside, and high numbers near units training in some training areas.
- The Combat Center and USGS (Las Vegas, Nevada) completed a preliminary study of burrowing owl (*Athene cunicularia*) at the Combat Center. A final version of this study was received in 2007, further research and management recommendations will be considered in the future.
- ICF Jones and Stokes completed an Avian Point count survey around the Expeditionary Air Field in support of the BASH plan in 2008.
- Circle Mountain Biological Consulting, LLC completed the general wildlife survey in 20 range training areas. The idea of the project was to provide a dependable and statistical baseline of all vertebrates found in the range training areas. This project was completed in 2012.
- Public Works Division and EA worked together to incorporate "Avian Protection Guidelines" in accordance to Southern California Edison line and power-pole configuration for all new power pole construction in 2011.

3.7.8 Other Special Status Fauna

In total, 39 species with some level of special status have been detected on the Combat Center, including 2 reptile, 27 bird, and 10 mammal species (Table 3-8). Four of these species are federally listed as threatened or endangered, however three are nonresidents, including the willow flycatcher [*Empidonax trailli*], Bell's vireo [*Vireo bellii*], and snowy plover [*Charadrius*

nivosus]. For each of these avian species, the subspecies observed on the Combat Center was also unknown or otherwise unnoted (USMC 2012). The desert tortoise is the only federally-listed resident faunal species known to occur on the Combat Center, and is a state-listed threatened species under the California Endangered Species Act. While the peninsular population of desert bighorn sheep (*Ovis canadensis nelsoni*) are listed as federally endangered, desert bighorn sheep at the Combat Center are well outside of this population. The population is fully protected by the state, and federally identified as a BLM Sensitive species. The table below lists special status faunal species documented aboard the Combat Center:

Table 3-8 Sensitive Status Fauna Present

Scientific Name	Common Name	Special Status
Reptiles		
Uma scoparia	Mojave Fringe-toed Lizard	CSC
Gopherus agassizii	Desert Tortoise	FT, ST, T1
Birds		
Aythya americana	Redhead	CSC
Pelecanus erythrorhynchos	American White Pelican	CSC
Haliaeetus leucocephalus	Bald Eagle	BGEPA; SE
Circus cyaneus	Northern Harrier	CSC
Aquila chrysaetos	Golden Eagle	BGEPA, FP
Charadrius nivosus	Snowy Plover	#, CSC
Numenius americanus	Long-billed Curlew	BCC
Chlidonias niger	Black Tern	CSC
Geococcyx californianus	Greater Roadrunner	T1
Athene cunicularia	Burrowing Owl	BCC, CSC
Asio otus	Long-eared Owl	CSC
Asio flammeus	Short-eared Owl	CSC
Chaetura vauxi	Vaux's Swift	CSC
Calypte costae	Costa's Hummingbird	BCC
Selasphorus sasin	Allen's Hummingbird	BCC
Colaptes chrysoides	Gilded Flicker	SE
Falco peregrinus anatum	American Peregrine Falcon	FP
Contopus cooperi	Olive-sided Flycatcher	CSC
Empidonax trailii	Willow Flycatcher	#, SE
Lanius ludovicianus	Loggerhead Shrike	BCC, CSC
Vireo bellii	Bell's Vireo	#
Riparia riparia	Bank Swallow	ST
Toxostoma lecontei	LeConte’s Thrasher	CSC
Oreothypis luciae	Lucy's Warbler	CSC
Setophaga petechia	Yellow Warbler	BCC, CSC
Xanthocephalus xanthocephalus	Yellow-headed Blackbird	CSC
	All raptors	CSC, FP
Mammals		
Macrotus californicus	California Leaf-nosed Bat	CSC
Lasiurus xanthinus	Western Yellow Bat	CSC
Corynorhinus (*= Plecotus) townsendii*	Townsend's Big-eared Bat	CSC

Table 3-8 Sensitive Status Fauna Present		
Scientific Name	**Common Name**	**Special Status**
Antrozous pallidus	Pallid Bat	CSC
Nyctinomops femorosaccus	Pocketed Free-tailed Bat	CSC
Eumops perotis californicus	Western Mastiff Bat	CSC
Chaetodipus (= *Perognathus*) *fallax pallidus*	Pallid San Diego Pocket Mouse	CSC
Canis latrans	Coyote	T1
Vulpes macrotis marsipus	Desert Kit Fox	FP
Taxidea taxus	American Badger	CSC
Ovis canadensis nelsoni	Bighorn Sheep	BLM-S, FP

No subspecies specified in formal records.
*Definitions:
Federal Federal categories per the Endangered Species Act, administrated by the USFWS.
FT Threatened - any species officially listed by the USFWS that is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range.
BGEPA Bald and Golden Eagle Protection Act of 1940.
BLM-S Bureau of Land Management Sensitive
BCC Bird of Conservation Concern

Tribes
T1 Species of interest/concern as identified by tribes.

State State categories per the 1984 California Endangered Species Act
SE Endangered - any species officially listed by the California Fish and Game Commission that is in danger of extinction throughout all or a significant portion of its range.
ST Threatened - any species officially listed by the California Fish and Game Commission that is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range.
CSC California Species of Special Concern.
FP Fully Protected

Birds represent the largest number of sensitive species at the Combat Center. Twenty-eight sensitive species have been observed, primarily near Mainside due to the wet areas created by the golf course, sewage treatment systems, and the evaporation ponds. Sensitive birds have also been observed throughout the training areas.

4.0 NATURAL RESOURCES MANAGEMENT

4.1 Introduction

The Natural Resources Management Program at the Combat Center seeks to address local, regional, and national priorities through the use of management practices and standard operating procedures that directly affect flora, fauna, soil, and limited water. The program integrates landscape, ecosystem, and species-scale perspectives to address DoD requirements from the MCO 5090, such as the conservation of biota, sustaining yields of renewable resources, performing scientific research, education, and supporting various forms of recreation.

Managing environmental considerations requires a broad array of technical expertise, time, and resources. The program description presented here highlights elements of natural resources that are overseen by various levels and entities within the installation, as well as those elements specifically under the purview of the Natural Resources Division of the Conservation Branch in the Environmental Affairs directorate. Elements not directly related to the biological program managed by the Conservation Branch are identified as such in the desecriptions, and varying levels of detail are provided depending on their applicability to the management of soils and biology, and reference information is provided to assist the reader with accessing additional information outside the purview of biological resources, if needed.

The Natural Resources Program adopts management approaches that integrate large-scale planning objectives with specific, distinct projects and actions. The NR Program also elevates certain priorities into standard operating procedures. This Program description is a written summary of the program background and context; Appendix A presents a 5-Year Workplan outlining specific actions, budgets and timeframes.

4.2 Program Description

4.2.1 Goal 1: Strengthen the Combat Center's Operational Capabilities

Activities performed under this goal seek to proactively enable or expand capability of the Combat Center to sustain existing and future training and operations, in alignment with environmental laws and regulations. Specific program elements include:

1.1 Align Natural Resources Management and Mission Statement
1.2 Training Lands Degradation Minimization
1.3 Ensure NEPA Compliance

Element 1.1 – Align natural resources management and mission sustainment

This element recognizes the Natural Resources Program's dual role in supporting the Combat Center's mission and managing the natural resources aboard the installation. While a new addition to the framework, the element ties into concepts from the earlier program.

The objectives listed below identify a structure for identifying current tasks and future initiatives with the explicit aim of reducing environmentally-sourced encroachment on military training and

other operations. Ongoing assessment of program operations against these objectives will assist the Natural Resources Program in maintaining its mission-supporting focus.

Objectives:

1.1.1 - Reduce the regulatory burden on mission implementation;

1.1.2 - Use the Integrated Natural Resources Management Planning process for natural resources management;

1.1.3 - Coordinate installation resources management with training area users;

1.1.4 - Coordinate installation resources management with regional initiatives and management strategies;

1.1.5 - Minimize wildlife conflicts; and

1.1.6 - Adequately staff and support implementation of the Natural Resources Program.

The 5-Year Workplan identifies specific actions that will be taken to fulfill the objectives of this program element.

Wildlife Conflict Minimization *addresses topics such as Pest Management, Animal Control, and Subsidy Management Program and is described in greater detail, below.*

Pest Management – The Integrated Pest Management Plan discusses many aspects of pest management that are not directly within the scope of this INRMP, such as control of disease vectors and protection of facilities. The Integrated Pest Management Plan (Naval Facilities Engineering 2017) is developed by an interdisciplinary team from Environmental Affairs, Public Works Department, the Naval Facilities Hospital (Infectious Disease Branch), Naval Facilities Southwest, and others. The Plan is revised every 5 years and:

- Supports the military mission by protecting the health and welfare of military and dependent personnel,
- Maximizes the service life of structures and other types of real property,
- Reduces reliance on pesticides to solve pest problems, and
- Implement environmental protection measures at every opportunity.

The plan emphasizes Integrated Pest Management and applies to all pesticide use on the Combat Center except pesticide repellents used for personal relief. Environmental Affairs directorate responsibilities to the Integrated Pest Management Plan include:

- Supporting the military mission by protecting the health and welfare of military and dependent personnel,
- Maximizing the service life of structures and other types of real property,
- Reducing the reliance on pesticides to solve pest problems, and
- Implementing environmental protection measures at every opportunity,

- Protecting native wildlife species and their habitats.

Animal Control – All wildlife species are protected at the Combat Center unless specifically targeted for control, with the exception of the European starling, house sparrow, Eurasian collared dove, rock pigeon, household invertebrates, household rodents, and Africanized or European honeybees. Coyotes are only considered pests under very specific circumstances, such as animals habituated to human presence. Feral or free-roaming dogs, coyotes, and Africanized honeybees are considered pests aboard all areas of the Combat Center, and the Combat Center implements measures to control the populations of these species on the entire installation, not just in areas with tortoise value. Ravens are protected under the federal Migratory Bird Treaty Act but in certain areas of Mainside and the Range Training Areas, where their numbers or predatory behaviors are problematic, they are considered pests.

Africanized honeybees (*Apis mellifera scutellata*) are prevalent in San Bernardino County. A terrestrial invertebrates study aboard the Combat Center (Pratt 2005), estimated that greater than 85% of all bees found are Africanized honeybees. Africanized honeybees are much more aggressive than the European honeybee. They become agitated much easier and will stay agitated for a longer period of time. The two types of bees are virtually indistinguishable except through a microscope. Marines are warned to treat all bees as the more dangerous Africanized honeybee variety.

The spread of non-native fire ants (*Solenopsis invicta*) is a concern. Non-native fire ants are slowly spreading northward from Southern California. They are typically found in the vicinity of irrigated areas and are unlikely to pose a significant threat to natural systems in the training areas. At the Combat Center, non-native fire ants are managed largely by military housing.

Feral, free-roaming dogs are a concern throughout the desert and are considered pest species on the Combat Center. Coyotes are also considered a pest species as individual animals can become a nuisance or depredate desert tortoises. Individuals that are found in housing areas or continually staying in populated areas will be dealt with by the Natural Resources staff and the Conservation Law Enforcement Officers on a case-by-case basis. Coyotes in the training areas will be subject to control efforts, as reports have documented signs of decreased inhibition and sometimes aggression towards marines. Under the 2017 Biological Opinion, control of coyotes is required to support the desert tortoise translocation effort. Installation guidance has been developed to guide the execution of controlled depredation efforts for coyotes (see Appendix G) and several events have been implemented to date. Targeted coyote depredation efforts have begun under the leadership of the Conservation Law Enforcement Officers and sometimes use trained volunteers. Coordinated hunting efforts are anticipated in the future as well, once the framework for hunting on base is developed. All hunting and depredation efforts will be located in areas within and around headstart release areas and translocation control and recipient areas.

Ravens and many other species occur throughout the built and natural areas of the installation and their population sizes are artificially inflated by provision of subsidies such as food, water, and shelter. In the built environment, the overabundance of ravens degrades the quality of the Marines work environment, particularly when several hundred roost in a single location on a repeated basis. In natural areas, raven predation is thought to reduce the effectiveness of desert

tortoise conservation measures taken by the installation. To manage these situations, the Combat Center is pursuing a MBTA Depredation Permit that will, if obtained, allow certain staff to implement lethal control measures. See Goal 2, Element 2.6 for more information on invasive species management and Goal 3, Element 3.1 for more information on depredation efforts for both ravens and coyotes in relation to the desert tortoise.

Subsidy Reduction - A subsidy reduction program is maintained by the Combat Center to identify and reduce subsidies made available by the presence of humans but it is impossible for an installation of this size to completely eliminate these opportunities. The effectiveness of the subsidy reduction program monitors the abundance of target species and resources made available to them, and tracks changes in their use of space and other resources over time. Desert tortoise predators such as ravens and coyotes are of primary focus in this program, as they are identified in the 2017 LandEx BO as desert tortoise predators warranting subsidy reductions, and both species pose hazards to the Marines as well as the tortoise.

Under this program, as information about predator species is received, new management recommendations are formulated to address changing or emerging conditions and new practices and technologies for predator management are explored. In this way, the subsidy reduction program uses an adaptive management approach to respond to ever-changing conditions to best manage the Combat Center's influence on these populations. While the program is outlined here, subsidy reduction practices outlined under this plan are not consolidated and are instead integrated into Goals 1 & 3, Objective 1.1.5 – Minimizing Wildlife Conflicts, Objective 3.1.2 - Inventory and Monitor to Identify Threats to Desert Tortoises, and Objective 3.1.4 - Minimize Tortoise Injury and Mortality Aboard the Combat Center. See the 5 Year Workplan under these Objectives for specific tasks identified for this program.

Element 1.2 –Training Lands Degradation Minimization

The majority of land disturbance on the Combat Center is caused by military training. Considering the huge costs and long time periods involved with restoration of disturbed lands, minimization and management of disturbance is the most cost effective technique to manage natural resources at the Combat Center. The Natural Resources Program supports ongoing, flexible military training by meeting the following objectives under this element:

Objectives:

1.2.1 - Minimize damage to training lands, disturbance to natural resources and ensure ongoing coordination with military planners;

1.2.2 - Design roads to benefit both military use and conservation; and

1.2.3 - Prevent damage to sensitive areas.

Disturbance Minimization may be affected by creating new Pre-designated Range Training Support Sites (PRTSS) and by locating new range projects in previously disturbed areas. Master planners at the Combat Center contribute significantly to implementing this objective. NEPA documentation associated with new projects will emphasize the use of already disturbed lands as alternatives to be strongly considered. Planners and Training Lands managers should also

employ the following techniques, which are pertinent to the management of concentrated military use sites:

- Maintain and delineate road access to sites to discourage units from making alternate routes,
- Ensure proper drainage when utilizing sites to return water to natural channels downstream from sites.

Training Lands Restoration - Training lands restoration work to date has primarily emphasized soils stabilization first, and very infrequently, the reestablishment of native plant assemblages. Usually, restoration projects are developed to address specific, small-scale areas of localized disturbance and emphasize reducing compaction and soils losses from wind and water erosion events, and employ soils management techniques such as ripping, pitting, swaling, and the creation of small catchment basins. Practices that actively seek to reestablish native vegetative cover can also assist with meeting these objectives and provide more rapid returns to healthy habitat. Restoration as a component of prudent lands conservation efforts provides many long-term benefits, especially when focused in the upper drainsheds. Hydrological functioning is improved, soil and water are retained on-site benefiting groundwater recharge, subsurface streamflow, native plant reestablishment, and ultimately fulfills the goal of training lands restoration efforts – to maintain a high-quality, realistic training environment and support ecosystem health.

For several reasons, revegetation practices have not historically been used; these include difficulties with attaining meaningful levels of seed germination and seedling establishment, costs of irrigation when used, which include up front system establishment and low success rates once water applications are stopped, and the general observation that native plant cover naturally return to disturbed areas over time. However, ground disturbance is well-documented to facilitate the establishment and spread of non-native, invasive plants such as *Schismus, Brassica tournefortii*, and even *Tamarix ramossisima*, all of which have long-term negative impacts on ecosystem health. For this reason, more attention will be paid to the decision to include revegetation in future projects, especially in areas with higher known densities of desert tortoise and environmentally sensitive areas. The selection of revegetation practices during the planning of training lands restoration projects shall include cost-benefit considerations on a case-by-case basis, prior to their funding, to ensure meaningful value from the action (see Appendix A for details).

The goal of training lands restoration shall also be supported by other types of specific restoration approaches as well as general aspects of the Natural Resources Management Program as outlined in this INRMP. Strategies such as removing jeep trails, minimizing encroachment/off-road travel, reevaluating the movement of roadway alignments to minimize disturbance through sensitive areas and the establishment and use of PRTSS will minimize impacts to soils and opportunities for non-native invasives to establish, further reducing impacts across the landscape.

Roadway Construction and Repair - A major portion of land management involves the construction and maintenance of access roads. The road system in the training areas is

comprised of unpaved Main Supply Routes (MSR) and secondary trails and are poorly marked. MSRs are graded and better maintained to allow for faster travel between training areas. There are also smaller roads, often called jeep trails, to allow movement through the Combat Center. These roads are not well maintained and frequently change. Roads that are washed out are not always repaired and new roads are occasionally created. Roadway maintenance, construction and repair cannot be reasonably restricted to seasonal actions, even in non-emergency situations, as such restrictions have significant potential to limit the implementation of the military mission. However, considerable consideration is given during maintenance and construction events to ensure minimal impacts to the environment.

Road maintenance crews at the Combat Center must be particularly cautious about creating berms along road shoulders. Road berms can channel water and create rutting or washouts. Steep berms are problematic for desert tortoises, particularly juveniles, as they can create physical barriers to movement or cause tortoises to overturn when attempting to climb.

Access Across BLM Lands - The BLM administers much of the lands adjacent to the Combat Center and there are times when it is advantageous for military units to use routes through BLM land to access the installation. This is necessary when transit through training ranges is prohibited due to live-fire training exercises. One training range, America Mine, is only ground accessible through BLM land. Units are required to request clearance from MTD in order to access any part of the installation through BLM land.

Special Use Area Marking - The Combat Center is developing a uniform system of marking Special Use Areas to prevent further disturbance to sensitive areas. Desert tortoise awareness signs are posted at entry points to training areas and off-limits signs are located along MSRs adjacent to off-limits areas. Information concerning a uniform marking system will be incorporated into mission awareness training.

Special Interest Area Protection - Designation of special protection status for unique or fragile areas is an important management tool. It is more cost effective to put use restrictions on areas to minimize disturbance than to mitigate damage. These areas are not considered off-limits to training; they are only being recognized as having unique features that warrant extra consideration in the planning process. Special interest areas include locations such as flood plains, lava tubes and mines, and wet areas. As part of the NEPA process, EA reviews proposed projects and activities at the Combat Center. Natural resources managers can identify concerns and recommend measures to minimize disturbance.

Element 1.3 - Ensure NEPA Compliance aboard the Installation

The NEPA of 1969 mandates Federal agencies use a systematic, interdisciplinary approach which applies natural sciences, social sciences, and environmental design arts in project planning and decision-making processes to protect, restore, or enhance the environment. Combat Center Order 5090.4F regulates NEPA compliance at the Combat Center. The Commanding General, through the Head of EA, is responsible for implementation of a NEPA program. The Combat Center maintains NEPA compliance through the Environmental Impact Review Board (EIRB). The Chief of Staff is the Chairman of the Board. The AC/S G-4 serves as a Member, and the Head of EA serves as the Executive Agent. The Head of PWD, AC/S MTD, and a legal

representative participate as standing members. The Combat Center Environmental Impact Working Group is a subcommittee of the Installation EIRB and assists in the passing of information from the Project Proponent to EA. This working group has representatives from units as well as appropriate technical experts. The Natural Resources Program has two NEPA-related objectives to ensure compliance aboard the installation:

Objectives:

1.3.1 - Use an established, NEPA project review process to identify projects and activities on the Combat Center that might impact natural resources and work with project planners to resolve issues early in the planning process;

1.3.2 - Maintain and acquire any necessary environmental reviews, permits and other legal authorizations to operate the Natural Resources Program

The Combat Center NEPA Project Review Process

The NEPA review process is initiated when a project proponent creates a project file in the automated, online system (NEPA PAMS) and submits the file as a Request for an Environmental Impact Review (REIR) to the NEPA Program Manager. The project REIR is then routed via the electronic system through Environmental Affairs to subject matter experts who review the project file to determine information gaps, potential impacts, issue resolutions, permits or approvals requirements, and recommend modifications to the proposed action if necessary.

If all subject matter experts determine a project's actions will not have significant effects and do not require an Environmental Assessment or Environmental Impact Statement, the project is found to be Categorically Excluded (CATEX). The Marine Corps uses the Department of the Navy's list of 45 CATEX's to identify the types of exemption(s) such action(s) may fall under, and a Decision Memorandum document is prepared which summarizes pertinent project details and CATEX determinations. CATEXs most commonly used at the Combat Center apply to actions such as studies, data, and information-gathering that involve no physical change to the environment, routine repair and maintenance of facilities in order to maintain existing operations, and new construction that is consistent with existing land use. If a proposed project includes the following "Extraordinary Circumstances," a CATEX may not be issued:

- Adversely affects public health or safety;
- Has the potential for significant environmental effects on wetlands, threatened or endangered species, historic or cultural resources;
- Involves effects that are highly uncertain, involve unknown risks;
- Establishes precedents or makes decision for future actions with significant effects; or
- Threatens to violate Federal, state, or local laws or requirements imposed for the protection of the environment.

An Environmental Assessment is completed when screening criteria for a categorical exclusion are not met. Examples include a new military exercise, construction of a new range, actions involving wide geographic areas, projects that may affect wet areas or other sensitive plant

communities, threatened or endangered species or cultural resources. EAs require Commanding General approval, and if appropriate, a Finding of No Significant Impact (FONSI) is signed and issued.

If the environmental assessment process determines that a FONSI is not appropriate, the project may be modified to remove significant impacts. The environmental assessment process may then be repeated, and if modifications or mitigation are sufficient to remove significant impacts, a FONSI may be issued. If these options fail, the action may be dropped, or a more detailed Environmental Impact Statement may be prepared. An Environmental Impact Statement is prepared for those actions that will have a significant effect on the quality of the human environment. Once the Environmental Impact Statement is prepared and a Record of Decision issued, the Marine Corps may proceed with the project.

Mitigation actions are specific activities that minimize or avoid impacts on the resources that would be negatively affected by the proposed project. Below are five general mitigation tactics as defined by Council of Environmental Quality (CEQ) regulations:

- Avoid the impact altogether by not taking a certain action or parts of an action;
- Minimize impacts by limiting the degree or magnitude of the action and its implementation;
- Rectify the impact by repairing, rehabilitating, or restoring the affected environment;
- Reduce or eliminate the impact over time by preservation and maintenance operations during the life of the action;
- Compensate for the impact by replacing or providing substitute resources or environments.

EA uses the afore described NEPA review process to ensure the Combat Center's natural resources activities are properly planned, coordinated, and documented. It also uses the NEPA review process to identify aspects of other organizations projects that have the potential to affect the installations natural resources. Thus, EA is both a proponent and a responsible agent for compliance with NEPA.

Existing NEPA Analyses

The Combat Center has completed NEPA analyses for several projects. The analyses for these projects are incorporated into this document through their Natural Resources Program references, which are listed below. Actions authorized under these analyses that are also identified in our programs will not require further analysis in the Environmental Assessment for the 2018 - 2022 Combat Center INRMP.

- 2003 Environmental Assessment and associated 2002 BO: Addresses environmental effects resulting from basewide training operations, preparation of training lands, and maintenance and construction activities.
- 2012 Environmental Impact Statement and associated BO: Addresses the expansion of the Combat Center to include specific military training operations and preparation of military training lands, within pre and post expansion acreages.

- 2017 Supplemental Environmental Impact Statement and associated 2017 BO: Addresses implementation of the desert tortoise translocation, as required under the 2012 EIS.
- 2018 Ongoing Training Environmental Assessment: Addresses environmental effects resulting from rotary wing and tilt-wing landing operations in the pre-expansion lands.

Existing Environmental Reviews, Permits and Other Legal Authorizations

The Conservation Branch of Environmental Affairs maintains several permits and other legal authorizations specific to federally protected species that are necessary to maintain installation compliance with environmental law. These authorizations include two Biological Opinions and two Section 10 permits for Desert Tortoise, and a Migratory Bird Treaty Act handling permit. Compliance with these authorizations is reviewed in more detail under Goal 3 of this section.

4.2.2 Goal 2: Support Natural Systems on the Landscape

This Goal ensures natural resources management provides good stewardship of the public lands entrusted to the U.S. Marine Corps for military training. Landscape level planning and adaptive ecosystem management strategies are employed to conserve the biodiversity of native flora and fauna. Ongoing monitoring and management of vegetation and wildlife considers all associated biological communities, ecosystem processes and human values. Areas on DoD installations that contain natural resources (ecological, scenic, recreational, or educational) that warrant special conservation efforts may be designated as special natural areas, where such conservation is consistent with the military mission. Natural resources managers contribute expertise and otherwise coordinate with other Combat Center divisions and directorates to improve how operations indirectly influence natural resources considerations. Coordination with outside agencies, regional ecosystem initiatives and planning efforts improves the effectiveness of the Natural Resources Program. On a project-by-project basis, management efforts will steer projects and tasks towards science-based efforts as much as practicable/feasible, such that in time, "routine" efforts resulting from the management and monitoring of ecosystems will also further general knowledge of desert systems. Program Elements under this goal include:

2.1 Coordinated Ecosystem Management;
2.2 Landscape Level Planning;
2.3 Habitat Management;
2.4 Wildlife Management;
2.5 Wet Areas Management;
2.6 Climate Change;
2.7 Invasive Species Management;
2.8 Wildfire Management;
2.9 Mainside Grounds Management Support

Element 2.1 Coordinated Ecosystem Management

Numerous regional land use or planning initiatives potentially influence natural resources management at the Combat Center, and many regional constraints and opportunities are shared between differing interests. Coordination with outside interests provides a significant opportunity to share information, identify early issues and upcoming priorities, and ensure

natural resources management strategies are appropriately crafted to best address issues of regional significance.

Objective:
2.1.1 - Develop management strategies and projects that provide local as well as regional benefits.

Element 2.2 - Landscape Level Planning

The Conservation Branch of Environmental Affairs is refining a landscape level planning approach, currently employed informally, to best identify how landscape level planning will be executed under the Natural Resources Program to best conserve the long-term sustainability and biodiversity at various relevant ecological scales. The approaches developed will be science-based and work to identify, maintain and restore the composition, structure and function of natural communities that comprise ecosystems. The approach will consider how and what effects installation programs have, on both spatial and temporal ecological scales, and identify options to develop sustainable human activities that best coexist with the dynamic landscape and mission needs. Effective management requires regional partners sharing, and working together towards, a vision of future ecosystem health. This standard is already emphasized during project development for the Natural Resources Program, and during the NEPA review process for installation projects. The best science and data available must be used to develop planning priorities, identify potential conflicts, and develop "SMART" goals (strategic, measurable, attainable, realistic, time bound). Once implemented, landscape-level planning projects will be monitored and results will inform the need for and direction of additional management actions.

Objectives:
2.2.1 – Use landscape level planning to alter limiting factors and promote priority endemic species;

2.2.2 – Manage for climate change by ensuring suitable habitat exists for species, including habitat connectivity across and beyond the base boundaries as appropriate, and is maintained under an altered climate regime.

Climate Change significantly influences the course and magnitude of environmental trends on the landscape and is therefore a priority in landscape-level planning. The Conservation Branch seeks to quantify risks associated with changing climate and determine whether species will persist under more extreme future climate regimes. Modeling is being used to examine the persistence of indicator species, and results indicate climate refugia exist for the desert tortoise. Examining whether such refugia exist for other prominent or keystone species is a prime objective of this INRMP.

Habitat modeling is a critical, efficient first step towards conservation planning for climate change aboard the installation. By nature, models capture and express abstractions of environmental patterns, and via ongoing monitoring at prudent intervals, will be used to establish baseline trend data to iteratively refine projections and improve robustness and utility. These data and models will inform the development of science-based, land management practices to

best conserve flora, fauna, and natural communities. Science-based management practices provide capacity to evaluate effectiveness of the practice, and facilitate the adaptive management process.

Element 2.3 Habitat Management

The Natural and Cultural Resources Branch of Environmental Affairs provides ongoing monitoring and adaptive management to sustain habitat at the Combat Center. A habitat is the assemblage of biotic and abiotic elements in which a particular individual or population of plant, animal, or other organism lives. Habitat contains a network of abiotic and biotic elements that cycle nutrients within and among species and trophic levels. Given localized natural and anthropogenic factors, the quality of habitats may vary spatially and temporally. Approaches to habitat monitoring and management will be reevaluated over time to ensure an organized, landscape approach to identify and track trends in health across a range of landscapes and natural communities. Monitoring will establish baseline conditions and evaluate trends for habitats and, on a case by case basis, grow to include measuring stressors and drivers, and identify and monitor indicator species.
Specific objectives of the monitoring program include:

Objectives:

2.3.1 – Survey and monitor habitat to assess trends in quality over time;

2.3.2 – Monitor training related changes to vegetation;

2.3.3 – Maintain and modify existing habitat as necessary to support healthy floral and faunal population sizes, and overall diversity.

The following strategies will be flushed out, scheduled, and implemented to develop a more formalized monitoring schedule, to ensure consistency with the above objectives:

- The types of habitats across the installation will be mapped and ground-truthed. Monitoring will include GIS analyses to assess the relationships between landforms, vegetative assemblages, and sensitive species. Monitoring will verify presence (via field-truthing) and assess condition of representative areas of habitat types, in areas of different disturbance levels. We will build a geodatabase to document and analyze these habitat areas and establish long-term monitoring plots. Rare and unique habitat types, such as mesquite dune systems, will be emphasized.

- Vegetation alliances will be monitored every 5 to 10 years to capture changes across natural communities. Vegetation monitoring will follow the installations standardized protocol, which incorporates the state's VegCAMP mapping standards. Particularly invasive plants will be included in the mapping.

- Integrated Monitoring of Habitat will closely examine relationships between select elements of particular habitats that are critical to sustaining sensitive or listed species across the habitats of the Combat Center. First, species-habitat associations will be measured. Monitoring will then identify key components (drivers and stressors) of these habitats, collecting baseline data on these components, as well as the vegetation,

water, and soils. Since habitats drastically change due to different disturbances, monitoring frequencies will be developed on a system-by-system basis, and will compare and contrast areas with high and low anthropogenic influences.

Habitat management and monitoring will be integrated, adaptive and science-based. Monitoring findings that indicate downward or undesired trajectories for habitat quality (extent, diversity, functioning, etc...) will be used to help identify underlying causes. Thresholds activating responses will be formalized based on site-specific considerations and include associating declines in habitat with declines in resident species of interest. We will use existing thresholds (e.g., minimally viable densities, USFWS 2011) or, with the scientific and regulatory communities, develop new thresholds to manage these resources, and will use the most up to date population viability information available from USFWS. Management actions will target the causes of these declines and will be applied and evaluated in areas of need, as time and budget allow. In a hypothetical situation, if an invasive such as Sahara mustard encroaches on a sensitive or otherwise high-value dune system to the extent that loose sand is becoming stabilized and sand-dependent species were decreasing in abundance, then management may contain or exclude the weed from a particular area, map the desired boundary/area to be protected, and deploy techniques such as hand pulling and early application of pesticides to slow the spread of the target plant. Over the next few years, we will use mapping and ground trothing to quantify the management effectiveness and inform future management plans and efforts.

Element 2.4 – Wildlife Management

Successful ecosystem management requires all native species be maintained in areas that support them. The Combat Center is taking appropriate steps via the processes outlined in this INRMP, informed by numerous studies and reports, to ensure that overall biodiversity is not compromised at the installation. In accordance with mission needs, the Combat Center shall maintain wildlife populations through targeted, adaptive management strategies that take into account species priorities, population ecology, population health considerations, and carrying capacities. Approaches to habitat monitoring and management will be reevaluated over time to ensure an organized, landscape approach to identify and track trends in health across a range of landscapes and natural communities. Objectives of wildlife management actions are presented below:

Objectives:

2.4.1 - Perform general wildlife inventories and monitoring to support self-sustaining populations while maintaining training lands;

2.4.2 - Ensure state-listed species are considered in the Combat Center actions;

2.4.3 - Provide other general, or otherwise miscellaneous, wildlife management support services;

2.4.4 - Restore and rehabilitate training lands when feasible.

Wildlife management and monitoring will be structured similarly to habitat management and monitoring, and will be integrated, adaptive and science-based. Monitoring results will inform managers about the state of various species, communities and landscapes, and help develop

management actions to retain and bolster critical species and installation biodiversity. Faunal monitoring and management actions taken to ensure consistency with the above objectives will encompass the following strategies:

1) Tracking the abundance of listed and sensitive species in known habitat: Significant species, as determined by their sensitivity or value to listed species, will be selected to represent the different landforms and ecosystems present at the Combat Center. Monitoring will prioritize assessing abundance of these species in areas of different disturbance levels, as practicable. Measurements should also include their habitat requirements including forage, shelter, and water resources, and stressors such as invasives and habitat disturbance. After documenting baselines, trends should be measured, from which we will estimate magnitudes of influence from the different drivers and stressors.

2) Exploring presence/absence of sensitive and listed species in potential habitat: Monitoring will also inventory and field truth areas of potential habitat for listed and sensitive species and determine occupancy.

3) Measuring species richness and biodiversity changes across the installation: General wildlife inventories and vegetation mapping will be performed on broader time scales (every 5-10 years) to track ecosystem health over time.

As with the adaptive management approach outlined in the floral management section, monitoring and management will be integrated and science-based as much as is feasible. Negative data for target species (such as declines in population size or numbers of populations, changes/declines in behavior, etc.) will be used to develop and implement management strategies. Management actions that address the likely causes of these declines will be developed, applied, and evaluated as time and budget allow. Findings from the management efforts will inform management decisions. For instance, desert bighorn sheep range across the installation seasonally in low numbers. While forage and other habitat elements are available, surface water is scarce, especially during high-heat months. By providing more stable, year-round water sources, we can reduce their water stress and sustain them for longer periods in areas of otherwise suitable habitat. In this way, management has determined placement of surface water resources can support the recruitment and retention of a single target species on the landscape.

The Marine Corps understands the importance of sensitive species to the health of any ecosystem and will take State-listed species into consideration when developing management strategies per USC 1535 and 16 USC 1540. Establishing management strategies for sensitive species can contribute to a reduction in their decline and may preclude listing under the Federal Endangered Species Act. Most species management on the Combat Center is directed towards the federally-listed desert tortoise, primarily due to compliance requirements. Conservation measures for this species, however, may also benefit many other species of wildlife such as the burrowing owl, Mojave fringed-toed lizard and the common chuckwalla.

Desert Bighorn Sheep - The experimental bighorn sheep population introduced in 1991 is now believed to be stable. To support the introduction of the experimental population, CDFW and

the Society for the Conservation of Bighorn Sheep constructed guzzlers in the Bullion Mountains in 1991 and 1999. These guzzlers are beneficial to other wildlife species and remote sensing has documented use by coyotes, foxes, bobcat, avian species and bighorn sheep. To date a total of 8 drinker devices (guzzler) have been established on the landscape and are annually visited and maintained. Maintenance efforts include checking system functionality, water levels, levels of use and wear and tear, and direct impacts to local fauna including the desert tortoise. Water basins and the surrounding areas are examined closely for signs of desert tortoise presence and potential mortality in the low-entrance water basins. To date, none of these checks has documented a desert tortoise mortality, in or near to the guzzler fixture.

Desert bighorn guzzlers are also monitored continuously with wildlife cameras installed by the installation, and photographic data has clearly documented increases in the number of bighorn users over time with more frequent use of the systems across certain seasons. Several of the guzzlers now experience year-round occupancy by desert bighorn, as well. However, population surveys conducted in 1997 and again in FY16 do not reflect an increase in the number of head aboard the Combat Center. This is likely due to the fact that the 2016 survey employed an unconventional and high-risk transect survey method in which a helicopter was flown in linear grids across mountainous topography. In this survey, so few observations were made that a statistical value of detectability could not be calculated. While it is possible that the survey results accurately reflected low numbers/presence, existing photographic monitoring data, levels of sheep sign, and the known occurrence of individuals in the southern half of the installation draws the quality of the dataset and unconventional survey methodology into question. The desert bighorn survey will be performed again sometime during the latter half of this INRMP period using a different methodology.

Bats - are an important component of the desert ecosystem as they fill a crucial niche in both plant pollination and invertebrate pest control. Surveys conducted in 1996-1997 and 2011-2012 confirmed the presence of six species of bats and an additional six species were listed as suspected or possibly occurring on the Combat Center. Of these twelve known or suspected species, six warrant special consideration as BLM and/or CDFW Species of Special Concern or former Federal ESA candidate species. Habitat loss is a major contributor to the decline of bat species. The Combat Center has installed four bat gates in three mines in recent years to allow bats access to roosts without disturbance from humans. Additionally, Brown and Berry (1998) recommended evaluation of modifying the bighorn sheep guzzlers for use by bats. Any modifications would not allow for entrapment of tortoises or other terrestrial animals.

Element 2.5 - Wet Areas Management

The Combat Center's Waters of the United States study (U.S. Army Corps of Engineers 1994) identified four types of wet areas of special concern: playa lakes, dry washes, seeps and springs, and man-made water bodies. No waters of the U.S. were identified aboard the Combat Center.

All dry lakes, substantial dry washes, seeps, springs, and man-made impoundments aboard the Combat Center are important to biodiversity. Plant and animal biological diversity is most related to availability of water, though in almost all cases this water is ephemeral.

Objective:

2.5.1 - Manage wet areas to protect their ecosystem functionality

Playas maintain intra/inter ecosystem integrity and were settings for prehistoric cultural activities. When filled with water, playas support complex invertebrate communities and attract significant numbers of wintering waterfowl. When dry, they are often populated with terrestrial birds and mammals when adequate vegetative cover exists (Krzysik and Trumbull 1996). The aquatic invertebrates survey completed in 2007 found fairy shrimp, tadpole shrimp, and clam shrimp in the different playas on the Combat Center. None of these species are listed or considered sensitive. The U.S. Army Corps of Engineers has identified a total of 14 important playas either entirely or partially within the Combat Center boundary. Eleven of these are within the legacy base boundary and include Lavic Lake, Galway Lake, Emerson Lake, Little Emerson Lake, Ames Dry Lake, Quackenbush Lake, Miller Dry Lake, South Miller Dry Lake, Deadman Lake, Dry Lake (Lead Mountain) and Mesquite Lake. Four are within the EMUA West, including Galway Lake, Melville Lake, Means Lake and Soggy Lake. There are no playas in EMUA South and Galway Lake is within the traditional boundary and EMUA West.

The two major impacts that occur to playas in the Combat Center result from vehicular use and bombing. Driving has created compacted and rutted surfaces; Emerson, Deadman, and Lavic Lakes each have more than four miles of roads. The fourteen playas together have about 17 miles of roads.

Since a 1994 Army Corps of Engineers report, the berm on Mesquite Lake along the Combat Center boundary and the berm along the western boundary of Emerson Lake have been breached in several places to restore more natural water flows. Storm water retention ponds have been constructed above Mesquite Lake to protect it from Mainside runoff. The Combat Center identified a limited number of authorized crossing sites on Deadman Lake, a heavily used lakebed. Signs have been placed to identify these crossings and close others. Crossings are maintained to encourage vehicles to use the routes and not create new ones.

Dry washes serve as sediment transport corridors, maintain intra/inter ecosystem integrity, and are rich with historical and cultural resources (U.S. Army of Corps Engineers 1994). Dry washes are zones of high animal activity, most notably insects, which attract many birds and mammals. These washes also act as travel corridors for many desert wildlife species.

Most of the military impact to dry washes is from vehicular use as most washes are also locations for the MSRs. In 1994 there were approximately 76 miles of desert wash roads on the installation (U.S. Army Corps of Engineers 1994).

Seeps and springs are, when discharging, valuable sources of water for wildlife. Most seeps and springs are located in mountainous terrain and are generally inaccessible; therefore, they are not affected by military activities. There are only a few identified surface discharging seeps or springs on the installation. When standing or flowing water is available, these seasonal seeps are a valuable biological resource for wildlife.

Man-made bodies of water at the Combat Center include stormwater and wastewater ponds located in the “Mainside” cantonment area and stormwater ponds in Camp Wilson. These

surface waters provide important resources to both migratory and resident wildlife species, particularly birds. There are no man-made bodies of water located in the training areas to be impacted by military training. Man-made waters are not regulated under section 404 of the California Water Authority (CWA).

Wet area inventory and floodplain delineation are not critical for natural resources management aboard the Combat Center as they are few in number, with the possible exception of small seeps or intermittent springs. A 100-year floodplain report was completed for Deadman and Mesquite playa lakes in 1997. There is no need for additional floodplain delineations at this time.

Element 2.6 - Invasive Species Management

Invasive species may be generally defined as those life forms that are not native to a particular area, their transit was assisted by humans at some point in recent history, and their presence currently generates harm to the environment, economy and/or human health. Under this definition, non-natives differ from invasives in that non-natives may find habitat niches and coexist within an ecosystem without harmful detriment, whereas an invasive species may not have a "check-and-balance" within the introduced system and typically proliferates uncontrolled or with very little resistance to population growth, upsetting ecological balances with results ranging from reduced biodiversity, degraded habitat, altered native genetic diversity, reduced ecosystem functioning and services, and heightened disease transmission (of exotics and native diseases, to any/all life forms naturally present within the system, to include humans). The types of species that may be classified as invasive can be broad, unpredictable, and generally include plants, animals, bacteria, fungi, and even other life forms. The emphasis of the Combat Center's Natural Resources Program will be on plant and animal species of concern, however attention will be given on a case-by-case basis should other life forms of concern be found (such as pathological fungi known to infect bats and reptiles, or invasive beetles known to infect mesquites).

The invasive species management program seeks to understand the impacts from invasive species, primarily plant and animal, on natural processes through monitoring, investigative research, and data analysis, so that data may inform exotic species management decisions. For instance, some studies have documented that invasive species can also provide benefits within an ecosystem, as shown in nutritional studies of *Schismus* on desert tortoises (Nagy *et al.*1998 and Drake *et al*. 2016), an area where research results are, varied, incomplete, and warrant additional attention. In some cases, the management of invasive species also has the potential to overlap with those priorities identified under the integrated pest management and animal control aspects of wildlife management, as discussed in Element 1.2. In these instances, species of concern are expected to exhibit particular influence on the desert tortoise or the well-being of the Marine community and may involve overabundance of native species of interest, and on a case-by-case basis will be handled outside of this Natural Resources Program Element.

Objective:

2.6.1 - Prevent, contain and slow the spread of invasive species aboard the Combat Center to conserve and enhance native species and functionality of natural systems.

The *Preliminary Survey of Nonnative Plant Species at Marine Corps Air Ground Combat Center* (Anteon 2001) lists eight observed invasive species aboard the Combat Center. The study *Invasive Nonnative Plant Survey* (Agri-Chemical and Supply, Inc. 2005), which was concentrated along the western boundary, observed nine invasive species. EA is actively managing for three of the species.

The removal of *Tamarix spp*. (*T. aphylla and T. ramosissima*), or saltcedar, is an ongoing land restoration action. *Tamarix ramossisima* is listed as a noxious weed by the California Department of Agriculture and has been assigned a high ranking from California Invasive Plant Council; this species of tamarisk is being actively targeted for removal when found. Trees have been removed from Mainside and in the training areas, most notably Lead Mountain. More than 50,000 plants have been removed since 1996. *T. aphylla* is not listed by CDFA as a weed of concern, and is ranked as "limited concern" by the California Invasive Plant Council. This tamarisk species is primarily found at Mainside, where it is cultivated as windbreaks or has become established in a select few natural areas with shallow water tables. It is thought that seed production at this latitude is poor, which reduces successful establishment in natural lands. A project to remove a *T. aphylla* windbreak was supported by the Combat Center until, in the late planning stages project costs rose above $800,000 and became exorbitant. Management for *T. aphylla* shall focus on excluding the species from high-value natural areas with adequate habitat (shallow water tables).

Russian thistle (*Salsola spp.*) is an invasive plant species that is being targeted for removal in certain areas of infestation. Complete eradication is not a reasonable goal; management efforts will focus on containment.

The nonnative grass Mediterranean grass (*Schismus barbatus*) is pervasive across the Combat Center. The plant material burns well and when present, significantly increases the risk of wildfire. The pervasiveness of this species limits planning and control options.

Element 2.7 - Wildfire Management

Historically, fire is not common in the Mojave Desert and most plants native to these ecosystems are not fire-adapted. Increased soil disturbance and the spread of nonnative grasses have resulted in increased fire frequency and fire size. In undisturbed Mojave Desert systems, limited precipitation supports "islands" of plant life separated by gaps and bare soil, which effectively served as fire breaks, limiting the ability of plant materials to carry and spread flames across a landscape. In the past few hundred years, western expansion has increased use of desert lands, resulting in significant increases in anthropogenic disturbances as well as the introduction of an array of non-native grasses that thrive in the desert climate. These grasses burn well and can grow thickly between the natural vegetation in non-drought years, increasing vegetative cover and the distance that a fire may spread. Today, wildfire is a threat to ecosystem function and biodiversity in the Mojave Desert, mostly because the resident species are not resistant or resilient to the effects of fire. The Combat Center is monitoring for nonnative annuals and grasses and has begun tracking increases in fire-related species such as Mediterranean grass (*Schismus barbatus*).

Control efforts are available. Nonnative annuals and grasses benefit from and are spread by disturbance events. Seeds may be spread from vehicles, boots and clothes into new areas. Disturbed areas with reduced native vegetative cover provide less competition for nonnative seedling establishment. Disturbance minimization is a priority. Containment and early eradication are also critical efforts to controlling potential fuels. Potential causes of fires should also be addressed. The military use of pyrotechnics increases the probability of wildfires starting in some areas of the Combat Center where nonnative annual grasses proliferate.

The issue of wildfire control has legal implications involving federally-listed species, such as the desert tortoise (Duck *et al.* 1997). There is currently no observable need for wildfire prevention (*e.g.*, firebreak construction and maintenance) activities. However, should a high rainfall year occur, it's possible that a resultant wildfire would require active suppression (*e.g.*, equipment and personnel moving across open desert, firebreak construction, and back-burning operations) which would involve "take" risks. In addition, wildfire suppression creates other negative impacts on ecosystem functionality, such as soil compaction, vegetation destruction, and the creation of trails that can lead to increased long-term human impacts.

Objective:

2.7.1 - Implement the Wildfire Management Plan for the Combat Center

Wildfire Management Plans are required for installations by U.S. Marine Corps policy, and the Natural and Cultural Resources Branch, along with the Combat Center Fire Department, are currently revising the existing plan to ensure awareness and oversight of wildfire potential and develop appropriate monitoring and oversight responses to ensure the maintenance of ecosystem biodiversity and functionality. Wildfire management planning is an important step in responding to a potentially increasing risk for the Combat Center ecosystem, and there may be value-added components to enhance military training.

Element 2.8 - Mainside Grounds Management Support

The Mainside area occupies approximately 8.2 square miles of the 1,102 total square miles of the Combat Center. The improved and/or landscaped areas of the Combat Center are completely within Mainside. There are various types of landscaping found at Mainside, from formalized xeriscaping conducted by professional landscape companies to informal plantings done by Marine units around their buildings. Residents in base housing also have different degrees of landscaping in place around their homes. Mainside landscapes consists of a variety of trees, shrubs, and ground covers that require routine maintenance efforts, such as mowing, weeding, pruning, fertilizing, pest control, and irrigation.

Objective:

2.8.1 - Ensure that Mainside landscaping and grounds maintenance are integrated and consistent with natural resources goals and objectives

Landscaping - Desert landscaping presents a unique opportunity for plant and irrigation selection to maximize water conservation, limit energy use, and improve the visual landscape for the Marine Corps community. Xeriscaping emphasizes the use of drought tolerant and desert adapted species in landscaping; the Natural Resources Program requires all new buildings

incorporate xeriscaping principles during the regular maintenance of existing landscaping and in the planning of new landscape features. Since 2005, the Headquarters building, Battalions office buildings, chow halls, and bachelor enlisted quarters have all been re-landscaped. Irrigation systems prioritize using two types of water, non-potable water and recycled wastewater. The golf course is the only user of recycled wastewater, and most of the other landscaping is irrigated with nonpotable water. The Combat Center is continuing to develop a distribution system for non-potable water, however non-potable water cannot be used in some situations such as residential lawns or playgrounds because the quality is too poor. Water conservation efforts are also overseen by Environmental Affairs in conjunction with PWD, and irrigation system evaluations can be performed by the Public Works Department to evaluate efficiencies and improve usage. Microirrigation is encouraged when appropriate.

Element 2.9 - Soils Monitoring and Management

The Combat Center completed an installation-wide soils inventory in 1999 (Lato *et al.* 1999) and does not need to redo this product for some time. Natural Resources Management efforts are not typically defined around soils considerations and there is no focused management program for soils at the installation or Conservation Branch level. However, soil parameters are included with other considerations while managing military activities, protecting stability, conserving wildlife habitat, and restoring training lands when/if feasible. Site-specific soil testing is also performed for natural resources management activities such as training land rehabilitation and erosion control, and soils inventory data are used to make decisions regarding land use and wildlife habitat management options. No program-level objectives are defined for soils monitoring and management at this time.

Element 2.10 - Air Quality

In California, air pollutant emissions are regulated at the federal, state, and local levels. Federal and state requirements are the responsibility of the Environmental Protection Agency (EPA) and the California Air Resources Board (CARB), respectively, and local requirements are implemented through the Mojave Desert Air Quality Management District's (MDAQMD) Rules and Regulations. MDAQMD requirements are based primarily on federal and state attainment directives and ensure compliance with state and national standards. Any equipment, operation, or process that has the potential to emit (PTE) air contaminants to the environment or that controls air contaminants is required to have an MDAQMD Permit to Operate (PTO), unless specifically exempted under MDAQMD Rule 219.

The Pollution Prevention Section of Environmental Affairs oversees Air Quality Management, thus specific objectives and projects for air quality are not presented in this Chapter or in the 5 Year Workplan. There are two air quality monitoring stations aboard the legacy base; the Mainside and Sandhill stations. These characterize air quality trends and help differentiate between pollutant loads moving onto the installation from external sites (largely resulting from disturbance occurring on neighboring lands), and loading resulting from internal, mission-related activities. The Pollution Prevention Section monitors these data and prioritizes any necessary corrective actions. MDAQMD recognizes the region for non-attainment of several pollutants, one of which is PM_{10} (suspended particles of diameters 10 microns or less in size), and are largely associated with dust levels. Generation of PM_{10} at the Combat Center is largely associated with activities that fall under the purview of the Conservation Branch of

Environmental Affairs, and management strategies are outlined in Combat Center Order 5090.4F and below, including:

- Maintaining, managing and restricting vehicle use to unpaved roadways (to minimize width proliferation, off-road vehicular travel, and minimize environmental disturbance);
- Avoiding desert playa lakebeds (which are composed of high levels of fine soil particulates and are sensitive ecological resources); and
- Maintaining the 20-mph speed limit (which reduces dust proliferation and improves sighting and response time for desert tortoises on roadways).

Element 2.11 - Water Resources

The Combat Center has a Stormwater Pollution Prevention Plan and a Groundwater Resources Management Plan which guide and ensure compliance for the management of these resources. Drinking water aquifers such as Mesquite basin offer mostly salt water, whereas the high-quality Surprise Springs basin offers potable water reserves which are the only drinking water source for the installation. This aquifer does not experience natural recharge and stored water is 20,000-years-old. A Water Conservation Study (Beck 2004) reviewed the installations water sources, future water demand and conservation measures. This plan addresses the bases future water needs and options, and includes methods to minimize water use. Most of the Combat Center's water resources management programs are not within the scope of the Natural Resources Program and thus are not pertinent to this INRMP. During 2018-2022, the Combat Center will continue to conserve and protect from pollution known water sources and seek new sources of water. Combat Center Order CCB 5090, the Combat Center Drought Response Policy, includes measures to be taken by Marines and other forces training on the Combat Center to conserve and protect water resources. For more information and references supporting other various aspects of water resources management, see INRMP sections 2.8.2, 3.2, and Chapter 4 Goal 2 Element 2.5.

4.2.3 Goal 3: Manage Federally Protected Species

The Marine Corps is committed to the protection of federally listed species found aboard the Combat Center and will ensure installation compliance with all applicable laws, particularly the Sikes Act upon which this INRMP is predicated but also the Endangered Species Act, Migratory Bird Treaty Act, Bald and Golden Eagle Act of 1940, Executive Order 13186, DoD Directive 4715.03, Marine Corps Order P5090.2A, USFWS regulations and agreements and other applicable laws and guidance from headquarters. Activities performed under this Goal shall protect listed species from harm and work to support recovery, as feasible, while ensuring the least disturbance possible to the military mission. Elements of this program Goal include:

3.1 Desert Tortoise Management;
3.2 Other Sensitive Species Management

Element 3.1 - Desert Tortoise Management

The desert tortoise is the only federally-listed species resident aboard the Combat Center. The Desert Tortoise Management Element of the Natural Resources Program strives to both protect and improve desert tortoise habitat, and increase tortoise population growth using research, habitat management, awareness, and other methods. This INRMP includes a variety of actions that are specifically intended to benefit the recovery of the species, and which align with the

USFWS Recovery Plan for the Desert Tortoise. Please see relevant sections of the 5 Year Workplan for details.

Objectives:

3.1.1 - Inventory and regularly monitor desert tortoise using standardized protocols to improve the understanding of long-term population trends aboard the Combat Center;

3.1.2 - Inventory and monitor to identify threats to desert tortoise;

3.1.3 – Perform health assessments to further the Combat Center's knowledge of desert tortoise health aboard the installation;

3.1.4 - Minimize tortoise injury and mortality aboard the Combat Center;

3.1.5 - Operate TRACRS to contribute to the recovery and eventual delisting of the desert tortoise;

3.1.6 - Implement the following required provisions from the Biological Opinions for Desert Tortoise: General Conservation Measures, Reasonable and Prudent Measures, Terms and Conditions, Conservation Recommendations; and required provisions from the 2017 SEIS.

3.1.7 - Improve desert tortoise population numbers aboard the installation and support recovery of the population aboard the installation and in adjacent recovery unit and apply appropriate land-use restrictions to high-density tortoise population areas aboard the installation that balance training and natural and fiscal resource requirements.

Effects of the Combat Center Activities on the Desert Tortoise

Various types of military activities occur on the Combat Center and not all types occur equally across the landscape. Facility development at Mainside, air operations, fixed range use, and small arms operations are not likely to have significant effects on tortoise populations. Large munitions impacts (*e.g.,* aerial bombs, artillery, tank, and mortar rounds) have little direct impact on populations. Direct mortality and injury from on-the-ground military training and maintenance activities are likely, but expected to be rare. Operations in undisturbed tortoise habitat areas may have the most significant effects on populations through habitat degradation, though not necessarily mortality. The most significant contributor to tortoise mortality will most likely be off-road travel, which can crush either tortoises or burrows. This type of impact is a concern in all tortoise habitat areas, not just on the Combat Center. The Combat Center has created flow down charts to minimize impacts to desert tortoises encountered on the installation (Appendix E).

The Combat Center operates under two Biological Opinions. The *Biological Opinion for the Base-Wide Training Operations and Routine Maintenance Program at the United States Marine Corps Air Ground Combat Center, Twentynine Palms, San Bernardino County California (1-8-99-F-41)* (Basewide BO; USFWS 2002) was received in 2002. It describes training, land use, and their combined effects on the desert tortoise, along with conservation strategies that focus on general conservation measures to be taken by the installation, and conservation strategies specific to mission-related construction and maintenance activities. The Basewide BO authorizes up to 150 acres per year of habitat impact from facility construction and maintenance activities, under certain conditions, without further consultation.

The 2017 BO (responding to a 2017 Supplemental EIS [SEIS]), entitled *Biological Opinion for Land Acquisition and Airspace Establishment, Twentynine Palms, California (8-8-11-F-65R)* (LandEx BO), analyzes the potential impacts to natural resources from the expansion of training activities in newly acquired Exclusive Military Use Areas. The LandEx BO replaces those portions of the Basewide BO that pertain to preparation of training lands and military training activities aboard the installation. The LandEx BO authorizes take, subject to various conservation measures, of up to 15 large desert tortoises per year from training activities. The Combat Center produces a combined annual report to meet the reporting requirements of each BO.

In addition, the Combat Center may occasionally operates under project-specific BOs addressing impacts with discrete, short-term actions such as facility construction. Two Section 10 USFWS Permits also support installation activities. One USFWS permit (#TE017730-5) authorizes desert tortoise handling and health assessment activity not associated with the LandEx BO, and the other Section 10 permit is held by UCLA, which works under a cooperative agreement with the Combat Center to operate the TRACRS (permit no. available upon request).

Conservation Initiatives

The Combat Center conducts a variety of desert tortoise conservation activities in response to requirements identified in the BOs referenced above, and generally in keeping with its requirements under section 7(a)(1) of the ESA to further conservation of threatened and endangered species.

Translocation **-** The Combat Center developed a scientifically rigorous program, consistent with USFWS guidance, to translocate tortoises from high and moderate impact areas before the first MEB exercise (refer to Appendix A in the EIS for preliminary methodology). Habitat quality, tortoise health, and population assessments were performed over three years; the evaluations assessed impact, recipient and control areas, and their associated tortoises. Tortoises were translocated prior to the first MEB or building block exercise to recipient sites (Figure 4-1, below) based on scientific evaluation of population density estimates, habitat quality, and habitat potential for supporting augmented tortoise populations (Table 4-1, below). Final health assessments were conducted and radio transmitters were attached to tortoises before translocation. Recipient and control site tortoises were also assessed (for health) and monitored before translocation, with subsets fitted with radio transmitters. Annually, the Combat Center will report post-translocation monitoring results (e.g., survivorship, health, assimilation and habitat effects) for the translocatee, control and resident tortoises, and their sites, to the USFWS

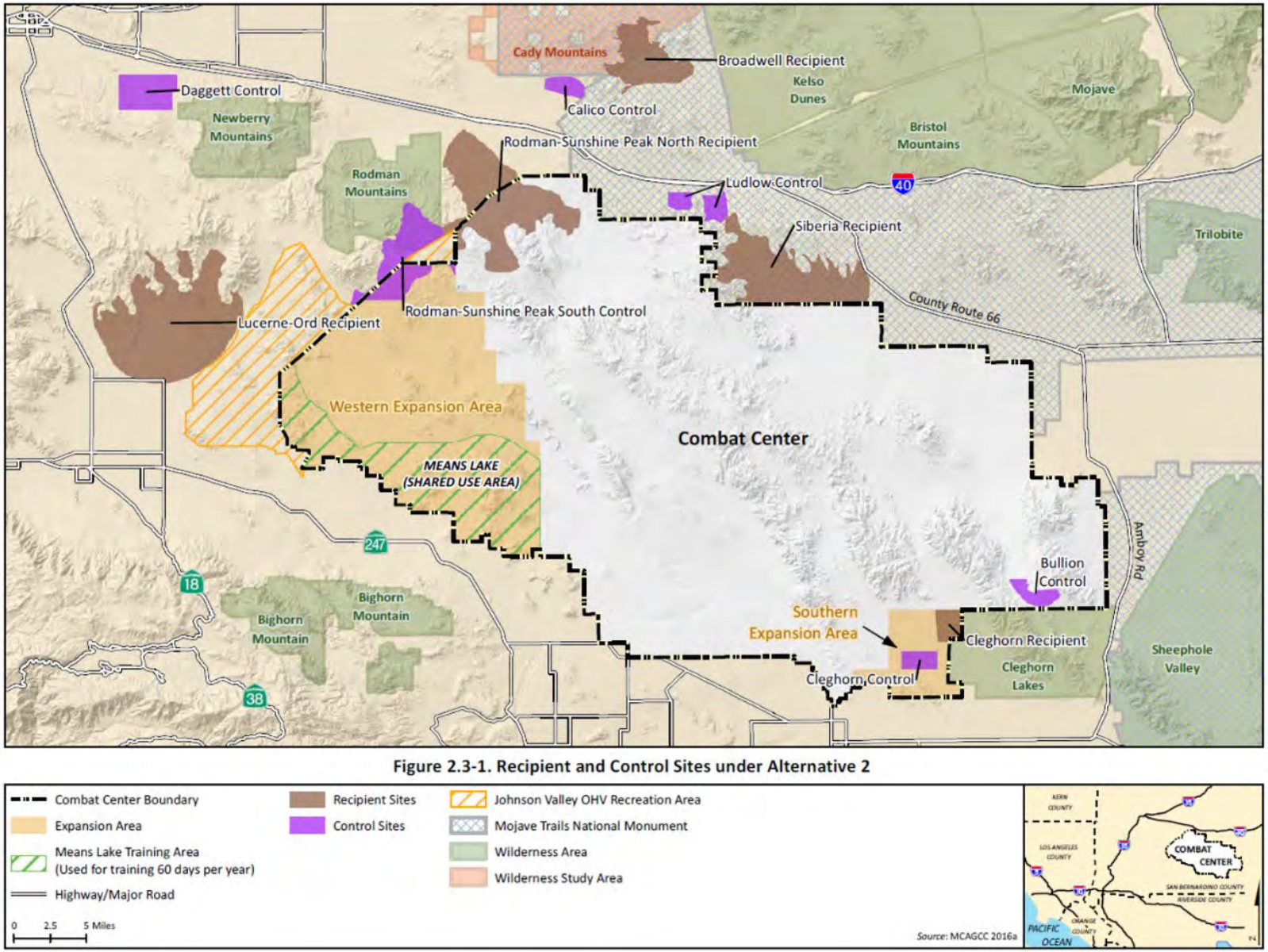
as required in the LandEx BO, and present an annual summary to the public. Short-term (up to 5 years) and long-term (up to 50 years) metrics of translocation success will be evaluated and published in peer-reviewed, scientific journals. Before each MEB exercise, high- and moderate impact areas will be surveyed to clear remaining desert tortoises to translocation sites where short- and long-term monitoring will be conducted.

Table 4-1 Recipient Sites Post-Translocation Densities

Alternative 2 Recipient Site	Initial Density (tortoises per km^2)	Projected Density (tortoises per km^2)	Planned Number of Translocatees	Post-Translocation Density (tortoises per km^2)
Lucerne-Ord	5.2	4.0	447	8.2
Rodman-Sunshine Peak North	4.9	3.8	341	8.2
Siberia[2]	2.6	2.1	155	5.5
Broadwell	5.1	4.1	18	5.5
Cleghorn	6.5	5.2	37	10.4

Notes: [1]Based on draft USFWS translocation guidance (USFWS 2016); assumes 8.3% decrease per year for the Lucerne-Ord and Rodman-sunshine Peak recipient site and a 7.1% decrease per year for remaining sites over 3 years.
[2]Value represents the 62% of 21,612 acre site (13,999 acres) that has a habitat suitability index of 0.6 or greater, derived from Barrows *et. al.* (2016).

Figure 4-1: Translocation Recipient and Control Sites



Environmental Awareness - The Environmental Affairs Mission Awareness program develops an awareness of values and requirements of natural and cultural resources protection on the Combat Center to support sustained military training. The primary target audience for this program is those who train or in some way affect training at the Combat Center. A secondary audience is those who are interested in the impacts of training on the Combat Center. Experienced Environmental Affairs personnel deliver verbal briefings to military personnel, and encourage awareness of the value of protecting natural resources via programs, initiatives and other messaging. The core information delivered by the program addresses the five specific awareness actions identified in the Biological Assessments to ensure protection of the desert tortoise on the Combat Center. More detail on these activities can be found under Goal 4, Element 4.3 – Environmental Awareness, found later in this chapter.

Tortoise Studies at the Combat Center have emphasized desert tortoise population health and headstart research, and have sponsored numerous studies aboard the Combat Center since 1983 (USMC 2000; 2011 INRMP). Earlier studies also emphasized population size and demographics (UCR 1993; Jones & Stokes Associates, Inc. 1998, Gardner and Brodie 2000, and Woodman *et al.* 2001), including three permanent plots and base-wide surveys of tortoise density (Woodman *et al.* 2001). The three plots are located in the Sandhill Training Area (one established 1985 & 1986 and now part of the Restricted Area), Emerson Lake TA and Bullion TA (the latter two were established in 1990 & 1991). Two studies (Boarman and Chamblin 2005; Boarman 2014) used point count surveys to assess the relative abundance of common ravens aboard the Combat Center, finding relatively high indices of ravens at or near subsidies in the Cantonment area, and relatively few ravens in the training areas. The earlier survey documented a nighttime roost of 2000 ravens on a power line near Camp Wilson; that power line was removed during the second study, with subsequent raven numbers greatly reduce, but not zero, at Camp Wilson.

Tortoise Health Assessments - the Combat Center has performed more than seven years of health and disease research aimed at understanding the incidence, distribution, causes, and effects of diseases on the Combat Center's desert tortoises. Complete health assessments, Berry and Christopher 2001 and USFWS 2011, have been completed on more than 100 tortoises in at least ten training areas. In general, it appears that most disease-affected tortoises are found adjacent to areas of the installation bounded by urbanization. Given that the percentage of infected individuals decreases with distance from the base boundary, it is assumed that the disease enters the base from urbanized areas and spreads towards the interior of the facility. This phenomenon is thought to occur from the release of captive tortoises and turtles back into the wild, which then transfer the diseases to the wild population.

The Combat Center has been tracking the incidence of URTD aboard the installation since 1998. Testing for the presence of URTD is accomplished by taking blood and plasma samples from tortoises in the field and sending them to a testing laboratory at the University of Florida. It currently requires approximately six weeks to get test results. See section 3.7.6 for technical information about disease monitoring.

Tortoise Mortality Minimization - Injury or death of desert tortoises can occur as a result of training activities; however, a number of rules are in place to minimize potential adverse effects to the tortoise population at the Combat Center. A significant proportion of training lands are not intensively used because of topography and other limiting factors such as the one-kilometer buffer around the entire base boundary to reduce trespass on neighboring lands. Desert tortoises in areas not used for land-based training are rarely affected by activities associated with training. Additionally, each unit that trains on the Combat Center, and contractors that work on the Combat Center in construction or in target maintenance, are given BO-mandated tortoise protection briefs before entering the ranges. These briefs provide sufficient information to avoid inadvertent take as well as providing options, including moving tortoises out of harms way, to allow mission or action to continue without undue delays.

Predation Control – Coyotes and ravens are the two desert tortoise predators upon which the Combat Center focuses. Mortality due to predation is a naturally occurring event, but increases in the presence of anthropogenic subsidies to predators. A subsidy reduction program is discussed in Chapter 4, Goal 1 due to the significance of these predators not only to tortoise but to the well-being of the Marine community. Generally, the Combat Center reduces strives to reduce subsidies for ravens and coyote populations through a variety of targeted means. Trash serves as a food source and access is reduced through on-base rules regarding the disposition of refuse and handling of refuse containers, which is supported by Environmental Affairs' compliance inspectors. Water availability is also reduced incidental to the installations water conservation efforts, which have seen drastic reduction in water use over the last decade.

The Conservation Law Enforcement Officers (CLEOs) regularly patrol training areas around Mainside and Camp Wilson, such as Sandhill, that may be subject to increased coyote populations as a result of anthropogenic subsidies. Depredation of coyotes is being implemented by the CLEOs and volunteer-based hunting will be coordinated at a later time. The CLEOs also perform targeted patrols of translocation recipient sites in the Cleghorn Lake TA and off-base in the Ord-Rodman area of Critical Concern (ACEC). The Combat Center conducts raven monitoring in key areas on and around the installation. Raven roosting and nesting subsidies are reduced through modifications to new utility poles, and incidentally by the recent focus on demolition of unused shade and other structures. Environmental Affairs also conducted an in-house test that found inexpensive, single-strand wire was effective as a roosting deterrent when strung above support beams in shade structures. The Combat Center had previously worked with the DMG interagency Raven Management Subgroup and stands ready to continue that collaboration should the group reconvene. In addition, Environmental Affairs staff have recently begun coordinating with their counterparts at other military installations in the desert on raven management issues. While these measures help reduce raven issues aboard the installation, the Combat Center will be seeking a raven depredation permit under the MBTA to address acute raven predation concerns through lethal control means.

The TRACRS facility at the Combat Center is a Captive Rearing ("Head Start") Facility for the desert tortoise that began operating in the fall of 2005. The purpose of the facility, called the "Tortoise Research and Captive Rearing Site" or "TRACRS," is to contribute to the recovery and eventual delisting of the desert tortoise. The facility is intended to protect nests, hatchling, and juvenile tortoises from predation for a period of three to seven years. When captive reared tortoises are of sufficient size, they will be released from the facility.

To "Head Start" tortoises, gravid (egg-carrying) females will be transported to the facility for egg deposition and then returned to their original location. Native vegetation within the enclosures will be irrigated, providing more and better-quality forage. This will allow individual tortoises to grow faster, hardening their shells and becoming more resistant to predation sooner in life.

While in captivity, growth rates and health status of juveniles is closely monitored. Many other research questions may be answered by activities at TRACRS, including the potential of vertical transmission of URTD and determination of juvenile sex ratios. The degree of multiple paternity within clutches is 50 to 80% (Davy *et al.* 2011). Upon release into the wild, subject animals will be monitored by radio telemetry for at least one year, and a percentage will be monitored for five or more years.

The captive rearing facility includes a fenced compound, enclosing four fenced pen structures in various configurations. Additional pens may be installed in the future. Each enclosure consists of a nylon netting canopy and a chain-link or hard-side fence buried 12 inches into the ground to prevent animals from digging under and into the enclosure. Additional barriers attached to the lower portion of the fence prevents entry by rodents. A third fence, constructed of fine mesh, will surround the enclosures to prevent any contact between wild and subject animals in the event of primary fence failure.

Critical Habitat **-** On February 8, 1994 the USFWS published a final rule in the Federal Register (59 CFR 5820) designating 6.4 million acres of Critical Habitat for the Mojave population of desert tortoise. No critical habitat was designated on the Combat Center. However, the Ord-Rodman Critical Habitat unit was designated adjacent to the installation and the Combat Center used this critical habitat for the placement of some of the translocated tortoises related to the expansion.

Special Use Areas **-** Special Use Areas are designated as Category 1 (no mechanized maneuver) or Category 2 (bivouacs, OHV use, or training involving vehicle activity are discouraged but not prohibited [MAGTFTC 2009]). A Special Use Area of approximately 7,900 acres was established in 1991 in the northeastern portion of Sandhill Training Area where off-road travel is not authorized and other types of military operations are limited. Signs are located at regular intervals along the MSR's in that area, warning "No off-road travel permitted", which have significantly reduced off-road violations. New signage was erected in this area during 2008-2009 and maintained. An additional, nearby area (to the south in the Sandhill Training Area) was designated as

"ecologically sensitive," for which there are no training restrictions but the area is posted with "Off-road travel is discouraged" signage, to reduce vehicle and foot impacts.

The Combat Center has designated Special Use Areas within the boundaries of recently acquired lands for the conservation of desert tortoises. A portion at the northern end of the Exclusive Military Use Area was designated as a Category 1 special use area. The southern portion of Bullion TA, containing a high-density desert tortoise population, was similarly designated. These areas are being fenced and signed and will be maintained to prevent military vehicle transit into Special Use Areas and, where relevant, prevent tortoises from homing back to the high- and medium-impact areas.

On the Horizon

Desert Tortoise "Headstarting" and Population Augmentation. Based on survey, monitoring, and analysis of translocated desert tortoises, the Combat Center would devise a strategy for population augmentation supported by the Combat Center's ongoing headstart program based at the TRACRS. Population augmentation strategies would be developed with USFWS and CDFW, as appropriate, and would be integrated with translocation and monitoring efforts to provide a comprehensive population sustainment and recovery strategy.

Element 3.2 – Other Sensitive Species Management

Objectives:

3.2.1 - Comply with the Migratory Bird Treaty Act and its implementing regulations while meeting mission requirements

3.2.2 - Comply with the Bald Eagle and Golden Eagle Protection Act and its implementing regulations

3.2.3 - Ensure conservation benefits can be provided for candidate species which occur on base and are proposed for federal listing by developing species-specific conservation plans

The Migratory Bird Treaty Act of 1918 (MBTA) protects most birds found in North America, excluding non-native species such as the house sparrow (*Passer domesticus*), European starling (*Sturnus vulgaris),* and rock pigeon (*Columba livia*). The Act was originally developed to protect birds migrating across international borders but over time the list of covered species grew to include non-migratory species. The MBTA specifically prohibits actions that may have negative effects on individuals or populations of covered species. Prohibitions include but are not limited to the killing, collection and transport of covered species, and relocation or transport of migratory birds must be authorized by the USFWS on a case-by-case basis under certain conditions through the issuance of special purpose permits. Recently, legal clarifications pertaining to the definition of incidental take have generated the potential to change in the way the Act may be applied at the Combat Center; however, a memo issued by the Office of the

Assistant Secretary of Defense on February 6, 2018 directs installations to follow existing guidance and policies until further notice.

The Combat Center provides limited habitat for migrating species but ample and varied habitat for resident bird species covered under the MBTA. As discussed in section 3.7.7, seasonal harborage for migratory birds is localized primarily in areas with surface waters, which include the man-made ponds within Mainside and ephemeral catchments, basins, and lake beds distributed across the built and natural environments (Cutler *et al.* 1999). Resident birds however exhibit a variety of roosting and breeding habitat preferences, across the urban habitat within the Mainside Cantonment area as well as native habitats in the training areas. As discussed in the afore mentioned section, periodic bird surveys are performed by specialists via contract, and by the marine community via the natural resources volunteer program, to investigate species richness, overall abundance, and frequency of habitat use by resident and migratory birds.

Conserving the natural state of existing aquatic resources and minimizing vegetation disturbance during military training, transit, and construction benefits MBTA covered species, and this management strategy is incorporated into various Natural Resources Program elements such as disturbance minimization identified under Goal 1. The Natural Resources Program also prescribes three specific measures by which the installation avoids or otherwise minimizes impacts to MBTA covered species – the NEPA Program, an MBTA Special Use Permit, and Standard Operating Procedures provided in the Environmental Protection Instruction Manual for CCO 5090.1F. The NEPA program ensures subject matter experts have the ability to influence all proposed actions aboard the Combat Center prior to implementation to ensure take of MBTA covered species is avoided. The Combat Center's MBTA Special Use Permit #MB053740-3 ensures military mission readiness at all times by authorizing specially trained staff to remove avian species from wildlife conflict situations when those species cannot avoid the conflict on their own. The permit also authorizes the relocation of a total of 10 active nests of particular species per year. Finally, Standard Operating Procedures outline provide wildlife response guidance to assist the Marine community in appropriately responding to wildlife issues and maintaining MBTA compliance. An animal response matrix identifies appropriately trained staff who may be contacted to respond to and diffuse conflicts between humans and wildlife (including MBTA covered species). Tree-trimming guidance is provided to ensure gardeners request surveys of potential nesting habitat prior to scheduled work events during the avian breeding season (February through September). Finally, a bird nest decision flowchart outlines who Marines and residents can contact, and what they can do under certain circumstances, when nesting activity is of concern (see Appendix F). The 5 Year Workplan presented in Appendix A outlines additional specific measures the Combat Center will take to maintain current information and protections for species protected under this Act.

Bald and Golden Eagle Protection Act - Golden eagles have been observed on several different occasions, and it is believed that a nesting pair lives in the western Range Training Areas. The golden eagle is afforded protection under the Bald Eagle Protection Act of 1940, which provides for the protection of both the bald eagle (*Haliaeetus*

leucocephalus) and the golden eagle (*Aquila chrysaetos*) by prohibiting, except under certain specified conditions, the taking, possession and commerce of such birds.

BGEPA provides for the protection of the bald eagle (the national emblem) and the golden eagle by prohibiting, except under certain specified conditions, the taking, possession and commerce of such birds. The 1972 amendments increased penalties for violating provisions of the Act or regulations issued pursuant thereto and strengthened other enforcement measures. Rewards are provided for information leading to arrest and conviction for violation of the Act.

4.2.4 Goal 4: Support Other Uses and Engagement

As per DoD Instruction 4715.03, DoD lands, waters, and coastal resources shall be made available to the public for the educational or recreational use of natural resources when such access is compatible with military mission activities, ecosystem sustainability, and with other considerations such as security, safety, and fiscal soundness. Therefore, the Combat Center shall identify and make available areas and conditions appropriate for public access. These may include coordinating with Federal or State conservation officials to allow access to DoD-controlled natural resources for their official business, allowing active and retired Service members and disabled veterans to access to its lands and waters for hunting, fishing, and/or non-consumptive use of wildlife; allowing Native Americans to use DoD sites and resources of cultural value; facilitate hunting opportunities when not in conflict with mission or Natural Resource Conservation goals; and facilitate public awareness and outreach programs to educate the public regarding resources on military lands and DoD conservation efforts.

Element 4.1 – Outdoor Recreation

Outdoor recreation enhances the quality of life for military and civilian personnel. The Sikes Act requires that Marine Corps lands with suitable natural resources be managed to allow outdoor recreational opportunities. For the purposes of this INRMP, outdoor recreation is defined as recreational programs, activities or opportunities that depend on the natural environment. Outdoor recreational opportunities associated with natural resources are currently limited at the Combat Center and include some horseback riding and hiking areas in the outlying areas of Mainside, away from facilities and housing but not part of the active training ranges. There is an OHV course accessible to the greater Marine community at certain times of the year, located within the Mainside area but away from most development. OHV activities are also supported for 10 months a year in the Means Lake Shared Use Area, which is co-managed with the BLM. A Wildlife Viewing Area is also a recreational feature located in Mainside; it includes natural riparian habitat around a managed drainage basin, and offers a walking trail, natural resources educational information in the form of signage, a bat house, and viewing points. There is also a skeet range near the water treatment ponds. Interest has been expressed by the Marine community in creating additional opportunities.

<u>Objectives:</u>

4.1.1 – Support the access and sustainable use of on-base natural resources by the general public and military interest groups by establishing a hunting program

4.1.2 - Support the access and sustainable use of on-base natural resources by the general public and military interest groups by identifying and developing other outdoor recreational opportunities on the Combat Center

The nature of the military mission, with its rapidly changing maneuver and firing activities, combined with inherent dangers associated with unexploded munitions, make public access for outdoor recreation in training areas difficult. The Combat Center is also situated near to many outstanding opportunities off-base, such as hiking, rock climbing and off-highway driving in Joshua Tree National Park, Johnson Valley Off-Highway Vehicle Area, Amboy Crater, and other public recreation areas. However, the Sikes Act does require special consideration be given to disabled sportsmen and there is significant interest in developing a hunting program and multi-use recreational area situated within the Mainside boundary. An outdoor recreational plan will be developed that focuses on the limited opportunities available on the Combat Center.

Element 4.2 – Conservation Law Enforcement Program

U.S.C. Title 16, Chapter 5C of the Sikes Improvement Act and MCO 5090.4a require military installations operate a Federal Conservation Law Enforcement Program comprised of specialized professionals trained in federal natural and cultural resources law (CLEOs). These Federally uniformed officers are mandated to enforce federal environmental laws and regulations pertaining to the Endangered Species Act, Migratory Bird Treaty Act, Antiquities Act of 1906, Archeological Resources Protection Act and the Lacy Act. The Combat Center maintains a staff of six CLEOs who perform a wide range of complex law enforcement activities, including arrest and detention, to reduce the exploitation of plant and animal species and protect the abundant cultural resources found here. CLEOs provide direct and indirect benefits to the installation – they discourage environmental lawlessness, such as illegal trespassing and scrapping; and facilitate the sustained use of the military lands for readiness activities. Changing social, natural and political landscapes require a flexible program; current objectives of this element are provided below.

Objective:

4.2.1 - Operate a Conservation Law Enforcement Program to prevent exploitation of the natural resources from occurring on the installation

In addition to regular ongoing program operations, new emphases have been added to the CLEO program addressing Combat Center responsibilities resulting from the recent Land and Airspace Acquisition. These new requirements include the; development and implementation of strategies intended to discourage subsidized predators, particularly around Mainside and Camp Wilson; education of military and civilian personnel on the importance of proper trash disposal, especially food items, discouragement of pest proliferation, leadership and oversight of the coyote depredation management plan, support of integrated pest management activities, and investigations of trespass and resources degradation aboard newly acquired range training lands.

Element 4.3 – Environmental Awareness

The Combat Center Natural Resources Program is founded on the principle of using stewardship to provide both user benefits and resources protection while meeting the requirements of the military mission. The U.S. Marine Corps has a long tradition of leadership in natural resources management and the Combat Center builds and enhances this reputation through the Natural Resources Management Program. Cultivating and maintaining an understanding of the need for conservation in both the Marine and external communities is a critical aspect of this program. Ultimately, environmental awareness and enforcement of environmental regulations prevents damages to the natural resources base, and violations of environmental laws. Making users of the Combat Center natural resources understand why it is important to protect and conserve natural resources is the first step in enlisting support. Ensuring public familiarity with installation resources and activities further improves regional understanding and impacts from management efforts. The Combat Center environmental awareness element addresses both installation and external interests, to maximize reach and effectiveness.

Objectives:

4.3.1: Encourage awareness of natural resources for internal stakeholders

4.3.2 - Encourage awareness of natural resources for external stakeholders

The term "environmental awareness" is used here to reflect a general knowledge, perception, or understanding of environmental issues, including but not limited to the fragility of natural resources to impacts from human actions. Efforts to cultivate environmental "awareness" outside of the Natural Resources Program use various forms of planned communication. Subject matter knowledge is critical to identifying needs and objectives for communication, therefore natural resources staff must be kept knowledgeable on all aspects of the Natural Resources Program in order to plan and relay content. Objectives (need) for communication must be well identified in advance and appropriate strategies developed to meet those objectives. Available channels for communication must be reviewed and those most appropriate selected to maximize the effectiveness of message delivery. Information must then be delivered clearly, concisely and in the most relatable way possible to ensure information is received and understood as intended. Different communication objectives and delivery methods are identified for internal and external stakeholders.

Internal Stakeholders and Environmental Mission Awareness – Internal stakeholders who use installation resources are required to have an understanding of environmental regulations. Programs such as cultural resources, protection, hazardous materials storage, spill prevention and cleanup, pollution prevention, and NEPA requirements all depend on awareness in order to succeed. The primary communication tool that provides environmental requirements to internal stakeholders is briefings. Additional tools that cultivate awareness include educational outreach at Marine community events, the promotion of Earth Day, provision of notices in media such as installation-wide speedcall emails and facebook pages for the Marine community, direct production or contribution of informational phamplets and brochures, and producing articles in the combat camera newspaper.

Educational briefings are the primary means of promoting environmental awareness aboard the Combat Center. They are delivered verbally by trained Environmental Affairs personnel, and by video. Briefing content includes all environmental requirements that must be followed to achieve mission success. Environmental mission awareness briefings are targeted toward all levels of military personnel and the planners who either use or affect military training activities. Other audiences who also receive an environmental awareness briefing include military family members, civilian employees, and external organizations or individuals who have a demonstrated interest in training activities aboard the Combat Center. The purpose of these briefings is to develop an understanding of how protecting natural resources supports the military training mission, what actions military users can take to minimize their impacts to the land and natural resources, and how the actions help to sustain and enhance the military training program.

All military units (both permanent and visiting) must be briefed prior to using training lands. These briefings are considered annual training requirements and must be received every year. Topics covered include safety precautions for working around unexploded ordnance, desert survival techniques, and the Environmental Mission Awareness. Approximately 30,000 to 40,000 Marines receive these briefings annually. The Environmental mission awareness reviews pertinent environmental laws, land management prescriptions such as restricted use areas, hazardous material compliance, cultural resources protections, venomous animals, desert tortoise conservation measures, and other general desert safety issues. In addition to the annual briefing requirement, Marine units permanently stationed aboard the Combat Center (tenant units) also receive natural resources briefs from Environmental Affairs when conducting Safety Stand-downs or "New Join" briefs. Approximately 2,000 to 5,000 tenant Marines are briefed in this manner each year.

In the past, Environmental Affairs has supplemented the verbal instruction provided in the brief with handouts. An informational field card had been produced and distributed which was a fold-out pamphlet that included a map of restricted, limited use, and sensitive areas aboard the legacy base, as well as procedures for dealing with hazardous materials (including contact information and measures to take in the field for spill responses and disposal). This field card also reviewed vehicle and training activities, and procedures for wildlife and desert tortoise encounters. At another point in time, a shorter, biology-focused "Green Card" was distributed by Environmental Affairs which contained abbreviated guidance on what to do if a desert tortoise was encountered in the field. Both materials are out of date and no longer distributed, however a new informational handout of some kind may be generated during the coverage of this INRMP.

The Combat Center Order addressing Environmental Protection, CCO 5090.1F, is the most important environmental management tool for the installation and Environmental Affairs. CCO's are signed by the Commanding General and are lawful orders that all Marines must follow while aboard the Combat center. In recent years, the awareness value of CCO 5090.1F has been enhanced through the inclusion of maps of areas valuable to natural and cultural resources.

External Stakeholders/Public Awareness efforts aim to keep those outside the immediate Combat Center community informed about a variety of topics related to the Natural Resources Program. Public information needs and communication strategies are typically project or activity-specific in nature, with a few exceptions. One example includes the installation land and airspace expansion action, which is a complex regional-scale undertaking for which public awareness efforts involved significant pre-planning between different directorates and multiple outreach methods employed over a sustained period of time, maximizing opportunities for public involvement and discussion. Another example is addressing unauthorized OHV trespass, which is an ongoing issue again requiring coordination with other directorates, neighboring landowners and the OHV community.

The Natural Resources Branch of Environmental Affairs works to address public information needs in many ways. Some personnel maintain direct personal communication with high ranking enlisted or officer personnel, environmental organization officers, outside agency personnel and civic leaders as appropriate. Environmental Affairs staff have also given prepared talks to schools, boy and girl scouts, civic organizations, and other federal agencies such as Joshua Tree National Park (both staff and visitors). Over time, several educational brochures and fliers have been produced to inform readers of Native American Rock Art found aboard the base and efforts aimed to conserve and protect desert tortoises. Posters are produced and distributed to highlight natural and cultural resources. Information requests from external news media are supported by the Public Affairs division. Electronic media like Facebook, Twitter and the Combat Center website are being increasingly utilized for communications. Opportunities to represent the Natural Resources Program at community events are also well-supported by EA personnel.

Element 4.4 – Cultural Resources

The Cultural Resources Program is part of the Conservation Branch of Environmental Affairs and is responsible for all Cultural Resources Management aboard the installation. Cultural Resources are managed through the implementation of the ICRMP, thus specific objectives and projects for cultural resources are not presented in this INRMP. However, Cultural and Natural Resources Programs work closely together, recognizing that Native American Tribes view many of the resources managed under the Natural Resources Program as cultural resources.

MCAGCC is located in a traditional use area for several Tribes and many of the flora and fauna collected and used by their ancestors are still present and collected by Tribes today. The Natural Resources Program recognizes there is an interest with tribal members to access the installation and collect natural resources that are of particular significance. No formal policy has been developed supporting this process, however requests shall be handled on a case by case basis and may be made by contacting the Cultural Resources Specialist within the Environmental Affairs Division.

4.3 Implementation

The cost to implement this INRMP is estimated at $37,426,291 for FY 2018-2022. Funding will come primarily from Operations and Maintenance Marine Corps Funds. Budgets will be adjusted as needed each year. Not included in the estimate are costs specific to water and air quality management, pest management, the NEPA program, pollution prevention, and in-house salaries.

Table 4-2 Summary Budget Request for Natural Resources Across FYs 2018-2022

	FY 18	FY 19	FY 20	FY 21	FY 22
COLS 3 Totals	$ 9,832,048	$ 9,000,194	$ 8,413,924	$ 4,155,280	$ 4,622,445
COLS 2 Totals	$ 599,600	$ 243,500	$ 109,000	$ 337,100	$ 113,200
COLS 1 Totals	$ -	$ -	$ -	$ -	$ -
Total Request	***$ 10,431,648***	***$ 9,243,694***	***$ 8,522,924***	***$ 4,492,380***	***$ 4,735,645***

The budget is skewed towards COLS 3 and 2 priority levels due to funding limitations, and not all projects identified in the 5-Year Workplan are included in Table 4-2. There are 5 are COLS 3 projects and 2 COLS 2 projects that have not been costed, and 3 projects requiring funding have not been ranked yet. These are anticipated to be costed out in the coming years.

4.3.1 Staffing

The Natural Resources Program has the following authorized billets:

Natural Resources Branch

1	Conservation Branch Head	GS 13

Positions Filled in the Natural Resources Section

1	Wildlife Ecologist	GS 12
1	Natural Resources Specialist	GS 12
1	Natural Resources Specialist	GS 11
1	Biologist	GS 11
1	Biological Technician	GS 7/9
5	Conservation Law Enforcement Officers	GS 7/9/11
1	Conservation Law Enforcement Officer Supervisor	GS 12

Contract staff also contribute to the implementation of this INRMP. GIS support is not listed but is critical to plan implementation. Not all positions may be filled at all times. Currently, the branch has lost a GS 7/9/11 Natural Resources Specialist position, and the GS 7/8/9 Biological Sciences Technician is vacant. In light of the additional requirements imposed by the land expansion there is now a need for two additional

positions, including a lower-grade Natural Resources Specialist as well as a Biological Technician. INRMP tasks and objectives were built assuming full staffing levels.

Congress, in reauthorizing the Sikes Act (16 USC 670a-670f) as part of the Fiscal Year 2004 Defense Authorization Act, endorsed natural resource management positions, such as those at the Combat Center as “Inherently Governmental positions” in a "Sense of Congress" section.

4.3.2 Funding Sources

Natural resources management relies on a variety of funding mechanisms. Below are general discussions about the various funding sources used to implement this INRMP.

Operations and Maintenance Marine Corps Funds

Operations and Maintenance Marine Corps (OMMC) Funds are provided to the Combat Center Commander for base operations. Virtually any project or program within this INRMP can compete for these discretionary funds. The majority of the EA program is funded from this avenue and is critical to the success of INRMP implementation.

Legacy Funds

The DoD Legacy Resources Management Program was instituted by Congress in 1991 to promote stewardship of natural and cultural resources. The Legacy Program is managed through special Legacy project proposal and reporting procedures. Legacy funds are generally for nonrecurring items that are neither routine operations nor compliance driven. They are typically used for projects that provide valuable information but are lower on the priority list. Funding levels from Legacy are highly variable and unreliable for planning purposes.

Headquarters Marine Corps Environmental Management Funds

Headquarters Marine Corps Environmental Management Funds are a special category within OMMC dollars and are managed by HQMC. These funds are "fenced" by Defense but are still subject to the restrictions of OMMC funds. The program heavily favors high priority funding for projects that are out of compliance with federal or state laws, especially if Notices of Violation or other enforcement agency actions have been issued.

4.3.3 Command Support

Command support is essential to implementation of this Plan. Many priority projects for natural resources management within the next five years require command support. The Commanding General is personally liable for noncompliance with environmental laws, and therefore has a personal interest in ensuring this Plan is properly implemented. This Plan has the support of the Combat Center Commanding General and other personnel in command positions that are needed to implement it. The Command is dedicated to implementation of this Plan as required by the Sikes Act Improvement Act and other Federal laws. The Command is also dedicated to maintaining and improving the military mission at the Combat Center. Implementation of this Plan facilitates that end.

INRMP Projects, Goals and Objectives are presented in the 5-Year Workplan in Appendix A. Projects are identified as ongoing, occurring annually, at some fixed recurring multi-year frequency, or specific and timebound in nature. Natural Resources Program Goals Elements and Objectives are summarized in the tables, and full explanations of each project can be found within this chapter.

This page is left intentionally blank.

5.0 **REFERENCES**

Agri-Chemical and Supply, Inc. 2005. *Invasive Non-native Plant Survey*. Prepared for Marine Air Ground Task Force Training Command and Natural Resources & Environmental Affairs Division Marine Corps Air Ground Combat Center Twentynine Palms, California. Oceanside, CA.

Agri-Chemical and Supply, Inc. 2008. Vegetation Classification and Mapping of Marine Corps Air Ground Combat Center Twentynine Palms, CA. Final Report. August.

Anteon Corporation. 2001. *Preliminary Survey of Nonnative Plant Species at Marine Corps Air Ground Combat Center, Twentynine Palms, California.* Prepared for Marine Air Ground Task Force Training Command, Natural Resources and Environmental Affairs Division, Twentynine Palms, California. San Diego, CA.

Barrows, C.W. 2011. Sensitivity to climate change for two reptiles at the Mojave–Sonoran Desert interface. Journal of Arid Environments 75:629–635.

Barrows, C. W., B.T. Henen, and A.E. Karl. 2016. Identifying climate refugia: A framework to inform conservation strategies for Agassiz's desert tortoise in a warmer future. Chelonian Conservation and Biology. 15: 2–11.

Beck, R.W., Inc. 2004. *Water Conservation Study*, Project # 103-02. Unpublished report.

Berry, K.H., and M.L. Christopher. 2001. *Guidelines for the field evaluation of desert tortoise health and disease*. Journal of Wildlife Diseases 37(3): 427-450

Boarman W.I. 2014. Assessing Common Raven Abundance, Subsidies and Impacts to Agassiz's Desert Tortoises at the Marine Corps Air Ground Combat Center, Twentynine Palms, California. Conservation Science Research & Consulting, Spring Valley California. Unpublished report for United States Navy Southwest Division Contract N6871105D3605 Task Order 0045.

Boarman, W.I. and H.D. Chamblin. 2005. Ecology of Common Ravens at the Marine Corps Air Ground Combat Center, Twentynine Palms, California. U.S. Department of the Interior, U.S. Geological Survey, Biological Resources Discipline, Western Ecological Research Center. Unpublished Report completed for U.S. Navy Southwest Division, Naval Facilities Engineering Services Command

Braun, J., M. Screnzel, C. Whitte, L. Gokool, J. Curchell, and B.A Rideout. 2014. *Molecular Methods to Detect* Mycoplasma spp. and testudinid herpesvirus II *in Desert Tortoises and Implications for Disease Management.* Journal of Wildlife Diseases, Volume 50: 757-766.

Brown, P., and R. Berry. 1998. *Bat Survey at Marine Corps Air Ground Combat Center, Twentynine Palms, California*. Draft unpublished report. 19pp.

Brown, D. R., I.M. Schumacher, G.S. McLaughlin, L.D. Wendland, M.E. Brown, P.A. Klein, and E.R. Jacobson. 2002. Application of diagnostic tests for mycoplasmal infections of desert and gopher tortoises with management recommendations. Chelonian Conservation and Biology, 4:497-507.

Bureau of Land Management (BLM). 1997. *Legislation Impacting the California Desert.* From the California BLM home page, www.ca.blm.gov.

_____. 2005. Final Environmental Impact Report and Statement for the West Mojave Plan, A Habitat Conservation Plan and California Desert Conservation Area Plan Amendment, Volume 1. January.

California Department of Water Resources (DWR). 2004. California's Groundwater Bulletin 118, Basin Descriptions. Last update February 27, 2004.

Cutler, T.L., D.J. Griffin, and P.R. Krausman. 1999. *A Wildlife Inventory and Management Recommendations for the Marine Corps Air Ground Combat Center, Twentynine Palms, California*. Prepared for MCAGCC and Southwest Division, Naval Facilities Engineering Command, San Diego, CA under Contract N68711-96-LT-60025. University of Arizona, Tucson, AZ. 142 pp.

Davy, C.M., T. Edwards, A. Lathrop, M. Bratton, M. Hagan, B. Henen, K. A., Nagy, J. Stone, L. S. Hillard, and R.W. Murphy. 2011. *Polyandry and multiple paternities in the threatened Agassiz's desert tortoise, Gopherus agassizii*. Conservation Genetics (2011) 12:1313-1322.

Department of Defense (DoD). 2011. Department of Defense Instruction 4715.03, Natural Resources Conservation Program. Available from http://www.dtic.mil/whs/directives/corres/pdf/471503p.pdf (accessed November 1, 2016).

DoD. 2013. Department of Defense Manual 4715.03, Integrated Natural Resources Management Plan (INRMP) Implementation Manual. Available from http://www.dtic.mil/whs/directives/corres/pdf/471503m.pdf (accessed November 1, 2016).

Department of the Navy (DoN) Geothermal Program Office. 2011. Geothermal field investigations of the Sand Hill – West Prospect Area, Marine Corps Air Ground Combat Center, Twentynine Palms, California. DON Geothermal Program Office, China Lake, California.

Drake, K.K., L. Bowen, K.E. Nussear, T.C. Esque, A.J. Berger, N.A. Custer, S.C. Waters, J.D. Johnson, A.K. Miles, and R.L. Lewison. 2016. Negative impacts of invasive plants on conservation of sensitive desert wildlife. Ecosphere 7(10):e01531. 10.1002/ecs2.1531

Duck, T.A., T.C. Esque, and T.J. Hughes. 1997. *Fighting Wildfires in Desert Tortoise Habitat: Considerations for Land Managers*. In Proceeding for Fire Effects on Range and Endangered Species Habitats Conference, Nov. 13-16. 1995, Coeur D'Alene, ID. International Wildland Fire Association.

EDAW, Inc. 1994. *MCAGCC, Marine Corps Air Ground Combat Center, Training Range Study*. Prefinal, prepared for Southwest Division, Naval Facilities Engineering Command, San Diego, CA under Contract N68711-93-D-1529.

Elvin, M.A. 2000. *Rare Plant Survey and Floristic Inventory*. 1999 Year-end report: Year Three of Three, Final Report. Prepared for Tierra Data Systems for NREA Directorate, MCAGCC, Twentynine Palms, CA. 21 pp.

Gardner, T.J., and E.D. Brodie. 2000. *The Occupation of Steep Slopes by Desert Tortoise (Gopherus agassizii) in the Western Mojave Desert: A Description of Occupied Habitats, Habitat Use, and Desert Tortoise Density.* Final Report. Utah State University. 61 pp + appendices.

Headquarters Marine Corps (HQMC). 2008. Range Environmental Vulnerability Assessment. Marine Corps Air Ground Combat Center Twentynine Palms. Prepared by Malcolm Pirnie.

Henen, B.T. 2012. Re-analysis of 1997 & 1999 Disturbance and tortoise abundance data for MCAGCC, the Marine Corps Air Ground Combat Center, Twentynine Palms California. Marine Corps Air Ground Combat Center. Twentynine Palms, California. 8 pages.

Izbicki, J.A. and R.L. Michel. 2004. Movement and Age of Ground Water in the Western Part of the Mojave Desert, Southern California, USA. United States Geological Survey Water-Resources Investigations Report 03-4314.

Jones & Stokes, Inc. 1998. *Technical Synthesis Report for a Desert Tortoise Survey on the Marine Corps Air Ground Combat Center.* Submitted to U.S. Army Corps of Engineering, Sacramento District, Sacramento, CA under Contract No. DACW05-95-D-003, Task Order no. 0039.

Karl, A. 2001. Desert Tortoise Abundance in the Fort Irwin National Training Center Land Acquisition Area: A Review. Unpublished report to Chambers Group, Inc., Irvine, CA. 44 pp plus appendices.

_____. 2009. Marine Corps Air Ground Combat Center Land Acquisition Study: Distribution and Abundance of Four Vertebrate Species in the Western and Southern Study Areas. Unpublished report submitted 4 September 2009 to United States Department of the Navy, Naval Facilities Engineering Command Southwest, San Diego, California.

_____. 2010. Marine Corps Air Ground Combat Center Desert Tortoise Density in the Land Acquisition Study Areas. Unpublished report submitted 13 August to United States

Department of Navy, Naval Facilities Engineering Command Southwest, San Diego, California.

_____. 2017. Desert tortoise density in the Bullion Training Area in 2012. Unpublished report to Naval Facilities Engineering Command Southwest, San Diego, California. 54 pages.

Katzenstein, A.M., and J.A. Whelan. 1987. *Preliminary Geothermal Exploration at the Marine Corps Air Ground Combat Center, Twentynine Palms, California.* Naval Weapons Center, China Lake, CA.

Kennedy/Jenks/Todd LLC. 2007. Basin Conceptual Model and Assessment of Water Supply and Demand for Ames Valley, Johnson Valley, and Mean Valley Groundwater Basins. Prepared for Mojave Water Agency. April 2007

Keystone Center. 1996. *A Department of Defense (DoD) Biodiversity Management Strategy.* Keystone Center Policy Dialogue on Department of Defense (DoD) Biodiversity, Final Report. Keystone, CO. 37 pp.

Koehler, J.H. 1983. Ground water in the northeast part of Twentynine Palms Marine Corps Base, Bagdad Area, California. USGS Water Resources Investigation Report 83-4053.

Krzysik, A.J., and V.L. Trumbull. 1996. *Biodiversity and Wildlife Management Plan: An Ecosystem Approach, Marine Corps Air Ground Combat Center, Twentynine Palms, California*. Prepared for MCAGCC, Twentynine Palms, CA, by U.S. Army Corps of Engineers, Construction Engineering Research Lab, Champaign, IL and University of Illinois, Urbana, IL. 181 pp.

LaRue Jr., E.L. 2013. Vertebrate Inventory, Human Impacts Analysis, and Management Recommendations for the Marine Corps Air Ground Combat Center, Twentynine Palms, San Bernardino County, California. Unpublished report submitted February 2013 to Naval Facilities Engineering Command, San Diego, California. 50 pages.

Lato, L.J., P.B. Fahnestock, and P. Novak-Echenique. 1999. *Soil Survey of Marine Corps Air Ground Combat Center, Twentynine Palms, California.* Draft. U.S. Department of Agriculture, Natural Resources Conservation Service, in cooperation with NREA, MCAGCC, Twentynine Palms, CA, and the Mojave Desert Resource Conservation District.

Li, Z., and P. Martin, 2011, Geohydrology, simulation of regional groundwater flow, and assessment of water management strategies, Twentynine Palms area, California: U.S. Geological Survey Scientific Investigations Report 2010–5249, 106 p.

Londquist, C.J. and P. Martin. 1991. Geohydrology and Groundwater Flow Simulation of the Surprise Spring Basin Aquifer System, San Bernardino County, CA. United States Geological Survey Water- Resources Investigations Report 89-4099.

Marine Air Ground Task Force Training Command (MAGTFTC). 2009. Combat Center Order 5090.1D.

Marine Corps Air Ground Combat Center (MCAGCC). 2003. Final Programmatic Environmental Assessment, Ongoing and Proposed Training Activities at Marine Corps Air Ground Combat Center, Twentynine Palms CA. May 2003.

MCAGCC. 2012. Final Environmental Impact Statement, Land Acquisition and Airspace Establishment to Support Large-Scale Marine Air Ground Task Force Live Fire and Maneuver Training. July 2012.

MCAGCC. 2016. Update of Vegetation Map and Non-Native Invasive Species Mapping: 2013–2015. Final. Marine Corps Air Ground Combat Center, Twentynine Palms, California. Contract No. N62473-13-D-4811, Task Order No. 0006. April.

McKernan, R.L. 1998. Draft: Neotropical bird use at the U.S. Marine Corps Air Ground Combat Center, Twentynine Palms, California, 1994 and 1995. Report prepared for U.S. Marine Corps Air Ground Combat Center, NREA Division, Twentynine Palms, CA. 41 pp.

Mendez, G.O. and A.H Christensen. 1997. Regional Water Table (1996) and Ground Water Level Changes in the Mojave River, the Morongo, and Fort Irwin Ground-Water Basins, San Bernardino County, California. U.S. Geological Survey Water Resources Investigations Report 97-4160. 34p.

Nagy, K.A. and P.A. Medica. 1986. Physiological ecology of desert tortoises in southern Nevada. Herpetologica 42: 73-92.

Nagy, K.A., B.T. Henen, and D.B Vyas. 1998. Nutritional Quality of Native and Introduced Food Plants of Wild Desert Tortoises. Journal of Herpetology 32:260-267.

Natural Resources Conservation Service (NRCS). 2018. Natural Resources Conservation Service <http://websoilsurvey.nrcs.usda.gov/> Website accessed February 2018.

Naval Facilities Engineering. 2017. *Integrated Pest Management Plan.* Prepared for MCAGCC, Twentynine Palms, CA.

Pratt, G.F. 2005. *Terrestrial Arthropods of the Marine Corps Air Ground Combat Center, Twentynine Palms, California*. 92 pp, plus appendices.

Rowlands, P.G., Johnson, E. Ritter, and A. Endo. 1982. *The Mojave Desert.* In G.L. Bender (ed.), *Reference Handbook on the Deserts of North America.* Greenwood Press, Westport, CT.

Simovich, M. 2006. Survey and Management Considerations for the Crustacean Communities: The Dry Lakes of the Marine Corps Air Ground Combat Center, Twentynine Palms, California. 38 pp.

Skinner, M., and B. Pavlik. 1994. *Inventory of Rare and Endangered Vascular Plants of California (fifth edition).* California Native Plant Society Special Publication No. 1. 338 pp.

Snover, S.A., and E.M. Kellogg. 1999. *Biological Assessment: Effects of training and Land Use at Marine Corps Air Ground Combat Center, Twentynine Palms, on the Desert Tortoise (Gopherus agassizii*). Prepared for Southwest Division, Naval Facilities Engineering Command Contract, San Diego, CA. Contract N68711-95-D-7605/0029. MCAGCC, Twentynine Palms, CA.

Twentynine Palms Water District (TPWD). 2008. Groundwater Management Plan Update. Final Report. Prepared Kennedy/Jenks Consultants. December 29, 2008.

U.S. Army Corps of Engineers. 1994. *Identification and Characterization of "Waters of the United States" at the Marine Corps Air-Ground Combat Center, Twentynine Palms, California.* Waterways Experiment Station, Environmental Laboratory. 3909 Halls Ferry Road, Vicksburg, MS.

U.S. Fish and Wildlife Service (USFWS). 1990. *Endangered and Threatened Wildlife and Plants: Determination of Threatened Status for the Mojave Population of the Desert Tortoise*. Federal Register 55:12, 178-12, 191.

_____. 1994. *Desert Tortoise (Mojave Population) Recovery Plan*. Portland, OR. 73 pp. + appendices.

_____. 2002. Biological Opinion for the Base-Wide Training Operations and Routine Maintenance Program at the United States Marine Corps Air Ground Combat Center, Twentynine Palms, San Bernardino County, California (1-8-99-F-41). Ventura Fish and Wildlife Office, Ventura, CA. March 7.

_____. 2011. Health Assessment Procedures for the Desert Tortoise (*Gopherus agassizii*): A Handbook Pertinent to Translocation. Desert Tortoise Recovery Office, U.S. Fish and Wildlife Service, Reno, Nevada

_____.2015. Range-Wide Monitoring of the Mojave Desert Tortoise (*Gopherus agassizii*): 2013 and 2014 Annual Reports. Report by the Desert Tortoise Recovery Office, U.S. Fish and Wildlife Service, Reno, Nevada.

_____. 2016. Summary of U.S. Fish and Wildlife Service Translocation Guidance for the Marine Corps Air Ground Combat Center Land Acquisition, Twentynine Palms, California. 12 September 2016. U.S. Fish and Wildlife Service, Palm Springs, CA.

U.S. Geological Survey (USGS). 2003. Regional Water Table (2000) and Ground-Water-Level Changes in the Mojave River and Morongo Ground-Water Basin, Southwestern Mojave Desert, California. Available at http//water.usgs.gov/pubs/wri/wri024277/

U.S. Marine Corps (USMC). 1976. *Multiple-Use Natural Resources Management Plan*. Marine Corps Air Ground Combat Center, Twentynine Palms, CA.

_____. 1990. *Restricted Area/Military Operations Area Utilization Report*. Marine Corps Air Ground Combat Center, Twentynine Palms, CA.

_____. 1991. *Restricted Area/Military Operations Area Utilization Report*. Marine Corps Air Ground Combat Center, Twentynine Palms, CA.

_____. 1993. *Restricted Area/Military Operations Area Utilization Report*. Marine Corps Air Ground Combat Center, Twentynine Palms, CA.

_____. 1997. *Environmental Quality Installation Award Submission*. Report submitted to the Secretary of the Navy for Fiscal Year 97 award competition. Natural Resources and Environmental Affairs, Marine Corps Air Ground Combat Center, Twentynine Palms, CA.

_____. 1999. *Handbook for Preparing Integrated Natural resources Management Plans for Marine Corps Installations*. Headquarters, Marine Corps, Washington, D.C. 44 pp.

_____. 2000. *United States Marine Corps, Installations Campaign Plan (ICP)*. Draft, Installations and Logistics, Headquarters, U.S. Marine Corps, Washington, D.C.

_____. 2003. Final Programmatic Environmental Assessment, Ongoing and Proposed Training Activities at Marine Corps Air Ground Combat Center, Twentynine Palms CA. May 2003.

_____. 2001. Programmatic Environmental Assessment, Ongoing and Proposed Training Activities at the Marine Corps Air Ground Combat Center, Twentynine Palms, CA.

_____. 2012. Final Environmental Impact Statement, Land Acquisition and Airspace Establishment to Support Large-Scale Marine Air Ground Task Force Live Fire and Maneuver Training. July 2012.

_____. 2013. Environmental Compliance and Protection Manual. MCO P5090.2A. Headquarters, US Marine Corps. Available from http://www.marines.mil/Portals/59/MCO%20P5090.2A%20W%20CH%201-3.pdf

_____. 2016. Update of Vegetation Map and Non-Native Invasive Species Mapping: 2013–2015. Final. Marine Corps Air Ground Combat Center, Twentynine Palms, California. Contract No. N62473-13-D-4811, Task Order No. 0006. April.

_____. 2017. Supplemental Environmental Impact Statement for Land Acquisition and Airspace Establishment to Support Large-Scale Marine Air Ground Task Force Live-Fire and Maneuver Training, Marine Corps Air Ground Combat Center, Twentynine Palms, California. 289 pages.

_____. 2018a. Final Biological Assessment for Ongoing Training at Marine Corps Air Ground Combat Center, Twentynine Palms, California. February 2018.

_____. 2018b. Final Environmental Assessment for Ongoing Training at Marine Corps Air Ground Combat Center, Twentynine Palms, California. January 2018.

University of California Riverside (UCR). 1993. M*arine Corps Air Ground Combat Center Natural Resources Management Plan, 1992*. Departments of Earth Science and Botany and Plant Sciences, Riverside, CA. Prepared for MCAGCC, Twentynine Palms, CA. through Naval Facilities Engineering Command, Southwestern Division, San Diego, CA. 16 pp + app.

Webb, R.H., J.W. Steiger, and H.G. Wilshire. 1986 *Recovery of Compacted Soils in Mojave Desert Ghost Towns*. Soil Science of America Journal 50(5): 1341-1344.

Woodman, A. P. 2001. Distance Sampling for the Desert Tortoise on the Marine Corps Air Ground Combat Center, Twentynine Palms, California. Report prepared for Southwest Division, Naval Facilities Engineering Command, San Diego, California. 14 pp. plus Appendices.

Woodman, A.P. 2012. Summary report for two demographic plots and health assessments conducted on desert tortoises at the Marine Corps Air Ground Combat Center, Spring and Fall 2009. 26 pages.

Woodman, A. P., G. Goodlett, and J. Westermeier. 2001. Technical Synthesis Report for Desert Tortoise Surveys at Marine Corps Air Ground Combat Center, Twentynine Palms, California. Submitted by Kiva Biological Consulting, in association with Jones & Stokes Associates, Inc. 77 pp. March

6.0 LIST OF PREPARERS

CHRISTENSEN, Walter J.; Editor; Conservation Branch Head, Environmental Affairs Division, Marine Air Ground Task Force Training Command, Twentynine Palms, California. 3 years of experience working at this location. B.S. in Biogeography.

SEGOVIANO, Ilima R.; Contributor/Reviewer/Editor; Natural Resources Specialist, Environmental Affairs, Division, Marine Air Ground Task Force Training Command, Twentynine Palms, California. 2 years of experience working at this location. M.S. in Natural Resources and Environmental Management

HENEN, Brian T.; Contributor / Reviewer; Ecologist, Environmental Affairs Division, Marine Air Ground Task Force Training Command, Twentynine Palms, California. 13 years' experience at this location. PhD Biology.

HUSUNG, Martin B.; Contributor; Natural Resources Specialist, Environmental Affairs Division, Marine Air Ground Task Force Training Command, Twentynine Palms, California. 15 years' experience at this location. B.A Wildlife Biology.

HOTCH, Nora; Contributor; Biological Science Technician, Environmental Affairs Division, Marine Air Ground Task Force Training Command, Twentynine Palms, California. 7 years' experience at this location. B.A. Environmental, Population and Organismic Biology

HARRISON, Janelle L.; Contributor / Reviewer; Cultural Resources Specialist, Environmental Affairs Division, Marine Air Ground Task Force Training Command, Twentynine Palms, California. 1 year of experience at this location.

ELLIOTT, Chris T.; Contributor / Reviewer; Environmental Protection Specialist, Environmental Affairs Division, Marine Air Ground Task Force Training Command, Twentynine Palms, California

VALLS, Joe E.; Contributor / Reviewer; Environmental Compliance Support, Marine Air Ground Task Force Training Command, Environmental Affairs Division, Twentynine Palms, California

KERR, Scott A; Contributor / Reviewer; NEPA Program Manager, Marine Air Ground Task Force Training Command, Environmental Affairs Division, Twentynine Palms, California

BOWLING, Leon J.; Contributor /Reviewer; Officer and RPAO, Marine Air Ground Task Force Training Command, Department of Public Works, Planning Department, Twentynine Palms, California

LEGARDA, Ken; Contributor / Reviewer; MBA Planning Branch/PWD - G4, Marine Air Ground Task Force Training Command, Twentynine Palms, California

BURTON, Mark A.; Contributor; Facilities Planning Specialist, PWD Planning Department, Marine Air Ground Task Force Training Command, Twentynine Palms, California

GELINAS, Timothy K.; Contributor / Reviewer; Range Development Officer, Marine Air Ground Task Force Training Command, Marine Training Directorate, Twentynine Palms, California

FISCHER, Kylie; Contributor / Reviewer; Senior Biologist, MultiMAC Joint Venture, 24 years of experience working with Flora and Fauna in Southern California. B.A. Psychology with Minor in Ecology.

KIMBALL, Nicole; Contributor / Reviewer; Senior Biologist, MultiMAC Joint Venture, 12 years of experience working with flora and fauna in Southern California. B.S. Biology.

EIDSON, Erika; Contributor / Reviewer; Senior Biologist, MultiMAC Joint Venture, 14 years of experience working with flora and fauna in Southern California. B.S. Ecology, Behavior, and Evolution.

ERLICH, Jason; Contributor; Biologist, MultiMAC Joint Venture. B.S. Geography, emphasis in Natural Resources and Environmental Geography.

MASTRELLI, Emily; Contributor; Biologist, MultiMAC Joint Venture. B.A. Biology.

7.0 LIST OF ACRONYMS

The following table presents acronyms used within this document.

AAV	Amphibious Assault Vehicle
ACV	Amphibious Combat Vehicle
ACEC	Area of Critical Environmental Concern
AC/S	Assistant Chief of Staff
AF	Acre Feet
BASH	Bird Airstrike Hazard
BCC	Bird of Conservation Concern
BEARMAT	Range Management Section
BEQ	Bachelor Enlisted Quarters
BGEPA	Bald and Golden Eagle Protection Act of 1940
bgs	Below Ground Surface
BIA	Bureau of Indian Affairs
BLM	Bureau of Land Management
BLS-S	Bureau of Land Management Sensitive
BO	Biological Opinion
BZO	Battle Site Zero
CAMOUT	Combined Arms Military Operations in Urban Terrain
CARB	California Air Resources Board
CATEX	Categorical Exclusion
CAX	Combined Arms Exercise
CCB	Combat Center Bulletin
CCO	Combat Center Order
CDFW	California Department of Fish and Wildlife
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
CLEO	Conservation Law Enforcement Officer
CLEP	Conservation Law Enforcement Program
cm	Centimeter
COGEN	Cogeneration
Combat Center	Marine Air Ground Task Force Training Command Marine Corps Air Ground Combat Center
CRPR	California Rare Plant Ranks
CSC	California Species of Special Concern
CVOT	Combat Vehicle Operator Training Course
CWA	California Water Authority
CY	Calendar Year
DESIFREX	Desert Fire Exercise
DoD	Department of Defense
DMG	Desert Managers Group
EA	Environmental Affairs
EIS	Environmental Impact Statement
ECE	Environmental Compliance Evaluation
EAF	Expeditionary Airfield
EFV	Expeditionary Fighting Vehicle
EIRB	Environmental Impact Review Board
EIS	Environmental Impact Statement
ELCC	Exercise Logistical Coordination Center

EO	Executive Order
EOD	Explosive Ordinance Device
ELISA	Enzyme-Link Immunosorbent Assay
EMUA	Exclusive Military Use Area
ESA	Endangered Species Act
EPA	Environmental Protection Agency
F	Fahrenheit
FAA	Federal Aviation Administration
FARP	Forward Ammunition Resupply Point
FE	Federally Endangered
FEAD	Facilities Engineering & Acquisition Division
FT	Federally Threatened
FINEX	Final Exercise
FLETC	Federal Law Enforcement Training Center
FMF	Fleet Marine Forces
FLB	Forward Logistics Base
FONSI	Finding of No Significant Impact
FP	Fully Protected
FPA	Free Production Allowance
FSC	Facilities Support Contracts
FSCAC	Fire Support Coordination Application Course
FSCEX	Fire Support Coordination Exercise
FSRM	Facilities sustainment, restoration, and modernization
Ft	Feet
FY	Fiscal Year
GIS	Geographical Information System
HQMC	Headquarters, U.S. Marine Corps
HIMARS	High Mobility Artillery Rocket System
HMMWV	High Mobility Multi-Purpose Wheeled Vehicle
ICRMP	Integrated Cultural Resources Management Plan
IED	Improvised Explosive Device
INRMP	Integrated Natural Resources Management Plan
IPMP	Integrated Pest Management
ISD	Installation Support Directorate
ISMP	Invasive Species Management Plan
ITX	Integrated Training Exercise
JDAM	Joint Directed Attack Munitions
JLTV	Joint Light Tactical Vehicle
Km	Kilometer
LandEx	Land Expansion
LAV	Light Armored Vehicles
m	Meter
MAGTF	Marine Air Ground Task Force
MAGTFTC	Marine Air Ground Task Force Training Command
MBTA	Migratory Bird Treaty Act
MCAGCC	Marine Corps Air Ground Combat Center
MCCES	Marine Corps Communications Electronics School
MCO	Marine Corps Order
MDAQMD	Mojave Desert Air Quality Management
MEB	Marine Expeditionary Brigade
mg/L	milligrams per liter

Mi	Mile
ML	Megaliters
MLRS	Multiple Launch Rocket System
MOUT	Military Operations in Urban Terrain
MPH	miles per hour
MPRC	Multi-Purpose Range Complex
MRAP	Mine Resistant Ambush Protected
MSR	Main Supply Route
MTD	MAGTF Training Directorate
NAGPRA	Native American Graves Protection and Repatriation Act
NAVFAC	Naval Facilities Engineering Command
NCRB	Natural and Cultural Resources Branch
NECO	Northern and Eastern Colorado Desert Coordinated Management Plant
NEMO	Northern and Eastern Mojave Planning Effort
NEPA	National Environmental Policy Act
NGO	Non-Governmental Organizations
NHPA	National Historic Preservation Act
NR	Natural Resources
NRCS	Natural Resources Conservation Service
NTC	National Training Center
OHV	Off Highway Vehicles
OMMC	Operations and Maintenance Marine Corps
PA	Programmatic Agreement
PLO	Public Land Order
PRTSS	Pre-designated Range Training Support Site
PTE	Potential to Emit
PTO	Permit to Operate
PWD	Public Works Division
PWO	Public Works Officer
PZ	Precipitation Zone
qPCR	Quantitative Polymerase Chain Reaction
REIR	Request for an Environmental Impact Review
RMB	Resource Management Branch
RMD	Range Management Division
RTAA	Range Training Area and Airspace
RTAMS	Range Training Area Maintenance Section
SAIA	Sikes Act Improvement Act
SE	State Endangered
SELF	Strategic Expeditionary Landing Field
SHPO	State Historic Preservation Officer
SOP	Standard Operating Procedures
ST	State Threatened
SUA	Special Use Area
SWAP	State Wildlife Action Plan
T1	Tribal Species of Special Concern
TA	Training Area
TACP	Tactical Air Control Party
TCP	Traditional Cultural Properties
TDS	Total Dissolved Solids
TP	Training Program

TTECG	Tactical Training Exercise Control Group
TRACRS	Tortoise Research and Captive Rearing Site
TRED	Tortoise Regional Estimate of Density
UAE	United Arab Emirates
UAV	Unmanned Aerial Vehicle
UCLA	University of California at Los Angeles
UCR	University of California, Riverside
UEM	Utilities/Energy Management
URTD	Upper Respiratory Tract Disease
USC	United States Code
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
USMC	United States Marine Corps
UTL	Utilities
UTM	Universal Transverse Mercator
WEA	Western Expansion Area
WFMP	Wildland Fire Management Plan

APPENDIX A

Workplan and Budget

Table A-1 Natural Resources Program 5-Year Workplan									
GOAL 1: Strengthen the Combat Center's Operational Capabilities									
Element 1.1 - Align Natural Resources Management and Mission Sustainment									
Objective 1.1.1 - Reduce the regulatory burden on mission implementation									
Task No.	**Task Description**	**Lead Entity**	**Timeframe**	**NEPA Status**	**FY 18**	**FY19**	**FY20**	**FY21**	**FY 22**
1.1.1-A	Develop a plan that uses the Encroachment Program to minimize impacts from environmental management on the military mission, while maintaining the quality of the Natural Resources Program.	GEA	TBD	COVERED	X				
1.1.1-B	Investigate recovery crediting system with USFWS for use in REPI.	EA	FY 18	COVERED	X				
1.1.1-C	Maintain a preemptive conservation planning strategy to minimize impacts to the military mission from the federal listing of new species.	EA	ONGOING	COVERED	X	X	X	X	X

Objective 1.1.2 - Continue using the Integrated Natural Resources Management Planning process for natural resources management									
Task No.	**Task Description**	**Lead Entity**	**Timeframe**	**NEPA Status**	**FY 18**	**FY19**	**FY20**	**FY21**	**FY 22**
1.1.2-A	Annually report INRMP implementation and effectiveness to USFWS and CDFW. Report due 01 Jan each year, content to cover previous fiscal year.	EA	ANNUALLY	COVERED	X	X	X	X	X
1.1.2-B	Review and revise the INRMP annually in coordination with USFWS, CDFW, and HQMC.	EA	ANNUALLY	COVERED	X	X	X	X	X
1.1.2-C	Formally revise the INRMP every 5 years in coordination with USFWS, CDFW and HWMC as necessary.	EA	5 YEAR	COVERED				X	X
Objective 1.1.3 - Coordinate installation resources management with training area users									
Task No.	**Task Description**	**Lead Entity**	**Timeframe**	**NEPA Status**	**FY 18**	**FY19**	**FY20**	**FY21**	**FY 22**
1.1.3-A	Coordinate guideline establishment for disturbance minimization.	EA	ONGOING	COVERED	X	X	X	X	X
1.1.3-B	Implement the EA Mission Awareness Program.	EA	ONGOING	COVERED	X	X	X	X	X
Objective 1.1.4 - Coordinate installation resources management with regional initiatives and management strategies									
Task No.	**Task Description**	**Lead Entity**	**Timeframe**	**NEPA Status**	**FY 18**	**FY19**	**FY20**	**FY21**	**FY 22**
1.1.4-A	Participate in regional land manager groups such as the Desert Manager's Group and Mojave Weed Management Area, and other desert advisory/management groups, to maintain presence, open communication and ensure alignment of management and monitoring, as applicable, with the larger context of regional issues.	EA	ONGOING	COVERED	X	X	X	X	X

1.1.4-B	Provide support to regional military planning groups.	EA	ONGOING	COVERED	X	X	X	X	X
1.1.4-C	Revise the MOA between the installation and CDFW for cooperative management of Desert Bighorn Sheep on base.	EA	FY 18	COVERED	X				
1.1.4-D	Establish policies and procedures related to tribal access to natural resources aboard the Combat Center					X			
Objective 1.1.5 - Reduce wildlife conflicts									
Task No.	**Task Description**	**Lead Entity**	**Timeframe**	**NEPA Status**	**FY 18**	**FY 19**	**FY 20**	**FY 21**	**FY 22**
1.1.5-A	Revise wildlife conflict SOPs and CCOs.	NR	FY 18	COVERED	X				
1.1.5-B	Respond to requirements for wildlife control aboard the Combat Center and maintain actions in a log.	NR	ONGOING	COVERED	X	X	X	X	X
1.1.5-C	Identify and take appropriate actions to control Africanized honey bees.	PWD	ONGOING	COVERED	X	X	X	X	X
1.1.5-D	Develop a Canid Management Plan.	NR	FY 19	COVERED		X	X		
1.1.5-E	Develop a coyote depredation CCO.	CLEP	FY 18	COVERED	X				
1.1.5-F	Implement targeted canid depredation (e.g. trapping and shooting).	NR	ONGOING	COVERED	X	X	X	X	X
1.1.5-G	Develop and implement an annual, on-base community outreach plan for wildlife safety.	NR	ONGOING start FY 18	COVERED	X	X	X	X	X

Objective 1.1.6 - Provide for adequate staff support to the Natural Resources Program									
Task No.	**Task Description**	**Lead Entity**	**Timeframe**	**NEPA Status**	**FY 18**	**FY19**	**FY20**	**FY21**	**FY 22**
1.1.6-A	Ensure staffing levels are adequate to implement the Combat Center Natural Resources Management Program.	CG	ONGOING	COVERED	X	X	X	X	X
1.1.6-B	Maintain an official representative who is designated responsible for ensuring ongoing compliance with all protective measures in the basewide training and expansion BOs.	EA	ONGOING	COVERED	X	X	X	X	X
1.1.6-C	Ensure annual Individual Development Plans are generated for each NR staff person, and quality trainings are included, to assist with INRMP implementation.	NR	ANNUAL	COVERED	X	X	X	X	X
1.1.6-D	Ensure attendance at relevant Desert Tortoise Council Workshops is included in all NR individual development plans.	EA	AS NEEDED	COVERED	X	X	X	X	X
1.1.6-E	Support, as funding allows, implementation of individual IDPs.	NR	ONGOING	COVERED	X	X	X	X	X
Element 1.2 Training Lands Degradation Minimization									
Objective 1.2.1 - Minimize damage to training lands, disturbance to natural resources and ensure ongoing coordination with military planners									
Task No.	**Task Description**	**Lead Entity**	**Timeframe**	**NEPA Status**	**FY 18**	**FY 19**	**FY 20**	**FY 21**	**FY 22**
1.2.1-A	Consider natural resources when developing and executing cleanup and restoration projects.	EA	ONGOING	COVERED	X	X	X	X	X
1.2.1-B	Create additional Predesignated Range Training Support Sites.	MTD	FYs 19-20	NFA		X	X		

Objective 1.2.2 - Design roads to benefit both military use and conservation									
Task No.	**Task Description**	**Lead Entity**	**Timeframe**	**NEPA Status**	**FY 18**	**FY 19**	**FY 20**	**FY 21**	**FY 22**
1.2.2-A	Identify future road network requirements.	MTD	TBD	COVERED		TBD	TBD	TBD	TBD
1.2.2-B	Identify opportunities for road realignments to reduce resources impacts.	NR	FY 19	COVERED		X			
1.2.2-C	Identify and add road design elements to existing and planned roads to minimize erosion and facilitate safe passage of Desert Tortoise across the landscape.	NR	FY 20	COVERED					X
1.2.2-D	Assess whether recurring storm damage to roads results from training impacts to adjacent lands (e.g... via veg, soil structure alterations, berm placement, etc...).	EA	FYs 19-20	COVERED				X	X
Objective 1.2.3 - Prevent damage to sensitive areas									
Task No.	**Task Description**	**Lead Entity**	**Timeframe**	**NEPA Status**	**FY 18**	**FY 19**	**FY 20**	**FY 21**	**FY 22**
1.2.3-A	Develop and implement a uniform conservation marking system for signage and boundary delineation (e.g. fencing) to support requirements of military training.	EA	FY 18	COVERED	X				
1.2.3-B	Identify sensitive areas where damage will trigger future encroachment.	NR	EVERY OTHER YEAR	COVERED		X		X	
1.2.3-C	Ensure Special Use Areas are incorporated into Combat Center Orders and MIM.	MTD	EVERY OTHER YEAR	COVERED		X		X	

Element 1.3 - Ensure NEPA Compliance

Objective 1.3.1 - Use an established NEPA review process to identify projects and activities on the Combat Center that might impact natural resources and work with project planners to resolve issues early in the planning process.

Task No.	Task Description	Lead Entity	Timeframe	NEPA Status	FY 18	FY 19	FY 20	FY 21	FY 22
1.3.1-A	Within 2 weeks of the request, review and respond to Requests for Environmental Impact Reviews (REIRs) in the NEPA PAMS system.	EA	ONGOING	COVERED	X	X	X	X	X
1.3.1-B	Develop a Natural Resource Reference Manual for Environmental Assessments and Environmental Impact Statements to reference.	NR	FY20	COVERED			X	X	

Objective 1.3.2 - Maintain and acquire any necessary environmental reviews, permits and other legal authorizations to operate the Natural Resources Program

Task No.	Task Description	Lead Entity	Timeframe	NEPA Status	FY 18	FY 19	FY 20	FY 21	FY 22
1.3.2-A	Develop a schedule for all natural resources permit reporting requirements, points of contact, and data needs. Incorporate and validate this information in the INRMP and ensure timely submissions.	NR	FY 18	COVERED	X				

GOAL 2: Support Natural Systems on the Landscape

Element 2.1 Coordinated Ecosystem Management

Objective 2.1.1 - Develop management strategies and projects that provide local as well as regional benefits

Task No.	Task Description	Lead Entity	Timeframe	NEPA Status	FY 18	FY 19	FY 20	FY 21	FY 22
2.1.1 - A	Consider regional resource planning groups priorities (e.g. DMG, MOG, RIT, etc.) when developing resources management projects.	NR	ONGOING	COVERED	X	X	X	X	X
2.1.1 - B	Maintain a current list of regional contacts relevant to natural resources management.	NR	ONGOING	COVERED	X	X	X	X	X
2.1.1-C	Coordinate Natural Resources Program operations with local stakeholders (JTNP, BLM, MDLT, USFWS, CDFW) to enhance management and monitoring activities.	NR	ONGOING	COVERED	X	X	X	X	X
2.1.1-D	Work with BLM to develop a cooperative resources management strategy for the SUA.	NR	FYs 18 -19	COVERED	X	X			
2.1.1-E	Evaluate the application of appropriate land use restrictions for the conservation of natural resources	NR	FYs 18 -19	COVERED	X	X			

Element 2.2 - Landscape Level Planning									
Objective 2.2.1 - Use landscape level planning to alter limiting factors and promote priority endemic species									
Task No.	**Task Description**	**Lead Entity**	**Timeframe**	**NEPA Status**	**FY 18**	**FY 19**	**FY 20**	**FY 21**	**FY 22**
2.2.1-A	Update the natural resources library and build a digital, geospatial database of all data associated with natural resources management.	NR	FY 18	COVERED	X	X	X	X	X
2.2.1-B	Develop and implement a method to inventory and assess baseline trend data of ecological conditions for all washes and canyons.	NR	FY 19; then ONGOING	COVERED		X	X	X	X
2.2.1-C	Develop a study to determine the effects of aquifer use on vegetation communities.	NR	FYs 19-20	COVERED		X	X		
Objective 2.2.2: Manage for climate change by ensuring suitable habitat exists for species, including habitat connectivity across and beyond the base boundaries as appropriate, and is maintained under an altered climate regime.									
Task No.	**Task Description**	**Lead Entity**	**Timeframe**	**NEPA Status**	**FY 18**	**FY 19**	**FY 20**	**FY 21**	**FY 22**
2.2.2-A	Develop element and task-level priorities for addressing climate change in the INRMP.	NR	FY 18	COVERED	X				
2.2.2-B	Develop climate change refugia models for sensitive species on base (other than desert tortoise).	NR	3 YEARS	COVERED	X	X	TBD		
2.2.2-C	Study existing and potential corridors for bighorn sheep; investigate where improvements in habitat resources would minimize conflicts with training exercises and maintain adequate geneflow across the installation under an altered climate regime.	NR	FY 20	COVERED				TBD	

Element 2.3 Habitat Management									
Objective 2.3.1 - Survey and monitor habitat to assess trends in quality over time									
Task No.	**Task Description**	**Lead Entity**	**Timeframe**	**NEPA Status**	**FY 18**	**FY 19**	**FY 20**	**FY 21**	**FY 22**
2.3.1-A	Revise and maintain a floral management plan which identifies priority species (including but not limited to rare plants), regular monitoring frequencies for priority habitat features. Monitor to ensure trends in health and quality over time. Incorporate adaptive management into monitoring after the second year.	NR	ONGOING	COVERED	X	X	X	X	X
2.3.1-B	Maintain a database of survey and monitoring findings, including Federal and State status as appropriate.	NR	ONGOING	COVERED	X	X	X	X	X
2.3.1-C	Map plant associations in expansion areas using the base's 2016 standardized protocol and integrate GIS data into the existing database.	NR	EVERY 5 YEARS	COVERED	X	X	X	X	X
2.3.1-D	Conduct sensitive plant surveys.	NR	ANNUALLY	COVERED	X	X	X	X	X
2.3.1-E	Update herbarium mounts.	NR	ONGOING	COVERED	X	X	X	X	X
Objective 2.3.2 - Monitor training related changes to vegetation									
Task No.	**Task Description**	**Lead Entity**	**Timeframe**	**NEPA Status**	**FY 18**	**FY 19**	**FY 20**	**FY 21**	**FY 22**
2.3.2-A	Identify long-term monitoring locations and controls within the expansion area.	NR	FY 19	COVERED		X			
2.3.2-B	Collect baseline data at monitoring locations and control locations.	NR	EVERY 3 YEARS	COVERED		X			X

Objective 2.3.3 - Maintain and modify existing habitat as necessary to support healthy floral and faunal population sizes and biodiversity									
Task No.	**Task Description**	**Lead Entity**	**Timeframe**	**NEPA Status**	**FY 18**	**FY 19**	**FY 20**	**FY 21**	**FY 22**
2.3.3-A	Annually maintain existing guzzlers and coordinate efforts with the Society for the Conservation of Bighorn Sheep.	NR	ANNUALLY	COVERED	X	X	X	X	X
2.3.3-B	Install new guzzlers to support wildlife transit across the full extent of mountains on base, and monitor new guzzlers to confirm wildlife usage.	NR	FY 18	NFA	X	X			
2.3.3-C	Monitor bat gates to inspect for trespass and condition.	NR	FY 19	COVERED			X		
2.3.3-D	Evaluate mine entrances, caves, adits, shafts, tunnels and pits for wildlife activity to identify where the installation of bat gates and other barriers may benefit existing wildlife populations.	NR	FYs 20-21	COVERED			X	X	
2.3.3-E	Develop an annual fencing/signage/cleanup plan, with assistance from CLEOs.	NR	ANNUALLY	COVERED	X	X	X	X	X
2.3.3-F	Maintain existing and install new fencing and signage in pre-identified areas, including the base boundary, to reduce encroachment and enforce management prescriptions.	NR	ANNUALLY	NFA	X	X	X	X	X
Element 2.4 - Wildlife Management									
Objective 2.4.1 - Perform general wildlife inventories and monitoring to support self-sustaining populations while maintaining training lands									
Task No.	**Task Description**	**Lead Entity**	**Timeframe**	**NEPA Status**	**FY 18**	**FY 19**	**FY 20**	**FY 21**	**FY 22**
2.4.1-A	Develop a faunal monitoring plan.	NR	ANNUALLY	COVERED	X				

2.4.1-B	Update the combat center species database with grey literature produced here on base after Cutler 1999.	NR	ONGOING	COVERED	X	X	X	X	X
2.4.1-C	Jointly survey and monitor the Combat Center's bighorn sheep population with CDFW to determine status, distribution and abundance.	NR	2 YEARS, EVERY 5 YEARS	NFA				X	X
2.4.1-D	Resurvey for bats.	NR	FYs 19-20	COVERED		X	X		
2.4.1-E	Resurvey for Pallid San Diego pocket mouse in expansion area.	NR	FYs 18-19	COVERED	X	X			
2.4.1-F	Map suitable habitat for chuckwalla and identify survey gaps.	NR	FY 22	COVERED					X
2.4.1 - G	Map suitable Mojave Fringe-Toed Lizard habitat on base and identify survey gaps. Fill some of the identified survey gaps for MFTL.	NR	FYs 21-22	COVERED				X	X
Objective 2.4.2 - Ensure state-listed species are considered in the Combat Center actions									
Task No.	**Task Description**	**Lead Entity**	**Timeframe**	**NEPA Status**	**FY 18**	**FY 19**	**FY 20**	**FY 21**	**FY 22**
2.4.2-A	Annually update the state sensitive species list.	NR	ANNUALLY	COVERED	X	X	X	X	X
2.4.2-B	Develop special conservation measures for use in NEPA Project Review for State-Listed Species.	NR	FY 19	COVERED		X			
Objective 2.4.3 - Provide other general, or otherwise miscellaneous, wildlife management support services									
Task No.	**Task Description**	**Lead Entity**	**Timeframe**	**NEPA Status**	**FY 18**	**FY 19**	**FY 20**	**FY 21**	**FY 22**
2.4.3-A	Obtain access to a wildlife rehabilitation facility for rehab services.	NR	FY 18	COVERED	X	X	X	X	X
2.4.3-B	Monitor and report on Bird Air Strike Hazards.	SELF	ONGOING	COVERED	X	X	X	X	X

2.4.4-C	Review and revise the BASH to evaluate landing areas outside of Camp Wilson.	NR	FY 20	COVERED			TBD		
Objective 2.4.4 - Restore and rehabilitate training lands when feasible									
Task No.	**Task Description**	**Lead Entity**	**Timeframe**	**NEPA Status**	**FY 18**	**FY 19**	**FY 20**	**FY 21**	**FY 22**
2.4.4-A	Evaluate methods and costs for common restoration efforts.	NR	ONGOING	COVERED	X	X	X	X	X
2.4.4-B	Develop "a toolbox" of restoration practice recommendations for consideration at higher value locations and include climate change considerations as applicable.	NR	ANNUALLY	COVERED	X	X	X	X	
Element 2.5 - Wet Areas Management									
Objective 2.5.1: Manage wet areas to protect their ecosystem functionality.									
Task No.	**Task Description**	**Lead Entity**	**Timeframe**	**NEPA Status**	**FY 18**	**FY 19**	**FY 20**	**FY 21**	**FY 22**
2.5.1-A	Inventory natural and artificial water sources.	NR	FY 18	COVERED	X				
2.5.1-B	Assess the condition of abiotic and biotic resources at existing water sources, both natural and man-made (egg. Guzzlers).	NR	EVERY 5 YEARS	COVERED	X	X			X
2.5.1-C	Annually monitor the use of natural and artificial water sources.	NR	ANNUALLY	COVERED	X	X	X	X	X
Element 2.6 - Invasive Species Management									
Objective 2.6.1 - Prevent, contain and slow the spread of invasive species aboard the Combat Center to conserve and enhance native species and functionality of natural systems									
Task No.	**Task Description**	**Lead Entity**	**Timeframe**	**NEPA Status**	**FY 18**	**FY 19**	**FY 20**	**FY 21**	**FY 22**
2.6.1-A	Develop a risk-based list of priority invasive species.	NR	FY 18	COVERED	X				

2.6.2-B	Compile historical occurrence data and perform limited, low-cost field surveys to map the occurrence of priority invasives on the landscape.	NR	FY 19	NFA	X	X	X	X	X
2.6.2-C	Formulate and cost out control measures. Implement measures. Monitor effectiveness over time.	NR	FY 19-22	COVERED	X	X	X	X	X
Element 2.7 - Wildfire Management									
Objective 2.7.1 - Revise the Wildfire Management Plan for the Combat Center									
Task No.	**Task Description**	**Lead Entity**	**Timeframe**	**NEPA Status**	**FY 18**	**FY 19**	**FY 20**	**FY 21**	**FY 22**
2.7.1-A	Incorporate and validate wildfire prevention in range CCO.	MTD	FY 19	COVERED		X			
2.7.1-B	Maintain a GIS shapefile of burnable acres and if a fire occurs, update the layer to begin tracking locations of burned acres and monitoring of post-fire effects.	NR	ONGOING	COVERED	X	X	X	X	X
2.7.1-C	As a proactive measure, inventory treatment methods for burned areas to reduce soil erosion and invasion by exotic species.	NR	FY 21	COVERED				X	
2.7.1-D	Ensure the Wildfire Management Plan is revised once every 5 years.	MA	FY 18	COVERED	X				TBD
Element 2.8 - Mainside Grounds Management Support									
Objective 2.8.1 - Ensure that Mainside landscaping and grounds maintenance are integrated and consistent with natural resources goals and objectives									
Task No.	**Task Description**	**Lead Entity**	**Timeframe**	**NEPA Status**	**FY 18**	**FY 19**	**FY 20**	**FY 21**	**FY 22**

2.8.1-A	Develop a conservation plan for the Curation Center using the conservation planning process to address resource concerns associated with soil erosion and irrigation inefficiencies, and determine whether an energy audit is needed. Ensure any practice recommendations selected are cost-effective.	NR	FYs 19-20	COVERED		X	X		
2.8.1-B	Ensure that xeriscape principals and native plant emphases are incorporated in landscaping projects through regular revisions of the approved plant list, the Base Exterior Architecture Plan, and regular professional input to projects.	NR	ONGOING	COVERED	X	X	X	X	X
2.8.1-C	Develop/validate the CCO for native landscaping.	NR	FY 20	COVERED			X		
2.8.1-D	Develop a vegetation trimming SOP	NR	FY 18	COVERED	X				

GOAL 3: Manage Federally Protected Species

Element 3.1 - Desert Tortoise Management

Objective 3.1.1 - Inventory and regularly monitor desert tortoise using standardized protocols to improve the understanding of long-term population trends aboard the Combat Center

Task No.	Task Description	Lead Entity	Timeframe	NEPA Status	FY 18	FY19	FY20	FY21	FY 22
3.1.1- A	Update tortoise density information for installation lands.	NR	ANNUALLY	COVERED	X	X	X	X	X
3.1.1- B	Monitor long-term study plots on a 3-year rotation.	NR	ANNUALLY	COVERED	X	X	X	X	X

3.1.1- C	Monitor desert tortoise habitat condition.	NR	ANNUALLY	COVERED	X	TBD	X	X	X
Objective 3.1.2 - Inventory and monitor to identify threats to the desert tortoise									
Task No.	**Task Description**	**Lead Entity**	**Timeframe**	**NEPA Status**	**FY 18**	**FY19**	**FY20**	**FY21**	**FY 22**
3.1.2- A	Examine disturbance effects on desert tortoise population health.	NR	FYs 18-20	COVERED	X	X	X		
3.1.2-B	Support the Spatial Data Support System (SDSS) prioritizing conservation actions.	NR	ONGOING	COVERED	X	X	X	X	X
3.1.2- C	Conduct desert tortoise predator assessments (mostly raven, coyote).	NR	ANNUALLY	COVERED	X	X	X	X	X
3.1.2-D	Investigate effects of contaminants on desert tortoise health.	NR	FYs 18-19	COVERED	X	X			
Objective 3.1.3 - Perform health assessments to further the Combat Center's knowledge of desert tortoise health aboard the installation									
Task No.	**Task Description**	**Lead Entity**	**Timeframe**	**NEPA Status**	**FY 18**	**FY19**	**FY20**	**FY21**	**FY 22**
3.1.3-A	Perform health assessments on established plots, in restricted areas, and elsewhere on base as needed.	NR	ONGOING	COVERED	X	X	X	X	X
3.1.3-B	Perform necropsies on desert tortoises to detect trends for mortality and emergent infectious diseases.	NR	ONGOING	COVERED	X	X	X	X	X
3.1.3-C	Maintain awareness of emergent desert tortoise health issues.	NR	ONGOING	COVERED	X	X	X	X	X
Objective 3.1.4 - Minimize tortoise injury and mortality aboard the Combat Center									
Task No.	**Task Description**	**Lead Entity**	**Timeframe**	**NEPA Status**	**FY 18**	**FY19**	**FY20**	**FY21**	**FY 22**
3.1.4 - A	Develop a Raven Management Plan.	NR	FY 18	COVERED	X				
3.1.4 - B	Apply for and maintain a MBTA depredation permit for ravens.	NR	ANNUALLY	NFA	X	x	x	x	x

Objective 3.1.5 - Operate TRACRS to contribute to the recovery and eventual delisting of the desert tortoise									
Task No.	**Task Description**	**Lead Entity**	**Timeframe**	**NEPA Status**	**FY 18**	**FY19**	**FY20**	**FY21**	**FY 22**
3.1.5- A	Manage the TRACRS facility.	NR	ONGOING	COVERED	X	X	X	X	X
3.1.5- B	Monitor desert tortoise nests for growth.	NR	ONGOING	COVERED	X	X	X	X	X
3.1.5- C	Monitor release of desert tortoises.	NR	ONGOING	COVERED	X	X	X	X	X
Objective 3.1.6 - Implement the following required provisions from the Biological Opinion for Desert Tortoise: General Conservation Measures, Reasonable and Prudent Measures, Terms and Conditions, Conservation Recommendations; and required provisions from the 2017 SEIS									
Task No.	**Task Description**	**Lead Entity**	**Timeframe**	**NEPA Status**	**FY 18**	**FY19**	**FY20**	**FY21**	**FY 22**
3.1.6-A	Conduct line distance sampling to monitor tortoise density and recovery in the Ord/Rodman ACEC.	NR	ANNUALLY	COVERED	X	X	X	X	X
3.1.6-B	Maintain a record of all observations of desert tortoise encountered at the Combat Center.	NR	ONGOING	COVERED	X	X	X	X	X
3.1.6-C	Provide an annual report to the USFWS, due March 31, which summarizes all required reporting information outlined in the B.O.	NR	ANNUALLY	COVERED	X	X	X	X	X
3.1.6-D	Install OHV barriers, rehabilitate unauthorized route, and maintain over time, in the Ord/Rodman ACEC.	NR	ONGOING	COVERED	X	X	X	X	X
3.1.6-E	Perform post-translocation monitoring.	NR	ONGOING	COVERED	X	X	X	X	X
3.1.6-F	Perform post-translocation research.	NR	ONGOING	COVERED	X	X	X	X	X
3.1.6-G	Conduct regular patrols of translocation recipient sites.	CLEO	ONGOING	COVERED	X	X	X	X	X
Objective 3.1.7 - Improve desert tortoise population numbers aboard the installation and support recovery of the population aboard the installation and in adjacent recovery unit; apply appropriate land-use restrictions to high-density tortoise population areas aboard the installation that balance training and natural and fiscal resource requirements.									

Task No.	Task Description	Lead Entity	Timeframe	NEPA Status	FY 18	FY19	FY20	FY21	FY 22
3.1.7- A	Develop a population augmentation initiative with USFWS and CDFW.	NR	FY 18	COVERED	X	X	X		
3.1.7- B	Use the habitat assessment study to identify habitat quality variables that influence the tortoise and may be positively influenced aboard the installation.	NR	ONGOING	COVERED	X	X	X	X	X
Element 3.2 - Other Sensitive Species									
Objective 3.2.1 - Comply with the Migratory Bird Treaty Act and its implementing regulations while meeting mission requirements									
Task No.	**Task Description**	**Lead Entity**	**Timeframe**	**NEPA Status**	**FY 18**	**FY19**	**FY20**	**FY21**	**FY 22**
3.2.1- A	Provide an annual report, required by the Special Purpose Permit, to continue authorization to relocate nests and transport sick or injured birds.	NR	ANNUALLY	COVERED	X	X	X	X	X
3.2.1- B	Expand burrowing owl surveys, including the expansion area.	NR	FY 20	COVERED			X	X	
3.2.1-C	Place anti-roosting and anti-nesting devices, as appropriate, on facilities in training areas, and Mainside.	NR	ONGOING	NFA	X	X	X	X	X
Objective 3.2.2 - Comply with the Bald Eagle and Golden Eagle Protection Act and its implementing regulations									
Task No.	**Task Description**	**Lead Entity**	**Timeframe**	**NEPA Status**	**FY 18**	**FY19**	**FY20**	**FY21**	**FY 22**
3.2.2- A	Conduct regular aerial surveys for eagles within range training areas.	NR	2 consecutive years, every 5 years	COVERED		X	X		
3.2.2- B	Identify and monitor eagle nesting locations.								
Objective 3.2.3 - Ensure conservation benefits can be provided for candidate species which occur on base and are proposed for federal listing by developing species-specific conservation plans									
Task No.	**Task Description**	**Lead Entity**	**Timeframe**	**NEPA Status**	**FY 18**	**FY19**	**FY20**	**FY21**	**FY 22**

3.2.3-A	Maintain awareness of emerging candidate species for federal listing.	NR	PRIOR TO LISTING	COVERED	X	X	X	X	X
3.2.3-B	Develop a management plan in coordination with USFWS to address any species approved for listing.	NR	YEAR 1 OF LISTING	COVERED	TBD	TBD	TBD	TBD	TBD

GOAL 4: Support Other Uses and Engagement

Element 4.1 - Outdoor Recreation

Objective 4.1.1 - Support the access and sustainable use of on-base natural resources by the general public and military interest groups by establishing a hunting program

Task No.	Task Description	Lead Entity	Timeframe	NEPA Status	FY 18	FY19	FY20	FY21	FY 22
4.1.1- A	Identify game management priorities for a hunting program.	NR & CLEP	FY 18	COVERED	X				
4.1.1- B	Provide on-base hunter safety training.	CLEP	ONGOING start FY19	COVERED		X	X	X	X
4.1.1- C	Develop a CCO on hunting.	CLEP	FY 19	NFA			X		

Objective 4.1.2 - Support the access and sustainable use of on-base natural resources by the general public and military interest groups by identifying and developing other outdoor recreational opportunities on the Combat Center

Task No.	Task Description	Lead Entity	Timeframe	NEPA Status	FY 18	FY19	FY20	FY21	FY 22
4.1.2-A	Develop formal outdoor recreational plan.	NR		COVERED			X		
4.1.2- B	Develop, as outlined in plan, a multi-use area for outdoor education and recreation activities.	NR	FYs 19-21	NFA		X	X	X	
4.1.2- C	Identify other potential recreation opportunities.	NR	ONGOING	COVERED	X	X	X	X	X

Element 4.2 - Conservation Law Enforcement

Objective 4.2.1 - Operate a Conservation Law Enforcement Program to prevent exploitation of the natural resources from occurring on the installation

Task No.	Task Description	Lead Entity	Timeframe	NEPA Status	FY 18	FY19	FY20	FY21	FY 22
4.2.1-A	Develop CLEO SOPs.	CLEP	FY 18	COVERED	X				
4.2.1-B	Annually review CLEO SOPs.	CLEP	ANNUALLY	COVERED		X	X	X	X
4.2.1-C	Monitor for natural resources degradation and exploitation, and reduce illegal trespass, OHV activity, and lawlessness in range training areas.	CLEP	ONGOING	COVERED	X	X	X	X	X
4.2.1-D	Conduct investigations of violations of Natural Resources law and take appropriate action.	CLEP	ONGOING	COVERED	X	X	X	X	X
4.2.1-E	Ensure all CLEOs are certified in Federal Law Enforcement Training Center's (FLETC) Land Management Police Training (LMPT).	CLEP	ONGOING	COVERED	X	X	X	X	X
4.2.1-F	Send CLEOs to relevant workshops put on by the Desert Tortoise Council.	CLEP	ONGOING	COVERED	X	X	X	X	X
4.2.1-G	Provide all CLEOs with regular training in resources to enhance their skillset.	CLEP	ONGOING	COVERED	X	X	X	X	X
4.2.1-H	Develop and maintain CLEO resources monitoring reference books in electronic and hardcopy formats.	NR	ANNUALLY	COVERED	X	X	X	X	X
4.2.1-I	Develop and implement an agreement with BLM regarding patrol of translocation recipient sites.	NR	FY 18	COVERED	X	X	X	X	X
Element 4.3 - Environmental Awareness									
Objective 4.3.1: Encourage awareness of natural resources for internal stakeholders									
Task No.	**Task Description**	**Lead Entity**	**Timeframe**	**NEPA Status**	**FY 18**	**FY19**	**FY20**	**FY21**	**FY 22**

4.3.1- A	Update/revise the contractor field briefing video.	NR	ANNUALLY	COVERED	X	X	X	X	X
4.3.1-B	Revise range briefings and develop appropriate handouts.	NR	ANNUALLY	COVERED		X	X	X	X
4.3.1-C	Provide natural resources information at on-base community outreach events.	NR	ONGOING	COVERED	X	X	X	X	X
4.3.1-D	Develop a natural resources education program for the curation center to host for the marine community (backyard birding, earth day, guided hikes, get to know your species, desert ecology lectures, etc.…).	NR	FY 18; then ONGOING	COVERED	X	X	X	X	X
4.3.1-E	Develop a Native American plant use outreach interpretive module.	NR	FY 18	COVERED	X				
4.3.1-F	Update EA website	NR	ONGOING	COVERED	X	X	X	X	X
4.3.1-G	Assess the condition of interpretive signage on-base; replace and add additional signage as necessary.	NR	ONGOING	NFA	X	X	X	X	X
4.3.1-H	Maintain a volunteer program for community to assist EA with general functions (taxidermy, support with marsh bird monitoring and desert tortoise tracking, seed collection, weed treatments, etc.…)	NR	ONGOING	COVERED	X	X	X	X	X
4.3.1-I	Develop a volunteer management plan identifying tasks, opportunities (internships), etc.… to secure external support for NR initiatives.	NR	FY 18	COVERED	X				
4.3.1-J	Develop a pollinator initiative aboard the Combat Center.	NR	ONGOING	COVERED	X	X	X	X	X
	Objective 4.3.2 - Encourage awareness of natural resources for external stakeholders								

Task No.	Task Description	Lead Entity	Timeframe	NEPA Status	FY 18	FY19	FY20	FY21	FY 22
4.3.2- A	Provide natural resources information at external community outreach events.	NR	ONGOING	COVERED	X	X	X	X	X
4.3.2- B	Develop an Educational Outreach Plan working with local leaders, communities and groups to promote awareness of environmental sensitivity and responsible OHV use.	GEA	ONGOING	COVERED	X	X	X	X	X

Workplan Key

Task No.	Coding for the task no. developed using the following approach: Goal #. Element #. Ob. # - Task Letter
Task Description	This section provides a general discussion of the proposed task.
Lead Entity	The entities identified in the workplan include: CG - Commanding General CLEP - Conservation Law Enforcement Program EA - Environmental Affairs GEA - Government and External Affairs MA - Mission Assurance MTD - MAGTFTC training directorate NR - Natural Resources PWD - Public Works Department RTAMS - Range Training and Maintenance SELF - Sustained Expeditionary Landing Field
Timeframe	The different types of project timeframes are described below: ONGOING - happens more than once a year over multiple years ANNUALLY - happens once a year over multiple years EVERY X YEARS - recurs on a regular, multi-year frequency FY(s) - One-time events, identified by the fiscal year(s) in which they are planned.
NEPA Status	COVERED - task is covered by INRMP analysis (or is already covered by another NEPA analysis; we are considering that all actions identified as "covered" have minimal negative impacts on the environment and therefore can be analyzed here, even if already analyzed under another document). NFA - Needs future (later) analysis
FY 18 - FY 22	This is the 5 Year Schedule for project implementation. It reflects two things - the years in which funding requests are planned, and the years in which implementation activities may occur. Coding is described below. $#, ### - Funding requests currently budgeted in STEP are identified in dollars under the year in which the request is planned X - indicates planned implementation activities (without a specific FY fund request) TBD - indicates "to be determined," this code indicates a funding request, and/or general implementation activity, may occur at a later time.

APPENDIX B
Environmental Assessment

Document to be included during final printing.

APPENDIX C

Plant Species

	Scientific Name	Common Name	Special Status	Reference
Pteridaceae				
	Cheilanthus parryi	Parry's Lip Fern		2
	Notholaena parryi	Cloak-fern		1
Ephedraceae				
	Ephedra aspera	Boundary Ephedra		1, 9
	Ephedra californica	California Ephedra		1, 9
	Ephedra funerea	Death Valley Ephedra		1
	Ephedra nevadensis	Nevada Ephedra		1
	Ephedra viridis	Green Ephedra		1
Aizoaceae				
*	*Mesembryanthemum nodiflorum*	Slender-leaved iceplant		1
*	*Sesuvium verrucosum*	Western Sea-purslane		1
Amaranthaceae				
*	*Amaranthus albus*	Tumbleweed		1
	Amaranthus blitoides	Procumbent Amaranth		1
	Amaranthus fimbriatus	Fringed Amaranth		1
	Tidestromia oblongifolia	Honeysweet		1
Apiaceae				
	Cymopterus mulitnervatus	Purple-nerve Cymopterus	CRPR 2B.2	1
	Cymopterus panamintensis var. acutifolius	Panamint Springparsley		1
	Lomatium parryi	Parry's Lomatium		1
Apocynaceae				
	Amsonia tomentosa	Woolly Bluestar		1
	Asclepias albicans	White-stemmed Milkweed		1
	Asclepias erosa	Desert Milkweed		1, 9
	Asclepias subulata	Rush Milkweed		1
	Funastrum crispum	Rigid Climbing Milkweed		1
	Funastrum utahense	Utah Vine Milkweed	CRPR 4.2	1, 2, 5, 8, 9
	Matelea parvifolia	Spearleaf	CRPR 2B.3	2, 5, 8
Asteraceae				
	Acamptopappus sphaerocephalus var. hirtellus	Hairy Rayless Goldenhead		1
	Adenophyllum cooperis	Cooper's Dogweed		1
	Adenophyllum porophylloides	San Felipe Dogweed		1
	Ambrosia acnathicarpa	Annual Bur-sage		1

Scientific Name		Common Name	Special Status	Reference
	Ambrosia dumosa	White Bur-sage		1, 8, 9
	Ambrosia salsola var. salsola	Cheesebush		1, 8, 9
	Anisocoma acaulis	Scalebud		1
	Atrichoseris platyphylla	Parachute Plant		1, 9
	Baccharis brachyphylla	Shortleaf Baccharis		1
	Bahiopsis parishii	Parhish's Goldeneye		1, 9
	Baileya multiradiata	Many Ray Desert Marigold		1
	Baileya pauciradiata	Short Ray Desert Marigold		1, 9
	Baileya pleniradiata	Woolly Desert Marigold		1
	Bebbia juncea var. aspera	Sweetbush		1, 8, 9
	Brickellia atractyloides var. arguta	Pungent Brickelbush		1
	Brickellia californica	California Brickelbush		1
	Brickellia desertorum	Desert Brickelbush		1, 9
	Brickellia incana	Woolly Brickelbush		1
	Calycoseris parryi	Yellow Tack-stem		1, 9
	Chaenactis carphoclinia var. carphoclinia	Pebble Pincushion		1
	Chaenactis fremontii	Fremont's Pincushioni		1, 9
	Chaenactis stevioides	Desert Pincushion		1, 9
	Dicoria canescens	Desert Twinbugs		1, 8
*	*Dimorphotheca sinuata*	Namaqualand Cape Marigold		1
	Encelia actoni	Acton's Encelia		1
	Encelia farinosa	Brittlebush		1, 8, 9
	Encelia frutescens	Rayless Encelia		1, 8
	Encelia virginensis	Virgin River Encelia		9
	Ericameria coooperi var. cooperi	Cooper's Goldenbush		9
	Ericameria cuneata var. spathulata	Wide Wedgeleaf Goldenbush		1
	Ericameria paniculata	Spreading Rabbitbush		1
	Erigeron canadensis	Horseweed		1
	Erigeron divergens	Spreading Daisy		1
	Eriophyllum lanosum	Heavy Woolly Sunflower		9
	Eriophyllum mohavense	Barstow Woolly Sunflower	CRPR 1B.2	5, 8
	Eriophyllum wallacei	Wallace's Woolly Sunflower		1, 9
	Geraea canescens	Desert Sunflower		1, 9
	Glyptopleura marginata	Carveseed		1
	Gutierrezia microcephala	Sticky Snakeweed		1
	Gutierrezia sarothrae	Matchweed		1
	Heterotheca grandiflora	Telegraph Weed		1
	Isocoma acradenia	Alkali Goldenbush		1

Scientific Name		Common Name	Special Status	Reference
*	*Lactuca serriola*	Prickly Lettuce		1
	Laennecia coulteri	Coulter's Horseweed		1
	Lasthenia glabrata ssp. coulteri	Coulter's Goldfields	CRPR 1B.1	2, 5, 8
	Layia glandulosa	White Tidy-tips		1, 9
	Lepidospartum squamatum	California Broomsage		1
	Leptosyne bigelovii	Bigelow's Tickseed		1, 9
	Leptosyne californica	California Tickseed		1
	Logfia arizonica	Arizona Cottonrose		1
	Logfia depressa	Dented Cottonrose		1
	Logfia filaginoides	California Cottonrose		1, 9
	Malacothrix californica	California Desert Dandelion		1
	Malacothrix coulteri	Coulter's Desert Dandelion		1
	Malacothrix glabrata	Smooth Desert Dandelion		1, 9
	Monoptilon bellidiforme	Daisy Desertstar		1
	Monoptilon bellioides	Mojave Desertstar		1, 9
	Nicolletia occidentalis	Hole-in-the-sand Plant		1
	Palafoxia arida var. arida	Desert Palafox		1, 9
	Pectis papposa var. papposa	Chich-weed		1
	Perityle emoryi	Emory's Rock Daisy		1, 9
	Peucephyllum schotti	Schott's Pygmycedar		1
	Pleurocoronis pluriseta	Bush Arrowleaf		1
	Pluchea sericea	Arrow-weed		1
	Porphyllum gracile	Slender Odora		1
	Prenanthella exigua	Brightwhite		1
	Psathyrotes ramosissima	Hairy Turtleback		1, 9
*	*Pseudognaphalium luteoalbum*	White Lamb Everlasting		1
	Psilostrophe cooperi	Whitestem Paperflower		9
	Rafinesquia neomexica	Desert Chicory		1, 9
	Senecio flaccidus var. monoensis	Smooth Threadleaf Ragwort		1
	Senecio mohavensis	Mojave Ragwort		1
*	*Sonchus oleraceus*	Common Sow Thistle		1
	Stephanomeria exigua ssp. exigua	Small Wire-lettuce		1
	Stephanomeria pauciflora	Few Flower Wire-lettuce		1, 9
	Stylocline micopoides	Desert Neststraw		1
	Symphyotrichum subulatum	Annual Saltmarsh Aster		1
	Syntrichopappus fremontii	Fremont's Syntrichopappus		1
	Taraxacum officinale	Common Dandelion		1
	Tetradymia spinosa	Short Spine Horsebrush		1
	Trichoptilium incisum	Yellowdome		1

Scientific Name		Common Name	Special Status	Reference
	Trixis californica var. californica	California Trixis		1
	Xylorhiza tortifolia var. tortifolia	Mojave-aster		1, 9
Bignoniaceae				
	Chilopsis linearis ssp. arcuata	Desert Willow	T1	1, 4, 5, 9
Boraginaceae				
	Amsinckia menziesii	Menzies's Fiddleneck		1
	Amsinckia tessellata	Bristly Fiddleneck		8, 9
	Amsinckia tessellata var. tessellata	Bristly Fiddleneck		1
	Cryptantha angustifolia	Narrow-leaved Cryptantha		1
	Cryptantha barbigera	Bearded Cryptantha		1, 9
	Cryptantha circumscissa	Cushion Cryptantha		1, 9
	Cryptantha costata	Ribbed Cryptantha	CRPR 4.3	2, 5, 8
	Cryptantha decipiens	Gravel Cryptantha		1
	Cryptantha dumetorum	Scrambing Cryptantha		1, 9
	Cryptantha holoptera	Winged Cryptantha	CRPR 4.3	1, 2, 5, 8
	Cryptantha maritima	Guadalupe Cryptantha		1
	Cryptantha micrantha var. micrantha	Red-root Cryptantha		1, 9
	Cryptantha nevadensis	Nevada Cryptantha		1, 9
	Cryptantha pterocarya	Wingnut Cryptantha		1, 9
	Cryptantha racemosa	Shrubby Cryptantha		1
	Cryptantha utahensis	Scented Cryptantha		1
	Emmananthe peduliflora var. penduliflora	Whispering Bells		1, 9
	Eucrypta chrysanthemifolia var. bepinnatifida	Spotted Hideseed		1
	Eucrypta micrantha	Dainty Desert Hideseed		1
	Heliotropium convolvulaceum var. californicum	Morning-glory Heliotrope		1
	Heliotropium curassavicum var. oculatum	Alkali Heliotrope		1
	Nama demissum var. demissum	Coville's Weak Purple Mat		1, 9
	Nama hsipidum var. spathulatum	Rough Purple Mat		1
	Nama pusillum	Eggleaf Purple Mat		1
	Pectocarya heterocarpa	Mixed-nut Pectocarya		1
	Pectocarya platycarpa	Wide-toothed Pectocarya		1, 9
	Pectocarya recurvata	Arched-nut Pectocarya		1, 9
	Phacelia calthifolia	Calthaleaf Phacelia		1
	Phacelia crenulata	Cleft Leaf Phacelia		9
	Phacelia crenulata var. ambigua	Hidden Cleft Leaf Phacelia		1
	Phacelia crenulata var. crenulata	Cleft Leaf Phacelia		1
	Phacelia crenulata var. minutiflora	Small Flower Phacelia		1
	Phacelia cryptantha	Hidden Flower Phacelia		1

	Scientific Name	Common Name	Special Status	Reference
	Phacelia distans	Wild Heliotrope Phacelia		1
	Phacelia fremontii	Fremont's Phacelia		1
	Phacelia neglecta	Alkali Phacelia		1
	Phacelia pachyphylla	Blacktack Phacelia		1
	Phacelia pedicellata	Pedicellate Phacelia		1
	Phacelia rotundifolia	Round Leaf Phacelia		1
	Phacelia tanacetifolia	Lacy Phacelia		9
	Plagiobothrys arizonicus	Arizona Popcornflower		9
	Plagiobothrys jonesii	Mojave Popcornflower		1
	Tiquillia nuttallii	Annual Crinklemat		1
	Tiquillia plicata	Fan-leaved Crinklemat		1
Brassicaceae				
	Boechera inyoensis	Inyo Rockcress		1
*	*Brassica tournefortii*	Sahara Mustard		1, 3, 4, 6, 7, 8, 9
*	*Capsella bursa-pastoris*	Shepard's Purse		1
	Caulanthus cooperi	Cooper's Jewelflower		1
	Caulanthus lasiophyllus	Woolly Leaf Jewelflower		1, 9
	Descurainia pinnata	Tansymustard		8, 9
	Descurainia pinnata ssp. glabra	Hairless Western Tansymustard		1
	Descurainia sophia	Wise Tansymustard		1
	Dithyrea californica	California Spectaclepod		1
	Draba cuneifolia	Wedgeleaf Draba		1
*	*Hirschfeldia incana*	Shortpod Mustard		1, 8
	Lepidium flavum	Yellow Pepper-grass		9
	Lepidium fremontii	Desert Pepper-grass		1, 9
	Lepidium lasiocarpum ssp. lasiocarpum	Shaggy Fruit Pepper-grass		1
	Lepidium thurberi	Thurber's Pepper-grass		9
*	*Sisymbrium altissimum*	Tumble Mustard		3, 8
*	*Sisymbrium irio*	London Rocket		1, 3, 7
*	*Sisymbrium orientale*	Indian Hedgemustard		1
	Stanleya pinnata	Desert Prince's Plume		1, 9
	Streptanthella longirostris	Longbeak Streptanthella		1
	Thysanocarpus curvipes	Curvy Fringepod		1
	Thysanocarpus laciniatus	Nothc Fringepod		1
Cactaceae				
	Coryphantha alversonii	Foxtail Cactus		1, 5, 8, 9
	Cylindropuntia acanthocarpa	Buckhorn Cholla		9
	Cylindropuntia bigelovii	Teddy-bear Cholla		9

	Scientific Name	Common Name	Special Status	Reference
	Cylindropuntia echinocarpa	Silver Cholla		1, 9
	Cylindropuntia ramosissima	Diamond Cholla		1, 9
	Cylindropuntia wigginsii	Wiggin's Cholla	CRPR 3.3	1
	Echinocactus polycephalus var. polycephalus	Cottontop Cactus		1, 9
	Echinocactus engelmannii	Engelmann's Hedgehog Cactus		1, 9
	Ferocactus cylindraceus	California Barrel Cactus		1, 5, 8
	Mammillaria dioica	White Fishhook Cactus		9
	Mammillaria tetrancistra	Fringe Petal Fishhook Cactus		1
	Opuntia basilaris var. basilaris	Beavertail Cactus		1, 9
	Sclerocactus polyancistrus	Mojave Fish-hook Cactus	CRPR 4.2	2, 5, 8
Campanulaceae				
	Nemacladus glanduliferus	Glandular Threadplant		1, 9
	Nemacladus rubescens	Desert Threadplant		1
	Nemacladus sigmoideus	Sigmoid Threadplant		1
Caryophyllaceae				
	Achyronychia cooperi	Onyx Flower		1
	Spergularia marina	Saltmarsh Sand-spurrey		2
Cleomaceae				
	Cleomella obtusifolia	Mojave Stinkweed		1
	Peritoma arborea	Bladderpod		1, 9
	Wislizenia refracta ssp. refracta	Jackass-clover	CRPR 2B.2	1, 2, 5, 8
Chenopodiaceae				
	Allenrolfea occidentalis	iodinebush		1
	Atriplex canescens var. canescens	Four-wing Saltbush		1, 8, 9
	Atriplex confertifolia	Shadscale		1, 8
	Atriplex elegans	Wheelscale		1
	Atriplex hymenelytra	Desert-holly		1, 8
	Atriplex lentiformis	Big Saltbush		1, 9
	Atriplex polycarpa	Allscale Saltbush		1, 8, 9
*	*Atriplex rosea*	Tumbling Saltbush		1
*	*Atriplex semibaccata*	Australian Saltbush		1
*	*Bassia hyssopifolia*	Fivehorn Smotherweed		1, 9
*	*Chenopodium album*	Lamb's Quarters		1, 8
*	*Chenopodium murale*	Nettleleaf Goosefoot		1
*	*Cycloloma atriplicifolium*	Winged Pigweed		1
	Grayia spinosa	spiny Hopsage		1, 9
	Krascheninnikovia lanata	Winter Fat		1
	Monolepis nuttalliana	Nuttall's Povery Weed		1
*	*Salsola paulsenii*	Paulsen's Russian Thistle		1, 6

Scientific Name		Common Name	Special Status	Reference
*	*Salsola tragus*	Prickly Russian Thistle		1, 3, 6, 7, 8
	Suaeda nigra	Black Seablite		1, 8, 9
Crassulaceae				
	Dudleya saxosa ssp. saxosa	Panamint Dudleya	CRPR 1B.3	5, 8
Crossosomataceae				
	Crossosoma bigelovii	Ragged Rockflower		1
Cucurbitaceae				
	Brandegea bigelovii	Desert Starvine		1
	Cucurbita palmata	Coyote Melon		1, 9
Cuscutaceae				
	Cuscuta denticulata	Small-toothed Dodder		1
Euphorbiaceae				
	Croton californicus	California Croton		1, 9
	Ditaxis neomexicana	New Mexico Silverbush		1, 9
	Ditaxis serrata	California Ditaxis		1
	Euphorbia abramsiana	Abram's Spurge	CRPR 2B.2	2
	Euphorbia albomarginata	White Margine Spurge		1, 9
*	*Euphorbia maculata*	Spotted Spurge		1
	Euphorbia micromera	Sonoran Spurge		1
	Euphorbia ocellata ssp. arenicola	Ring Sand Spurge		1
	Euphorbia parryi	Parry's Spurge	CRPR 2B.3	2
	Euphorbia polycarpa	Many Seed Spurge		1
	Euphorbia revoluta	Revolute Spurge	CRPR 4.3	2
	Euporbia setiloba	Yuma Spurge		1
	Stillingia linearifolia	Thin Leaf Toothleaf		1
	Stillingia spinulosa	Annual Toothleaf		1
Fabaceae				
	Acmispon brachycarpus	Short Fruit Lotus		1
	Acmispon strigosus	Strigose Lotus		1, 9
	Astragalus acutirostris	Sharpkeel Milkvetch		1
	Astragalus didymocarpus var. dispermus	Two Seeded Milkvetch		1
	Astragalus layneae	Layne Milkvetch		1
	Astragalus lentiginosis var. fremontii	Fremont's Freckled Milkvetch		1, 9
	Dalea mollis	Hairy Prairie Clover		1,
	Dalea mollissima	Soft Prairie Clover		1
	Lupinus arizonicus	Arizona Lupine		1
	Lupinus bicolor	Miniature Lupine		9
	Lupinus concinnus	Bajada Lupine		1

Scientific Name		Common Name	Special Status	Reference
	Lupinus shockleyi	Shockley's Lupine		1
	Lupinus sparsiflorus	Coulter's Lupine		9
	Marina parryi	Parry's False Prairie-clover		1
*	*Medicago lupulina*	Black Burclover		1
*	*Melilotus indicus*	Indian Sweetclover		1
	Parkinsonia aculeata	Mexican Palo Verde		1
	Parkinsonia florida	Blue Palo Verde		1, 4
	Prosopis glandulosa var. torreyana	Honey Mesquite	T1	1, 8, 9
	Psorothamnus arborescens var. simplicifolius	Simple Leaved Mojave Indigo-bush		1
	Psorothamnus emoryi	Emory's Indigo-bush		1, 9
	Psorothamnus polydenius	Nevada Indigo-bush		1
	Psorothamnus spinosus	Smoke Tree		1, 8, 9
	Senegalia greggii	Catclaw Acacia		1, 8, 9
	Senna armata	Spiny Senna		1, 8, 9
Geraniaceae				
*	*Erodium cicutarium*	Redstem Filaree		1, 3, 7, 8, 9
	Erodium texanum	Texas Filaree		1, 9
Krameriaceae				
	Krameria bicolor	White Rhatany		1, 9
	Krameria erecta	Pima Rhatany		1
Lamiaceae				
	Condea emoryi	Desert Lavender		1, 8, 9
	Monardella robisonii	Robison's Monardella	CRPR 1B.3	2, 5, 8
	Salvia columbariae	Chia	T1	1, 9
	Salvia mohavensis	Mojave Sage		1
	Scutellaria mexicana	Mexican Skullcap		1, 9
Lennoaceae				
	Pholisma arenarium	Desert Christmas Tree		1
Loasaceae				
	Mentzelia affinis	White Blazing Star		1, 9
	Mentzelia albicaulis	White Stem Blazing Star		1
	Mentzelia involucrata	White Bract Blazing Star		1, 9
	Mentzelia obscura	Pacific Blazing Star		9
	Mentzelia oreophila	Argus Blazing Star		1
	Mentzelia tridentata	Creamy Blazing Star		10
	Petalonyx thurberi ssp. thurberi	Thurber's Sandpaper Plant		1
Malvaceae				
	Eremalche exilis	White Mallow		1

Scientific Name		Common Name	Special Status	Reference
	Eremalche rotundifolia	Desert Fivespot		1, 9
*	*Malva neglecta*	Common Mallow		9
*	*Malva parviflora*	Cheeseweed		1
	Sidalcea neomexicana	Salt Spring Checkerbloom	CRPR 2B.2	5, 8
	Sphaeralcea ambigua var. ambigua	Apricot Mallow		1, 9
	Sphaeralcea angustifolia	Narrow-leaved Mallow		1
	Sphaeralcea emoryi var. emoryi	Emory's Globemallow		1
Molluginaceae				
*	*Mollugo cerviana*	Threadstem Carpetweed		1
Montiaceae				
	Calyptridium monandrum	Common Pussypaws		1
	Cistanthe ambigua	Desert Cistanthe		1
Nyctaginaceae				
	Abronia villosa	Desert Sand-verbena		8, 9
	Abronia villosa var. villosa	Desert Sand-verbena		1
	Allionia incarnata	Trailing Windmills		1, 9
	Boerhavia triquetra var. intermedia	Fivewing Ringstem		1
	Boerhavia wrightii	Wright's Ringstem		1
	Mirabilis laevis var. retrorsa	Desert Wishbone		1, 9
	Mirabilis laevis var. villosa	Hairy Wishbone		1
Oleaceae				
	Menodora spinescens	Spiny Twinberry		1
Onagraceae				
	Camissonia campestris ssp. campestris	Mojave Suncup		1, 9
	Camissoniopsis pallida ssp. hallii	Hall's Suncup		1
	Chylismia brevipes ssp. brevipes	Golden Suncup		1, 9
	Chylismia cardiophylla ssp. cardiophylla	Heartleaf Suncup		1
	Chylismia calviformis ssp. aurantiaca	Orange Cutleaf Suncup		1, 9
	Eremothera boothii ssp. boothii	Booth's Evening-primrose	CRPR 2B.3	2, 5, 8, 9
	Eremothera boothii ssp. condensata	Dense Evening-primrose		1
	Eremothera chamaenerioides	Longcapsule Evening-primrose		1
	Eremothera refracta	Narrowleaf Evening-primrose		1
	Eulobus californicus	False-mustard		9
*	*Oenothera curtiflora*	Shortened Evening-primrose		1
	Oenothera deltoides ssp. deltoides	Basket Evening-primrose		1, 9
	Oenothera primiveris ssp. bufonis	Desert Toad Evening-primrose		1
Orobanchaceae				
	Orobanche cooperii	Cooper's Broom-rape		1
Papaveraceae				

Scientific Name		Common Name	Special Status	Reference
	Argemone corymbosa	Mojave Pricklypoppy		1, 9
	Argemone munita	Chicalote		1
	Eschscholzia glyptosperma	Desert Poppy		1, 9
	Eschscholzia minutiflora	Pygmy Poppy		1, 9
	Eschscholzia parishii	Parish's Poppy		1
Phrymaceae				
	Mimulus bigelovii	Bigelow's Monkeyflower		1, 9
	Mimulus pilosus	Downy Monkeyflower		9
Plantaginaceae				
	Antirrhinum filipes	Desert Snapdragon		1
	Mohavea breviflora	Mojave Ghost Flower		1
	Mohavea confertiflora	Sonoran Ghost Flower		1
	Penstemon albomarginatus	White-margined Beardtongue	CRPR 1B.1	1, 2, 5, 8
	Penstemon clevelandii var. mohavensis	Cleveland's Mojave Beardtongue		1
	Penstemon pseudospectabilis	Desert Beardtonge	CRPR 2B.2	1
	Penstemon thurberi	Thurber's Beardtongue	CRPR 4.2	2, 5, 8
*	*Plantago lanceolata*	English Plantain		3, 8
	Plantago ovata	Desert Plantain		1, 9
*	*Veronica anagallis-aquatica*	Water Speedwell		1
Polemoniaceae				
	Aliciella leptomeria	Sand Aliciella		1
	Aliciella micromeria	Dainty Aliciella		1
	Eriastrum diffusum	Miniature Woollystar		1, 9
	Eriastrum eremicum ssp. eremicum	Desert Woollystar		1
	Eriastrum harwoodii	Harwood's Eriastrum	CRPR 1B.2	8
	Eriastrum sparsiflorum	Few-flowered Eriastrum	CRPR 4.3	1
	Eriastrum wilcoxii	Wilcox's Woollystar		1
	Gilia aliquanta ssp. aliquanta	Puffcalyx Gilia		5
	Gilia latiflora	Broad Flowered gilia		1
	Gilia latiflora var. davyi	Davy's Broad Flowered gilia		1
	Gilia minor	Little Gilia		9
	Gilia scopulorum	Rock Gilia		1
	Gilia sinuata	Rosy Gilia		1
	Gilia stellata	Star Gilia		1, 9
	Ipomopsis polycladon	Many Branched Ipomopsis		1
	Langloisia setosissima ssp. punctata	Lilac Sunbonnet		1, 9
	Leoptosiphon aureus ssp. aureus	Golden Leptosiphon		1
	Linanthus arenicola	Sand Linanthus		1, 5
	Linanthus demissus	Desert Snow		1

Scientific Name		Common Name	Special Status	Reference
	Linanthus filiformis	Yellow Linanthus		1
	Linanthus jonesii	Jone's Linanthus		1
	Loeseliastrum matthewsii	Desert Calico		1, 9
	Loeseliastrum schottii	Schott's Calico		1
Polygonaceae				
	Chorizanthe brevicornu var. brevicornu	Brittle Spineflower		1, 9
	Chorizanthe corrugata	Wrinkled Spineflower		1
	Chorizanthe rigida	Rigid Spineflower		1, 9
	Chorizanthe spinosa	Mojave Spineflower	CRPR 4.2	2, 5, 8
	Chorizanthe xanti var. leucotheca	White-bracted Spineflower	CRPR 1B.2	5, 8
	Eriogonum brachyanthum	Short-flower Buckwheat		1
	Eriogonum brachypodum	Parry's Buckwheat		1
	Eriogonum deflexum var. deflexum	Reflexed Buckwheat		1, 9
	Eriogonum fasciculatum	California Buckwheat		8, 9
	Eriogonum fasciculatum var. poliofolium	Mojave Desert Buckwheat		1
	Eriogonum inflatum	Desert Trumpet		1, 9
	Eriogonum maculatum	Spotted Buckwheat		1, 9
	Eriogonum nidularium	Birdnest Buckwheat		1, 9
	Eriogonum pusillum	Yellow Turbans		1
	Eriogonum reniforme	Kidney-leaf Buckwheat		1
	Eriogonum thomasii	Thomas' Buckwheat		1, 9
	Eriogonum trichopes	Little Desert Trumpet		1
	Eriogonum viridescens	Greenish Buckwheat		1
	Eriognonum wrightii var. nodosum	Knotstem Wright's Buckwheat		1
	Oxytheca perfoliata	Round-leaf Puncturebract		1
*	*Polygonum argyrocoleon*	Persian Knotweed		1
*	*Polygonum aviculare ssp. depressum*	Dented Oval Leaf Knotweed		1
	Rumex hymenosepalus	Fleshy Dock		1
Portulacaceae				
	Portulaca halimoides	Desert Portulaca	CRPR 4.2	2, 5, 8
Ranunculaceae				
	Delphinium parishii ssp. parishii	Parish's Larkspur		1
Resedaceae				
	Oligomeris linifolia	Lineleaf Whitepuff		1
Rosaceae				
	Coleogyne ramosissima	Blackbrush		1, 8
	Prunus fasciculata var. fasciculata	Desert Almond		1
	Purshia tridentata	Antelope Bush		9
Rubiaceae				

Scientific Name		Common Name	Special Status	Reference
	Galium angustifolium ssp. gracillimum	Slender Bedstraw	CRPR 4.2	1, 2, 5, 8, 9
	Galium stellatum	Starry Bedstraw		1
Rutaceae				
	Thamnosma montana	Turpentine Bush		1, 9
Salicaceae				
	Populus fremontii ssp. fremontii	Fremont's Cottonwood	T1	1, 4
	Salix gooddingii	Goodding's Black Willow		1
Simaroubaceae				
	Castela emoryi	Emory's Crucifixion-thorn	CRPR 2B.2	1, 2, 8
Simmondsiaceae				
	Simmondsia chinensis	Jojoba	T1	1
Solanaceae				
	Datura wrightii	Wright's Jimsonweed	T1	1
	Lycium andersonii	Anderson's Box-thorn		1, 9
	Lycium cooperii	Cooper's Box-thorn		1
	Nicotiana obtusifolia	Desert Tobacco	T1	1, 9
	Physalis crassifolia	Yellow Nightshade		1, 9
	Physalis lobata	Lobed Ground-cherry	CRPR 2B.3	2, 5, 8
Tamaricaceae				
*	*Tamarix aphylla*	Athel Tamarix		1, 3, 4, 6, 7
*	*Tamarix ramosissima*	Hairy Tamarix		1, 3, 4, 6, 7, 8
Urticaceae				
	Parietaria hespera var. hespera	Western Pellitory		1
Verbenaceae				
	Verbena gooddingii	Gooding's Vervain		1
Viscaceae				
	Phorodendron californicum	Desert Mistletoe		1, 9
Zygophyllaceae				
	Fagonia laevis	California Fagonbush		1
	Kallstroemia californica	California Caltrop		1
	Larrea tridentata	Creosote Bush	T1	1, 8, 9
*	*Tribulus terrestris*	Puncturevine		1, 8
Agavaceae				
	Hesperocallis undulata	Desert Lily		9
	Yucca brevifolia	Joshua Tree		1, 8, 9
	Yucca schidigera	Mojave yucca		1, 8, 9
Alliaceae				

	Scientific Name	Common Name	Special Status	Reference
	Allium parishii	Parish's Onion	CRPR 4.3	1, 2, 5, 8
Liliaceae				
	Calochortus kennedyi var. kennedyi	Desert Mariposa Lily		1
Cyperaceae				
	Bolboschoenus robustus	Seacoast Bulrush		1
	Cyperus esculentus	Edible Flatsedge		1
Melanthiaceae				
	Toxicoscordion brevibracteatum	Desert Death Camas		1
Poaceae				
	Aristida adscensionis	Sixweeks Three-awn		1
	Aristida californica	California Three-awn		1
	Aristida purpurea var. parishii	Parish three-awn		1
	Aristida purpurea var. purpurea	Purple Three-awn		1
*	*Avena barbata*	Slender wild Oat		1
	Bouteloua aristidoides var. aristidoides	Needle Grama		1
	Bouteloua barbata var. barbata	Sixweeks Grama		1
	Bromus arizonicus	Arizona Brome		1
*	*Bromus catharticus*	Rescuegrass		1
*	*Bromus madritensis ssp. rubens*	Red Brome		1, 3, 7, 8, 9
*	*Bromus tectorum*	Cheat Grass		1, 8
*	*Chloris virgata*	Feather Finger Grass		1
*	*Cynodon dactylon*	Bermuda Grass		1
	Dasyochloa pulchella	Low Woollygrass		1
*	*Digitaria sp.*	Crabgrass		3, 8
*	*Digitaria sanguinalis*	Hairy Cottontop		1
	Distichlis spicata	Salt Grass		1, 9
*	*Echinochloa crus-galli*	Barnyard Cockspurgrass		1
*	*Festuca myuros*	Rattail Fescue		1
	Festuca octoflora	Eight Flowered Fescue		1
	Hilaria rigida	Big Galleta		1, 8
	Hordeum depressum	Low Barley		9
*	*Hordeum murinum*	Wall Barley		1, 3, 7
	Leptochloa fusca ssp. univervia	Mexican Sprangletop		1
	Muhlenbergia microsperma	Littleseed Muhly		1
	Muhlenbergia porteri	Bush Muhly		1
*	*Phalaris aquatica*	Harding Grass		1, 3, 7
*	*Poa annua*	Annual Blue Grass		1
*	*Polypogon monspeliensis*	Rabbit Foot Beard Grass		1
*	*Schismus arabicus*	Arabian Schismus		1, 3, 7, 8

Scientific Name		Common Name	Special Status	Reference
*	*Schismus barbatus*	Mediterranean Schismus		1, 3, 6, 7, 8, 9
	Sporobolus cryptandrus	Sand Dropseed		1
	Stipa hymenoides	Indian Rice Grass		1, 8, 9
	Stipa speciosa	Desert Needle Grass		1, 9
Themidaceae				
	Androstephium breviflorum	Small-flowered Androstephium	CRPR 2B.2	2
	Muilla coronata	Crowned Muilla	CRPR 4.2	1, 2, 5, 8
Typhaceae				
	Typha domingensis	Southern Cattail		1
	Typha latifolia	Broad-leaved Cattail		1

Federal

R Taxon removed from Candidate status (no present compliance status).

Tribes

T1 Species of interest/concern as identified by tribes.

State

CR State-listed as Rare.

CC Candidate for State listing.

California Rare Plant Ranks (CRPR)

Inventory of Rare and Endangered Vascular Plants of California:

1B Rare or endangered in California and elsewhere.

2 Rare or endangered in California, but more common elsewhere.

3 Need more information (a review list).

4 Plants of limited distribution (watch list).

CRPR Threat Ranks

.1 - Seriously endangered in California

.2 – Fairly endangered in California

.3 – Not very endangered in California

Reference:

1 Elvin, Mark A. 2000. Rare Plant Survey and Floristic Inventory. Tierra Data Systems. January 2000.

2 AgriChemical & Supply, Inc. 2006. Sensitive Plant Surveys Final Report. July 2006.

3 AgriChemical & Supply, Inc. 2005. Invasive Non-Native Plant Survey Final Report. August 2005.

4 AgriChemical & Supply, Inc. 2008. Exotic Pest Plant Treatment on Marine Corps Air Ground Combat Center, Twentynine Palms, CA Final Report. February 2008.

5 Marine Air Ground Task Force training Command (MAGTFTC). 2006. Integrated Natural Resources management Plan and Environmental Assessment. Fiscal Years 2002-2006.

6 Marine Air Ground Task Force Training Command. 2008. Invasive Plant Species Management Plan.

7 Tierra Data, Inc. 2009. MCAGCC Twentynine Palms Historic Invasive Species Survey of the Western Training Areas. November 2009.

8 Marine Corps Air Ground Combat Center (MCAGCC). 2012. Final Environmental Impact Statement, Land Acquisition and Airspace Establishment to Support Large-Scale Marine Air Ground Task Force Live Fire and Maneuver Training. July 2012.

9 ICF Jones & Stokes. 2009. Twentynine Palms Proposed Western and Southern, Base Expansion Areas; Rare and Sensitive Plant Surveys Final Report. July 2009.

10 Vegetation Map of Expansion Area; in progress, Vernadero, 2018.

APPENDIX D

Wildlife Species

Scientific Name		Common Name	Special Status	Reference
Invertebrates				
	Branchinecta lindahli	Versatile Fairy Shrimp		2
	Branchia potens	Solpugid		13
	Eremobates ajoanus	Solpugid		13
	Eremochelis morrisi	Solpugid		13
	Eremorhax titania	Solpugid		13
	Eremocosta titania	Solpugid		13
	Hermerotrecha branchi	Solpugid		13
	Order Opiliones	Daddy Long Legs		13
	Aphonopelma iodius	Amblypigid		13
	Paruroctonus mesaensis	Scorpion		13
	Family Araneidae	Orb Weaver		13
	Gnaphosa sp.	Stealthy Ground Spider		13
	Family Lycosidae	Wolf Spider		13
	Syspira tigrina	Prowling Spider		13
	Peucelia viridans	Lynx Spider		13
	Philodromus sp.	Running Crab Spider		13
	Psilochorus sp.	Cellar Spider		13
	Family Salticidae	Jumping Spider		13
	Loxosceles deserta	Violin (Recluse) Spider		13
	Misumenops rothi	Crab Spider		13
	Order Isopoda	Desert Pillbug		13
	Family Poduridae	Springtail		13
	Leucolepisma arenaria	Silverfish		13
	Machilis sp.	Jumping Bristletail		13
	Baetidae sp.	Minnow Mayfly		13
	Pachydiplax longipennis	Blue Dasher		13
	Erythemis collocata	Western Pondhawk		13
	Sympetrum corruptum	Variegated Meadowhawk		13
	Pantala hymenaea	Spot-winged Glider		13
	Pantala flavescens	Wandering Glider		13
	Family Libellulidae	Skimmer		13
	Family Coenagrionidae	Damselfly		13
	Enallagma civile	Familiar Bluet		13
	Aeoloplides tenuipennis	Grasshopper		13

Scientific Name		Common Name	Special Status	Reference
	Anconia integra	Grasshopper		13
	Bootettix argentatus	Creosote Bush Grasshopper		13
	Cibolacris parviceps	Grasshopper		13
	Ligurotelitix coquilletti	Grasshopper		13
	Melanoplus yarrowi	Grasshopper		13
	Parapomala pallida	Grasshopper		13
	Poecilotettix sanguineus	Grasshopper		13
	Schistocerca sp.	Grasshopper		13
	Trimerotropis pallidipennis	Pallid-winged Grasshopper		13
	Trimerotropis pseudofasciata	Grasshopper		13
	Trimerotropis rebellis	Grasshopper		13
	Tytthotyle maculata	Grasshopper		13
	Acheta assimilis	Cricket		13
	Acheta domestica	House Cricket		13
	Anaxipha sp.	Cricket		13
	Subfamily Nemobiinae	Cricket		13
	Ceuthophilus sp.	Camel Cricket		13
	Tanaocerus koebellii	Grasshopper		13
	Capnobotes fuliginosus	Sooty-winged Katydid		13
	Eremopedes bilineatus	Katydid		13
	Insara covilleae	Katydid		13
	Blatta orientalis	Oriental Cockroach		13
	Periplaneta sp.	Cockroach		13
	Arenivaga sp.	Desert Cockroach		13
	Eremoblatta subdiaphana	Cockroach		13
	Litaneutra minor	Minor Ground Mantid		13
	Iris oratoria	Mediterranean Mantid		13
	Stagmomantis californica	California Mantid		13
	Order Isoptera	Termite		13
	Family Phasmatidae	Walking Stick		13
	Oligotoma nigra	Black Webspinner		13
	Orius tristicolor	Minute Pirate Bug		13
	Apiomeris sp.	Minute Pirate Bug		13
	Family Berytidae	Stilt Bug		13
	Family Coreidae	Leaf-footed Bug		13
	Corisella decolor	Water Boatmen		13
	Pangaeus congruus	Burrower Bug		13
	Cydnidae sp.	Burrower Bug		13
	Largus californicus	California Plant Bug		13

Scientific Name		Common Name	Special Status	Reference
	Geocoris pallens	Seed Bug		13
	Lygaeus kalmii	Small Milkweed Buc		13
	Neacoryphus lateralis	Seed Bug		13
	Nysius tenellus	Seed Bug		13
	Pseudopamera nitidula	Seed Bug		13
	Chlamyclatus monilipes	Plant Bug		13
	Hadronema princeps	Plant Bug		13
	Haplomachides consors	Plant Bug		13
	Lopidea confraterna	Plant Bug		13
	Panthenicus picicollis	Plant Bug		13
	Phytocoris ramosus	Plant Bug		13
	Phytocoris ingens	Plant Bug		13
	Taylorilgus pallidulus	Plant Bug		13
	Tropidosteptes sp.	Plant Bug		13
	Nabis americoferus	Damsel Bug		13
	Buenos sp.	Back Swimmer		13
	Notonecta indica	Back Swimmer		13
	Chlorochroa sayi	Say Stink Bug		13
	Dendrocoris contaminatus	Stink Bug		13
	Tepa brevis	Stink Bug		13
	Thyanta pallidorvirens	Stink Bug		13
	Thyanta custator	Stink Bug		13
	Family Phymatidae	Ambush Bug		13
	Apiomeris sp.	Bee Assassin		13
	Paratriatoma hirsuta	Assassin Bug		13
	Triatoma protracta	Western Bloodsucking Conenose		13
	Zelus renardii	Assassin Bug		13
	Arhyssus lateralis	Scentless Plant Bug		13
	Harmostes reflexus	Scentless Plant Bug		13
	Liorhyssus hyalinus	Scentless Plant Bug		13
	Saldula pallipea	Shore Bug		13
	Family Tingidae	Lace Bug		13
	Family Aphiidae	Aphid		13
	Family Cercopidae	Spittlebug		13
	Norvellina sp.	Leafhopper		13
	Xerophloea peltata	Leafhopper		13
	Okanagana vanduzeei	Cicada		13
	Oecieus decens	Cixiid Planthopper		13
	Family Delphacidae	Delphacid Planthopper		13

Scientific Name		Common Name	Special Status	Reference
	Family Dictyopharidae	Dictyopharid Planthopper		13
	Ormenis saucia	Flatid Planthoppere		13
	Micrutalis sp.	Treehopper		13
	Multareis cornutus	Treehopper		13
	Multareoides befurcatus	Treehopper		13
	Family Psyllidae	Psyllid (Jumping Plantlice)		13
	Coniopteryx sp.	Dusty-wing		13
	Neoconis sp.	Dusty-wing		13
	Chrysopa coloradensis	Green Lacewing		13
	Chrysoperia comanche	Green Lacewing		13
	Chrysoperia phlorabunda	Green Lacewing		13
	Eremochrysa tibialis	Green Lacewing		13
	Eremochrysa punctinervis	Green Lacewing		13
	Pimarchrysa albicostales	Green Lacewing		13
	Micromus variolosus	Brown Lacewing		13
	Sympherobius killingtoni	Brown Lacewing		13
	Sympherobius perparvus	Brown Lacewing		13
	Megalomus moestus	Brown Lacewing		13
	Plega sp.	Mantispid		13
	Plega signata	Mantispid		13
	Brachynemurus pulchellus	Antlion		13
	Brachynemurus sackeni	Antlion		13
	Clathroneuria couquilleti	Antlion		13
	Clathroneuria schwarzi	Antlion		13
	Eremoleon insipidus	Antlion		13
	Eremoleon nigribasis	Antlion		13
	Gnopholeon barberi	Antlion		13
	Gnopholeon delicatulus	Antlion		13
	Myrmeleon arizonicus	Antlion		13
	Myrmeleon californicus	Antlion		13
	Paranthaclisis congener	Antlion		13
	Paranthaclisis hageni	Antlion		13
	Paranthaclisis nevadensis	Antlion		13
	Scotoleon carrizonus	Antlion		13
	Scotoleon eiseni	Antlion		13
	Scotoleon deflexus	Antlion		13
	Scotoleon expansus	Antlion		13
	Scotoleon fidelitas	Antlion		13
	Scotoleon intermedius	Antlion		13

Scientific Name		Common Name	Special Status	Reference
	Scotoleon longipalpus	Antlion		13
	Scotoleon minusculus	Antlion		13
	Scotoleon minutus	Antlion		13
	Scotoleon pallidus	Antlion		13
	Scotoleon quadripunctatus	Antlion		13
	Scotoleon singularis	Antlion		13
	Scotoleon yavapai	Antlion		13
	Tyttholeon puerilis	Antlion		13
	Xeranobium sp.	Anobiid Beetle		13
	Family Anthicidae	Antlike Flower Beetle		13
	Apatides fortis	Twi-boring Beetle		13
	Family Bruchidae	Seed Beetle		13
	Acmaeodera lanata	Metallic Wood-boring Beetle		13
	Agrilus sp.	Metallic Wood-boring Beetle		13
	Chrysobothris debilis	Metallic Wood-boring Beetle		13
	Hippomelas obliterata	Metallic Wood-boring Beetle		13
	Bembidion sp.	Ground Beetle		13
	Calosoma peregrinator	Ground Beetle		13
	Cicindela punctatus	Tiger Beetle		13
	Aneflomorpha sp.	Longhorn Beetle		13
	Derobrachus geminatus	Longhorn Beetle		13
	Plionoma rubens	Longhorn Beetle		13
	Neochlamisus sp.	Leaf Beetle		13
	Saxinus saucia	Red-shouldered Leaf Beetle		13
	Phyllotreta sp.	Leaf Beetle		13
	Chaetocnema ectypa	Leaf Beetle		13
	Pachybrachys desertus	Leaf Beetle		13
	Stenopodius sp.	Leaf Beetle		13
	Cymatodera punctata	Cherckered Beetle		13
	Trichodes ornatus	Cherckered Beetle		13
	Hippodamia convergens	Convergent Lady Beetle		13
	Olla v-nigrum	Lady Beetle		13
	Family Cryptophagidae	Silken Fungus Beetle		13
	Ophryastes argentatus	Weevil		13
	Apleurus angularis	Weevil		13
	Family Dascillidae	Soft-bodied Plant Beetle		13
	Anthrenus sp.	Carpet Beetle		13
	Dermestes marmoratus	Common Carrion Dermestid		13
	Trogoderma varlabile	Skin Beetle		13

Scientific Name		Common Name	Special Status	Reference
	Novelsis uteana	Skin Beetle		13
	Family Dyticidae	Predaceous Diving beetle		13
	Horistonotus sp.	Click Beetle		13
	Aphricus sp.	Click Beetle		13
	Aeolus sp.	Click Beetle		13
	Heterocerus gnatho	Variegated Mud-loving Beetle		13
	Saprinus sp.	Hister Beetle		13
	Xerosaprinus	Hister Beetle		13
	Troposterus lateralis	Water Scavenger Beetle		13
	Berosus punctulatus	Water Scavenger Beetle		13
	Cysteodemus armatus	Blister Beetle		13
	Eupompha sp.	Blister Beetle		13
	Lytta auriculata	Blister Beetle		13
	Lytta magister	Magisterial Blister Beetle		13
	Nemognatha macswaini	Blister Beetle		13
	Nemognatha nigripennis	Blister Beetle		13
	Pleurospasta mirabilis	Blister Beetle		13
	Zonitis atripennis	Blister Beetle		13
	Epicauta lauta	Blister Beetle		13
	Epicauta tenella	Blister Beetle		13
	Epicauta wheeleri	Blister Beetle		13
	Meloe strigulosus	Blister Beetle		13
	Tanaops sp.	Soft-winged Flower Beetle		13
	Attalus difficilis	Soft-winged Flower Beetle		13
	Anthobates nubulis	Tumbling Flower Beetle		13
	Mordella albosutura	Tumbling Flower Beetle		13
	Mordellistena sp.	Tumbling Flower Beetle		13
	Family Nitidulidae	Sap Beetle		13
	Family Oedemeridae	False Blister Beetle		13
	Family Phengodidae	Water-penny Beetle		13
	Subfamily Pedilinae	Fire-colored Beetle		13
	Family Ripiphoridae	Ripiphorid Beetle		13
	Aphodius lividus	Scarab Beetle		13
	Cyclocephala longula	Scarab Beetle		13
	Diplotaxis subangulata	Scarab Beetle		13
	Diplotaxis moerens	Scarab Beetle		13
	Ligyrus gibbosus	Scarab Beetle		13
	Phobetus mojavus	Scarab Beetle		13
	Belonuchus sp.	Rove Beetle		13

Scientific Name		Common Name	Special Status	Reference
	Cryptoglossa verrucosus	Darkling Beetle		13
	Alleculina sp.	Darkling Beetle		13
	Auchmobius picipes	Darkling Beetle		13
	Centrioptera muricata	Darkling Beetle		13
	Centrioptera laevis	Darkling Beetle		13
	Chilometopon sp.	Darkling Beetle		13
	Cnemodinus sp.	Darkling Beetle		13
	Coniontis parviceps	Darkling Beetle		13
	Edrotes ventricosus	Darkling Beetle		13
	Eleodes armata	Darkling Beetle		13
	Eupsophulus castaneus	Darkling Beetle		13
	Eurymetopon sp.	Darkling Beetle		13
	Hymenorus montivagus	Darkling Beetle		13
	Melanastus sp.	Darkling Beetle		13
	Metoponium sp.	Darkling Beetle		13
	Philolithus actuosus	Darkling Beetle		13
	Euchaetias zella	Tiger Moth		13
	Givera mucida	Goat Moth (Carpenterworm)		13
	Aroga paulalla	Gelechiid Moth		13
	Arotrura sp.	Gelechiid Moth		13
	Lita sp.	Gelechiid Moth		13
	Animomyia smitha	Measuringworm Moth		13
	Archirhoe neomexicana	Measuringworm Moth		13
	Chesiadodes coniferaria	Measuringworm Moth		13
	Chlorochlames appellaria	Measuringworm Moth		13
	Dichorda rectaria	Measuringworm Moth		13
	Eupithiecia deserticola	Measuringworm Moth		13
	Glaucina erroraria	Measuringworm Moth		13
	Lobocleta lanceolata	Measuringworm Moth		13
	Lobocleta ossularia	Measuringworm Moth		13
	Marmopteryx tessellata	Measuringworm Moth		13
	Narraga timetaria	Measuringworm Moth		13
	Nasusina minuta	Measuringworm Moth		13
	Nemoria intensaria	Emerald		13
	Platea diva	Measuringworm Moth		13
	Semiothisa colorata	Measuringworm Moth		13
	Semiothisa cyda	Measuringworm Moth		13
	Yermola perplexata	Measuringworm Moth		13
	Erynnis funeralis	Funereal Duskywing		13

Scientific Name		Common Name	Special Status	Reference
	Helioptes ericetorum	Northern White-skipper		13
	Hylephila phyleus	Fiery Skipper		13
	Lerodea eufala	Eufala Skipper		13
	Pyrgus albescens	Checkered-skipper		13
	Pyrgus scriptura	Small Checkered-skipper		13
	Pholisora libya	Sootywing		13
	Tegeticula yuccasella	Yucca Moth		13
	Atlides halesus	Great Purple Hairstreak		13
	Brephidium exilis	Pygmy Blue		13
	Euphilotes enoptes	Dotted Blue		13
	Euphilotes mojave	Dotted Blue		13
	Euphilotes bernardino	Dotted Blue		13
	Hemiargus ceraunus	Ceraunus (Edward's) Blue		13
	Hemiargus isola	Reakirt's Blue		13
	Icaricia (Plebejus) acmon	Acmon Blue		13
	Leptotes marinus	Marine Blue		13
	Strymon melinus	Gray Hairstreak		13
	Abagrotis discoidalis	Owlet Moth		13
	Abagrotis forbesi	Owlet Moth		13
	Abagrotis nefascia	Owlet Moth		13
	Abagrotis reedi	Owlet Moth		13
	Acontia arida	Owlet Moth		13
	Acontia disconecta	Owlet Moth		13
	Acontia tetragonia	Owlet Moth		13
	Allerastria albiciliata	Owlet Moth		13
	Agrotis ipsilon	Black Cutworm Moth		13
	Agrotis subterranea	Owlet Moth		13
	Aseptis serrula	Owlet Moth		13
	Autographa californica	Owlet Moth		13
	Bulia deducta	Owlet Moth		13
	Chalcopasta koebelei	Owlet Moth		13
	Conochares acutus	Owlet Moth		13
	Conochares arizonae	Owlet Moth		13
	Copablepharon album	Owlet Moth		13
	Cucullia cucullioides	Owlet Moth		13
	Copicucullia antipoda	Owlet Moth		13
	Copicucullia heinrichi	Owlet Moth		13
	Dargida procincta	Owlet Moth		13
	Discestra fulgora	Owlet Moth		13

Scientific Name		Common Name	Special Status	Reference
	Euanotia clarki	Owlet Moth		13
	Euxoa auxiliaris	Owlet Moth		13
	Euxoa oncocnemoides	Owlet Moth		13
	Euxoa ovilalis	Owlet Moth		13
	Euxoa recula	Owlet Moth		13
	Euxoa silens	Owlet Moth		13
	Grotella stretchi	Owlet Moth		13
	Grotellaforma lactea	Owlet Moth		13
	Hadenella pergentilis	Owlet Moth		13
	Helionche pictipennis	Owlet Moth		13
	Heliothis phloxiphagus	Owlet Moth		13
	Heliothis zea	Owlet Moth		13
	Heteranasia sp.	Owlet Moth		13
	Hypopta palmata	Owlet Moth		13
	Lacinipolia illaudabilis	Owlet Moth		13
	Leucocnemis variabilis	Owlet Moth		13
	Melipotis indamita	Owlet Moth		13
	Melipotis jucunda	Owlet Moth		13
	Mimoschinia rufofascialis	Owlet Moth		13
	Neotarache deserticola	Owlet Moth		13
	Nocloa pallens	Owlet Moth		13
	Oligia marina	Owlet Moth		13
	Oncocnemis primula	Owlet Moth		13
	Oxycnemis fusimacula	Owlet Moth		13
	Peridroma saucia	Owlet Moth		13
	Ponometia macdunnoghi	Owlet Moth		13
	Ponometia megocula	Owlet Moth		13
	Protogygia biclavis	Owlet Moth		13
	Provla argentata	Owlet Moth		13
	Pseudanarta crocea	Owlet Moth		13
	Rhynchagrotis formalis	Owlet Moth		13
	Rhizagrotis cloanthoides	Owlet Moth		13
	Schinia dobla	Owlet Moth		13
	Schinia ligea	Owlet Moth		13
	Spaelotis havilae	Owlet Moth		13
	Spodoptera exigua	Owlet Moth		13
	Spodoptera frugiperda	Fall Armyworm Moth		13
	Synedoida fumosa	Owlet Moth		13
	Synedoida tegonica	Owlet Moth		13

Scientific Name		Common Name	Special Status	Reference
	Toxonprucha volucris	Owlet Moth		13
	Trichoplusia ni	Cabbage Looper Moth		13
	Tridepia nova	Owlet Moth		13
	Triocnemis saporis	Owlet Moth		13
	Zale insuda	Owlet Moth		13
	Furcula nivea	Prominent Moth		13
	Charidryas neumogeni	Brush-footed Butterfly		13
	Chlosyne californica	California Patch		13
	Danaus gillippus	Queen		13
	Danaus plexippus	Monarch		13
	Euptoieta claudia	Brush-footed Butterfly		13
	Lybithea bachmanii	Snout Butterfly		13
	Precis coenia	Common Buckeye		13
	Vanessa cardui	Painted Lady		13
	Vanessa annabella	West Coast Lady		13
	Papilio indra	Indra Swallowtail		13
	Papilio polyxenes	Black Swallowtail		13
	Anthocharis cethura	Desert Orangetip		13
	Anthocharis sara	Sara's Orangetip		13
	Colias eurytheme	Alfalfa (Orange) Sulphur		13
	Euchloe hyantis	Pearly Marble		13
	Euchloe niccippe	Marble		13
	Nathalis iole	Dainty Sulphur		13
	Pieris rapae	Cabbage White		13
	Pontia protodice	Common (Checkered) White		13
	Pontia beckeri	Becker's White		13
	Phoebis sennae	Senna (Cloudless) Sulphur		13
	Family Pterophoridae	Pterophorid Moth		13
	Ypsolopha delicatella	Diamondback Moth		13
	Oiketicus sp.	Bagworm Moth		13
	Achyra occidentalis	Pyralid Moth		13
	Achyra rantalis	Pyralid Moth		13
	Arenochra flavalis	Pyralid Moth		13
	Cahela ponderosella	Pyralid Moth		13
	Euchromius ocelleus	Pyralid Moth		13
	Evercestis comstocki	Pyralid Moth		13
	Helvibotys pseudohelvialis	Pyralid Moth		13
	Jocara trabalis	Pyralid Moth		13
	Loxostege albiceralis	Pyralid Moth		13

Scientific Name		Common Name	Special Status	Reference
	Loxostege oberthuralis	Pyralid Moth		13
	Loxostege sticticalis	Pyralid Moth		13
	Nomophila nearctica	Pyralid Moth		13
	Prorasea sideralis	Pyralid Moth		13
	Pyrausta pseudonythesalis	Pyralid Moth		13
	Ragonotia dotalis	Pyralid Moth		13
	Spoladea recurvalis	Pyralid Moth		13
	Apodemia mormo	Mormon Metalmark		13
	Hemileuca burnsi	Giant Silk Moth		13
	Erinnyis ello	Hawk Moth		13
	Erinnyis obscura	Hawk Moth		13
	Hyles lineata	White-lined Sphinx		13
	Manduca quinquemaculata	Tomato Hornworm Moth		13
	Acrolophus variabilis	Tineid Moth		13
	Cydia latiferreans	Tortricid Moth		13
	Eucosma sp.	Tortricid Moth		13
	Family Agromyzidae	Leafminer Fly		13
	Pegomya duplicata	Anthomyiid Fly		13
	Apiocera pierci	Flower-loving Fly		13
	Ablautus sp.	Robber Fly		13
	Cerotainiops sp.	Robber Fly		13
	Efferia sp.	Robber Fly		13
	Protocanthella sp.	Robber Fly		13
	Megaphorus frustrata	Robber Fly		13
	Proctacanthus sp.	Robber Fly		13
	Stichopogon sp.	Robber Fly		13
	Backomyia sp.	Robber Fly		13
	Itolia timberlakei	Robber Fly		13
	Saropogon sp.	Robber Fly		13
	Promachus sp.	Robber Fly		13
	Haplopogon sp.	Robber Fly		13
	Anthrax sp.	Bee Fly		13
	Apoloysis sp.	Bee Fly		13
	Aphoebantus sp.	Bee Fly		13
	Bombylius sp.	Bee Fly		13
	Chrysanthrax pertusus	Bee Fly		13
	Eucessia sp.	Bee Fly		13
	Exoprosopa sp.	Bee Fly		13
	Geminaria sp.	Bee Fly		13

Scientific Name		Common Name	Special Status	Reference
	Geron sp.	Bee Fly		13
	Lepidanthrax sp.	Bee Fly		13
	Lordotus sp.	Bee Fly		13
	Neodipiocampta sp.	Bee Fly		13
	Ogcodocera sp.	Bee Fly		13
	Oligodranes sp.	Bee Fly		13
	Pantarbes sp.	Bee Fly		13
	Phthiria sp.	Bee Fly		13
	Poecilanthrax sp.	Bee Fly		13
	Parabombylius sp.	Bee Fly		13
	Thevenemyia sp.	Bee Fly		13
	Thyridanthrax sp.	Bee Fly		13
	Toxophora virgata	Bee Fly		13
	Triploechus sp.	Bee Fly		13
	Villa sp.	Bee Fly		13
	Family Calliphoridae	Blow Fly		13
	Asphondylia sp.	Gall Midge		13
	Family Ceratopogonidae	Biting Midge		13
	Family Chamaemyiidae	Aphid Fly		13
	Family Chironomidae	Midge		13
	Siphonella sp.	Chloropid Fly		13
	Thaumatomyia rubida	Chloropid Fly		13
	Family Culicidae	Mosquito		13
	Family Cuterebridae	Robust Bot Fly		13
	Hydrophorus sp.	Long-legged Fly		13
	Drapetis sp.	Dance Fly		13
	Ephydra sp.	Brine Fly		13
	Mosillus tibialis	Shore Fly		13
	Scatella paludum	Shore Fly		13
	Family Heleomyzidae	Heleomyzid Fly		13
	Family Lauxaniidae	Lauxaniid Fly		13
	Family Lonchaeidae	Spear-winged Fly		13
	Family Milichiidae	Milichiid Fly		13
	Family Muscidae	House Fly		13
	Family Mycetophilidae	Fungus Gnat		13
	Opomydas sp.	Mydas Fly		13
	Rhaphiomidas acton	Flower-loving Fly		13
	Euxesta sp.	Picture-winged Fly		13
	Family Pipunculidae	Big-headed Fly		13

Scientific Name		Common Name	Special Status	Reference
	Blaesoxipha plinthopyga	Flesh Fly		13
	Metrichia bulbosa	Window Fly		13
	Pherbella vitalis	Marsh Fly		13
	Sepsis sp.	Black Scavenger Fly		13
	Family Simuliidae	Black Fly		13
	Family Sphaeroceridae	Small Dung Fly		13
	Nemotelus arator	Soldier Fly		13
	Dieuryneura stigma	Soldier Fly		13
	Eristalis latifrons	Flower Fly		13
	Syritta pipiens	Flower Fly		13
	Eupeodes volucris	Flower Fly		13
	Mallota sp.	Flower Fly		13
	Meliscaeva sp.	Flower Fly		13
	Chrysotoxum sp.	Flower Fly		13
	Platycheirus stegnus	Flower Fly		13
	Epistrophe sp.	Flower Fly		13
	Tabanus punctifer	Tachinid Fly		13
	Gymnosoma fuliginosum	Tachinid Fly		13
	Microchaetina sp.	Tachinid Fly		13
	Paradidyma sp.	Tachinid Fly		13
	Phasia aldrichii	Tachinid Fly		13
	Peleteria malleola	Tachinid Fly		13
	Exorista sp.	Tachinid Fly		13
	Chetogena sp.	Tachinid Fly		13
	Trupanea jonesi	Fruit Fly		13
	Euarestoides acutangulus	Fruit Fly		13
	Thereva sp.	Stiletto Fly		13
	Family Threophoridae	Threophorid Fly		13
	Family Tipulidae	Crane Fly		13
	Family Trixoscelididae	Trixoscelidid Fly		13
	Ancylandrena sp.	Andrenid Bee		13
	Andrena sp.	Burrowing Bee		13
	Perdita sp.	Andrenid Bee		13
	Megandrena enceliae	Andrenid Bee		13
	Nomada sp.	Cuckoo Bee		13
	Melissodes sp.	Cuckoo Bee		13
	Diadasia sp.	Cuckoo Bee		13
	Svastra sp.	Cuckoo Bee		13
	Tetraloniella sp.	Cuckoo Bee		13

Scientific Name		Common Name	Special Status	Reference
	Xeromelecta californica	Cuckoo Bee		13
	Xeromelecta larreae	Cuckoo Bee		13
	Xylocopa sp.	Cuckoo Bee		13
	Anthophora sp.	Cuckoo Bee		13
	Centris sp.	Cuckoo Bee		13
	Melecta sp.	Cuckoo Bee		13
	Apis mellifera	Honey Bee		13
	Anthophorula sp.	Bee		13
	Idiomelissodes duplocincta	Bee		13
	Family Argidae	Argid Sawfly		13
	Family Bethylidae	Bethylid Wasp		13
	Chelonus sp.	Braconid Wasp		13
	Family Chrysididae	Cuckoo Wasp		13
	Colletes sp.	Yellow-faced (Plasterer) Bee		13
	Family Chalcididae	Chalcid Wasp		13
	Family Cynipidae	Gall Wasp		13
	Family Encyrtidae	Encrytid Wasp		13
	Family Eulophidae	Eulophid Wasp		13
	Family Eupelmidae	Eupelmid Wasp		13
	Family Eurytomidae	Seed Chalcid		13
	Crematogaster sp.	Ant		13
	Leptothorax rugatulus	Honey Ant		13
	Myrmecocystus kennedyi	Honey Ant		13
	Myrmecocystus creightoni	Honey Ant		13
	Monomorium minimum	Ant		13
	Camponotus sp.	Carpenter Ant		13
	Pogonomyrmex rugosus	Harvester Ant		13
	Pogonomyrmex californicus	California Harvester Ant		13
	Pogonomyrmex magnacanthus	Harvester Ant		13
	Pseudomyrmex pallidus	Ant		13
	Messor pergandei	Black Harvester Ant		13
	Pheidole sp.	Ant		13
	Iridomyrmex humulis	Argentine Ant		13
	Dorymyrmex pyramicus	Ant		13
	Dorymyrmex bicolor	Ant		13
	Solenopsis xyloni	Ant		13
	Family Ichneumonidae	Ichneumonid Wasp		13
	Family Halictidae	Halictid bee		13
	Ashmeadiella bigeloviae	Leafcutting Bee		13

Scientific Name		Common Name	Special Status	Reference
	Coeloxys sp.	Leafcutting Bee		13
	Dianthidium sp.	Leafcutting Bee		13
	Hoplitis sp.	Leafcutting Bee		13
	Epeolus sp.	Leafcutting Bee		13
	Neolarra sp.	Leafcutting Bee		13
	Trachusa bequaerti	Leafcutting Bee		13
	Trachusa larreae	Leafcutting Bee		13
	Megachile sp.	Leafcutting Bee		13
	Hesperapis sp.	Melittid Bee		13
	Dasymutilla satanas	Melittid Bee		13
	Family Mutillidae	Velvet Ant		13
	Spharopthalma sp.	Velvet Ant		13
	Family Perilampidae	Perilampid Wasp		13
	Family Platygasteridae	Platygasterid Wasp		13
	Family Pteromalidae	Pteromalid Wasp		13
	Pepsis sp.	Tarantula Hawk		13
	Anoplius cieora	Blue-black Spider Wasp		13
	Family Scelionidae	Scelionid Wasp		13
	Campsomeris sp.	Scoliid Wasp		13
	Ammophila wrightii	Sphecid Wasp		13
	Aphilanthops hispidus	Sphecid Wasp		13
	Astata sp.	Sphecid Wasp		13
	Bembecinus sp.	Sphecid Wasp		13
	Bembix rugosa	Sphecid Wasp		13
	Cerceris acanthophila	Sphecid Wasp		13
	Cerceris sextoides	Sphecid Wasp		13
	Clypeadon evansi	Sphecid Wasp		13
	Diploplectron sp.	Sphecid Wasp		13
	Dryudella sp.	Sphecid Wasp		13
	Eucerceris canaliculata	Sphecid Wasp		13
	Eucerceris arenaria	Sphecid Wasp		13
	Hoplisoides spilopterus	Sphecid Wasp		13
	Glenostictia sp.	Sphecid Wasp		13
	Microbembix argyropleura	Sphecid Wasp		13
	Microstictia ap.	Sphecid Wasp		13
	Philanthus sp.	Sphecid Wasp		13
	Podalonia deserticola	Sphecid Wasp		13
	Podalonia proticola	Sphecid Wasp		13
	Prionyx foxi	Sphecid Wasp		13

Scientific Name		Common Name	Special Status	Reference
	Prionyx parkeri	Sphecid Wasp		13
	Steniola duplicata	Sphecid Wasp		13
	Stictiella sp.	Sphecid Wasp		13
	Sphecius convallis	Sphecid Wasp		13
	Sphex ashmeadii	Sphecid Wasp		13
	Tachytes erimineus	Sphecid Wasp		13
	Family Tiphiidae	Tiphiid Wasp		13
	Family Torymidae	Torymid Wasp		13
	Trichogramma pratti	Trichogrammatid Wasp		13
	Trichogramma kaykai	Trichogrammatid Wasp		13
	Subfamily Eumeninae	Vespid Wasp		13
	Euodynerus annulatus	Vespid Wasp		13
	Pseudomasaris edwardsii	Vespid Wasp		13
	Pseudomasaris maculifrons	Vespid Wasp		13
	Pseudomasaris wheeleri	Vespid Wasp		13
	Pterocheilus mirandus	Vespid Wasp		13
	Pterocheilus hirsutipennis	Vespid Wasp		13
	Pterocheilus laticeps	Vespid Wasp		13
	Pterocheilus pimorum	Vespid Wasp		13
	Polistes fuscatus	Paper Wasp		13
Fish				
*	*Gambusia affinis*	Western Mosquitofish		1, 2, 14, 16
Amphibians				
	Anaxyrus boreas	Western Toad		2, 14
	Anaxyrus punctatus	Red-spotted Toad		2, 14
Reptiles				
	Aspidoscelis tigris	Western Whiptail		2, 3, 9, 10, 14
	Callisaurus draconoides	Zebra-tailed Lizard		2, 3, 9, 10, 11, 14
	Coleonyx variegatus	Banded Gecko		2, 3, 9, 10, 11, 14
	Crotaphytus bicinctores	Great Basin Collared Lizard		2, 3, 11
	Crotaphytus insularis	Desert Collared Lizard		14
	Dipsosaurus dorsalis	Desert Iguana		2, 3, 9, 10, 11, 14
	Sauromalus ater	Chuckwalla		2, 3, 4, 11, 14
	Gambelia wislizenii	Long-nosed Leopard Lizard		2, 3, 9, 10, 11, 14

Scientific Name		Common Name	Special Status	Reference
	Phrynosoma platyrhinos	Desert Horned Lizard		2, 3, 9, 10, 11, 14
	Sceloporus magister	Desert Spiny Lizard		2, 3, 10, 11, 14
	Uma scoparia	Mojave Fringe-toed Lizard	CSC	1, 2, 9, 11, 14
	Urosaurus graciosus	Western Long-tailed Brush Lizard		2, 3, 9, 11, 14
	Uta stansburiana	Side-blotched Lizard		2, 3, 9, 10, 11, 14
	Plestiodon gilberti	Gilbert Skink		Hypothetical
	Xantusia vigilis	Desert Night Lizard		2, 11, 14
	Arizona elegans	Glossy Snake		2, 10, 11, 14
	Chionactis occipitalis	Shovel-nosed Snake		3, 10, 11, 14
	Coluber flagellum	Red Racer (Coachwhip)		2, 3, 10, 11, 14
	Crotalus atrox	Western Diamondback		Hypothetical
	Crotalus cerastes	Sidewinder		3, 10, 11, 14
	Crotalus mitchelli	Speckled Rattlesnake		3, 11, 14
	Crotalus oreganos (viridis)	Western Rattlesnake		Hypothetical
	Crotalus scutulatus	Mohave Rattlesnake		3, 10, 11, 14
	Leptotyphlops humilis	Western Blind Snake		Hypothetical
	Diadophis punctatus	Ring-necked Snake		Hypothetical
	Hypsiglena torquata	Night Snake		Hypothetical
	Lampropeltis californiae	California Kingsnake		11, 14
	Lampropeltis getulus	Desert Kingsnake		10
	Lichanura trivirgata	Rosy Boa		2, 14
	Phyllorhynchus decurtatus	Spotted Leaf-nosed Snake		2, 10, 11, 14
	Pituophis melanoleucus	Ground Snake		2, 10, 14
	Pituophis catenifer	Gopher Snake		3, 10, 11, 14
	Rhinocheilus lecontei lecontei	Long-nosed Snake		2, 14
	Salvadora hexalepis	Western Patch-nosed Snake		3, 11, 14
	Tantilla hobartsmithi	Southwestern Black-headed Snake		Hypothetical
	Sonora semiannulata	Western Groundsnake		3, 11
	Trimorphodon bisculatus	Lyre Snake		Hypothetical
	Gopherus agassizii	Desert Tortoise	FT, ST, T1	1, 2, 9, 11, 14
Birds				
	Anser albifrons	Greater White-fronted Goose	MBTA	2, 14
	Chen caerulescens	Snow Goose	MBTA	2, 14

Scientific Name		Common Name	Special Status	Reference
	Chen rossii	Ross' Goose	MBTA	2, 14
	Branta canadensis	Canada Goose	MBTA	2, 14
	Cygnus columbianus	Tundra Swan	MBTA	14
	Anas strepera	Gadwall	MBTA	5, 14
	Anas americana	American Wigeon	MBTA	2, 14
	Anas platyrhynchos	Mallard	MBTA	2, 5, 14
	Anas discors	Blue-winged Teal	MBTA	5, 14
	Anas cyanoptera	Cinnamon Teal	MBTA	5, 14
	Anas clypeata	Northern Shoveler	MBTA	2, 5, 14
	Anas acuta	Northern Pintail	MBTA	5, 14
	Anas crecca	Green-winged Teal	MBTA	5, 14
	Aythya valisineria	Canvasback	MBTA	14
	Aythya americana	Redhead	CSC, MBTA	2, 5, 14
	Aythya collaris	Ring-necked Duck	MBTA	5, 14
	Aythya marila	Greater Scaup	MBTA	14
	Aythya affinis	Lesser Scaup	MBTA	5, 14
	Clangula hyemalis	Oldsquaw (Long-tailed Duck)	MBTA	14
	Bucephala albeola	Bufflehead	MBTA	5, 14
	Mergus merganser	Common Merganser	MBTA	14
	Oxyura jamaicensis	Ruddy Duck	MBTA	2, 5, 14
	Callipepla gambellii	Gambel's Quail		2, 3, 14
	Alectoris chukar	Chukar		3
	Podilymbus podiceps	Pied-billed Grebe	MBTA	14
	Podiceps grisegena	Red-necked Grebe	MBTA	14
	Podiceps nigricollis	Eared Grebe	MBTA	2, 5, 14
	Aechmophorus occidentalis	Western Grebe	MBTA	14
	Phalacrocorax auritus	Double-crested Cormorant	MBTA	2, 14
	Pelecanus erythrorhynchos	American White Pelican	CSC, MBTA	14
	Pelecanus occidentalis	Brown Pelican	MBTA	1
	Ardea herodias	Great Blue Heron	MBTA	14
	Ardea alba	Great Egret	MBTA	14
	Egretta thula	Snowy Egret	MBTA	14
	Bubulcus ibis	Cattle Egret	MBTA	14
	Butorides virescens	Green Heron	MBTA	14
	Plegadis chihi	White-faced Ibis	MBTA	2, 14
	Cathartes aura	Turkey Vulture	MBTA	3, 14
	Pandion haliaetus	Osprey	MBTA	2, 14
	Haliaeetus leucocephalus	Bald Eagle	BEPA, SE, MBTA	2
	Circus cyaneus	Northern Harrier	CSC, MBTA	1, 2, 14, 15

Scientific Name		Common Name	Special Status	Reference
	Accipiter striatus	Sharp-shinned Hawk	MBTA	1, 2, 14 ,15
	Accipiter cooperii	Cooper's Hawk	MBTA	1, 2, 14, 15
	Buteo lineatus	Red-shouldered Hawk	MBTA	14
	Buteo jamaicensis	Red-tailed Hawk	MBTA	2, 3, 14
	Buteo regalis	Ferruginous Hawk	MBTA	2, 14, 15
	Aquila chrysaetos	Golden Eagle	BEPA, CFP, MBTA	1, 2, 14,15
	Porzana carolina	Sora	MBTA	2, 14
	Fulica americana	American Coot	MBTA	2, 5, 14
	Himantopus mexicanus	Black-necked Stilt	MBTA	2, 5, 14
	Recurvirostra americana	American Avocet	MBTA	2, 5, 14
	Pluvialis squatarola	Black-bellied Plover	MBTA	14
	Charadrius nivosus	Snowy Plover	MBTA	14
	Charadrius semipalmatus	Semipalmated Plover	MBTA	14
	Charadrius vociferus	Killdeer	MBTA	2, 5, 14
	Actitis macularius	Spotted Sandpiper	MBTA	14
	Tringa solitaria	Solitary Sandpiper	MBTA	2, 14
	Tringa melanoleuca	Greater Yellowlegs	MBTA	5, 14
	Tringa semipalmata	Willet	MBTA	14
	Tringa flavipes	Lesser Yellowlegs	MBTA	5, 14
	Numenius americanus	Long-billed Curlew	MBTA	14
	Limosa fedoa	Marbled Godwit	MBTA	14
	Calidris alpina	Dunlin	MBTA	14
	Calidris minutilla	Least Sandpiper	MBTA	2, 5, 14
	Calidris melanotos	Pectoral Sandpiper	MBTA	14
	Calidris pusilla	Semipalmated Sandpiper	MBTA	14
	Calidris mauri	Western Sandpiper	MBTA	5, 14
	Limnodromus sp.	Dowitcher	MBTA	5
	Limnodromus griseus	Short-billed Dowitcher	MBTA	14
	Limnodromus scolopaceus	Long-billed Dowitcher	MBTA	14
	Gallinago gallinago	Common Snipe	MBTA	14
	Phalaropus tricolor	Wilson's Phalarope	MBTA	14
	Phalaropus lobatus	Red-necked Phalarope	MBTA	14
	Phalaropus fulicarius	Red Phalarope	MBTA	14
	Larus pipixcan	Franklin's Gull	MBTA	14
	Larus philadelphia	Bonaparte's Gull	MBTA	14
	Larus canus	Mew Gull	MBTA	14
	Larus delawarensis	Ring-billed Gull	MBTA	5, 14

Scientific Name		Common Name	Special Status	Reference
	Larus occidentalis	Western Gull	MBTA	14
	Larus californicus	California Gull	MBTA	5, 14
	Larus argentatus	Herring Gull	MBTA	14
	Hydroprogne caspia	Caspian Tern	MBTA	14
	Chlidonias niger	Black Tern	CSC, MBTA	2, 14, 15
	Sterna forsteri	Forster's Tern	MBTA	14
*	*Columba livia*	Rock Pigeon		2, 14
*	*Streptopelia decaocto*	Eurasian Collared-Dove		Hypothetical
	Zenaida asiatica	White-winged Dove	MBTA	2, 3, 14
	Zenaida macroura	Mourning Dove	MBTA	2, 3, 14
	Columbina inca	Inca Dove	MBTA	14
	Columbina passerina	Common Ground-Dove	MBTA	2
	Geococcyx californianus	Greater Roadrunner	MBTA, T1	2, 3, 14
	Tyto alba	Barn Owl	MBTA	2, 3, 14
	Bubo virginianus	Great Horned Owl	MBTA	2, 3, 12, 14
	Athene cunicularia	Burrowing Owl	CSC, MBTA	1, 2, 6, 14, 15
	Asio otus	Long-eared Owl	CSC, MBTA	1, 2, 14, 15
	Asio flammeus	Short-eared Owl	CSC, MBTA	2, 14
	Chordeiles acutipennis	Lesser Nighthawk	MBTA	2, 3, 14
	Phalaenoptilus nuttallii	Common Poorwill	MBTA	2, 3, 14
	Chaetura vauxi	Vaux's Swift	CSC, MBTA	2, 14, 15
	Aeronautes saxatalis	White-throated Swift	MBTA	2, 3, 14
	Archilochus alexandri	Black-chinned Hummingbird	MBTA	3, 14
	Calypte anna	Anna's Hummingbird	MBTA	2, 3, 14
	Calypte costae	Costa's Hummingbird	MBTA	2, 3, 14
	Selasphorus rufus	Rufous Hummingbird	MBTA	14
	Selasphorus sasin	Allen's Hummingbird	MBTA	14
	Ceryle alcyon	Belted Kingfisher	MBTA	14
	Melanerpes lewis	Lewis' Woodpecker	MBTA	14
	Sphyrapicus varius	Yellow-bellied Sapsucker	MBTA	14
	Sphyrapicus nuchalis	Red-naped Sapsucker	MBTA	14
	Picoides scalaris	Ladder-backed Woodpecker	MBTA	2, 3, 14
	Colaptes auratus	Northern Flicker	MBTA	2, 14
	Colaptes chrysoides	Gilded Flicker	SE, MBTA	2, 14, 15
	Falco sparverius	American Kestrel	MBTA	2, 3, 14
	Falco columbarius	Merlin	MBTA	2, 14, 15
	Falco peregrinus anatum	American Peregrine Falcon	CFP, MBTA	2, 15
	Falco mexicanus	Prairie Falcon	MBTA	1, 2, 14,

Scientific Name		Common Name	Special Status	Reference
	Contopus cooperi	Olive-sided Flycatcher	CSC, MBTA	14
	Contopus sordidulus	Western Wood-pewee	MBTA	14
	Empidonax traillii	Willow Flycatcher	SE, MBTA	1, 14
	Empidonax traillii extimus	Southwestern Willow Flycatcher	FE, SE, MBTA	2
	Empidonax hammondii	Hammond's Flycatcher	MBTA	3, 14
	Empidonax wrightii	Gray Flycatcher	MBTA	14
	Empidonax oberholseri	Dusky Flycatcher	MBTA	14
	Empidonax difficilis	Pacific-slope Flycatcher	MBTA	3, 14
	Sayornis nigricans	Black Phoebe	MBTA	2, 5, 14
	Sayornis saya	Say's Phoebe	MBTA	2, 3, 5, 14
	Myiarchus cinerascens	Ash-throated Flycatcher	MBTA	2, 3, 14
	Myiarchus tyrannulus	Brown-crested Flycatcher	MBTA	2, 14, 15
	Tyrannus vociferans	Cassin's Kingbird	MBTA	14
	Tyrannus verticalis	Western Kingbird	MBTA	2, 3, 14
	Tyrannus forficatus	Scissor-tailed Flycatcher	MBTA	14
	Lanius ludovicianus	Loggerhead Shrike	CSC, MBTA	1, 2, 5, 14, 15
	Vireo bellii	Bell's Vireo	MBTA	14
	Vireo bellii pusillus	Least Bell's Vireo	FE, SE, MBTA	2
	Vireo solitarius	Solitary Vireo	MBTA	14
	Vireo flavifrons	Yellow-throated Vireo	MBTA	14
	Vireo gilvus	Warbling Vireo	MBTA	14
	Aphelocoma californica	Western Scrub-jay	MBTA	14
	Corvus brachyrhynchos	American Crow	MBTA	14
	Corvus corax	Common Raven	MBTA	1, 2, 3, 5, 14
	Eremophila alpestris	Horned Lark	MBTA	2, 3, 5, 14
	Tachycineta bicolor	Tree Swallow	MBTA	5, 14
	Tachycineta thalassina	Violet-green Swallow	MBTA	3, 14
	Stelgidopteryx serripennis	Northern Rough-winged Swallow	MBTA	3, 5, 14
	Riparia riparia	Bank Swallow	ST, MBTA	2, 14, 15
	Petrochelidon pyrrhonota	Cliff Swallow	MBTA	2, 3, 5, 14
	Hirundo rustica	Barn Swallow	MBTA	3, 5, 14
	Auriparus flaviceps	Verdin	MBTA	2, 3, 14
	Sitta canadensis	Red-breasted Nuthatch	MBTA	14
	Sitta carolinensis	White-breasted Nuthatch	MBTA	14
	Salpinctes obsoletus	Rock Wren	MBTA	2, 3, 14
	Catherpes mexicanus	Canyon Wren	MBTA	2, 14
	Troglodytes aedon	House Wren	MBTA	14

Scientific Name		Common Name	Special Status	Reference
	Cistothorus palustris	Marsh Wren	MBTA	2, 14
	Thryomanes bewickii	Bewick's Wren	MBTA	14
	Campylorhynchus brunneicapillus	Cactus Wren	MBTA	2, 3, 14
	Polioptila caerulea	Blue-gray Gnatcatcher	MBTA	3, 14
	Polioptila melanura	Black-tailed Gnatcatcher	MBTA	2, 3, 14
	Regulus calendula	Ruby-crowned Kinglet	MBTA	2, 3, 14
	Sialia currucoides	Mountain Bluebird	MBTA	2, 14
	Catharus ustulatus	Swainson's Thrush	MBTA	14
	Catharus guttatus	Hermit Thrush	MBTA	14
	Turdus migratorius	American Robin	MBTA	2, 14
	Toxostoma redivivum	California Thrasher	MBTA	2, 14
	Toxostoma lecontei	Le Conte’s Thrasher	CSC, MBTA	1, 2, 14, 15
	Oreoscoptes montanus	Sage Thrasher	MBTA	3, 14
	Mimus polyglottos	Northern Mockingbird	MBTA	2, 3, 14
*	*Sturnus vulgaris*	European Starling	MBTA	2, 3, 5, 14
	Anthus rufescens	American Pipit	MBTA	2, 5, 14
	Anthus spragueii	Sprague's Pipit	MBTA	14
	Bombycilla cedrorum	Cedary Waxwing	MBTA	14
	Phainopepla nitens	Phainopepla	MBTA	2, 3, 14
	Parkesia noveboracensis	Northern Waterthrush	MBTA	14
	Oreothypis luciae	Lucy's Warbler	CSC, MBTA	3
	Oreothypis celata	Orange-crowned Warbler	MBTA	3, 14
	Oreothypis ruficapilla	Nashville Warbler	MBTA	14
	Geothlypis tolmiei	MacGillivray's Warbler	MBTA	14
	Geothlypis trichas	Common Yellowthroat	MBTA	2, 5, 14
	Setophaga ruticilla	American Redstart	MBTA	14
	Setophaga petechia	Yellow Warbler	CSC, MBTA	2, 14,
	Setophaga pensylvanica	Chestnut-sided Warbler	MBTA	14
	Setophaga coronata	Yellow-rumped Warbler	MBTA	2, 3, 5, 14
	Setophaga nigrescens	Black-throated Gray Warbler	MBTA	14
	Setophaga townsendi	Townsend's Warbler	MBTA	3, 14
	Setophaga occidentalis	Hermit Warbler	MBTA	14
	Cardellina pusilla	Wilson's Warbler	MBTA	3, 14
	Pipilo chlorurus	Green-tailed Towhee	MBTA	14
	Pipilo maculatus	Spotted Towhee	MBTA	2, 14
	Spizella passerina	Chipping Sparrow	MBTA	3, 14
	Spizella breweri	Brewer's Sparrow	MBTA	2, 3, 14
	Pooecetes gramineus	Vesper Sparrow	MBTA	14
	Chondestes grammacus	Lark Sparrow	MBTA	14

Scientific Name		Common Name	Special Status	Reference
	Amphispiza bilineata	Black-throated Sparrow	MBTA	2, 3, 14
	Artemisiospiza belli	Sage Sparrow	MBTA	2, 3, 14
	Passerculus sandwichensis	Savannah Sparrow	MBTA	2, 3, 5, 14
	Passerella iliaca	Fox Sparrow	MBTA	2
	Melospiza melodia	Song Sparrow	MBTA	14
	Melospiza lincolnii	Lincoln's Sparrow	MBTA	2, 3, 14
	Zonotrichia leucophrys	White-crowned Sparrow	MBTA	2, 3, 5, 14
	Junco hyemalis	Dark-eyed Junco	MBTA	2, 14
	Piranga ludoviciana	Western Tanager	MBTA	3, 14
	Pheucticus ludovicianus	Rose-breasted Grosbeak	MBTA	14
	Pheucticus melanocephalus	Black-headed Grosbeak	MBTA	3, 14
	Passerina amoena	Lazuli Bunting	MBTA	14
	Agelaius phoeniceus	Red-winged Blackbird	MBTA	2, 14
	Sturnella neglecta	Western Meadowlark	MBTA	2, 3, 14
	Xanthocephalus xanthocephalus	Yellow-headed Blackbird	CSC, MBTA	2, 14
	Euphagus cyanocephalus	Brewer's Blackbird	MBTA	2, 5, 14
	Quiscalus mexicanus	Great-tailed Grackle	MBTA	2, 5, 14
*	*Molothrus ater*	Brown-headed Cowbird	MBTA	14
	Icterus cucullatus	Hooded Oriole	MBTA	2, 14
	Icterus bullockii	Bullock's Oriole	MBTA	2, 14
	Icterus parisorum	Scott's Oriole	MBTA	2, 3, 14
	Haemorhous mexicanus	House Finch	MBTA	2, 3, 5, 14
	Loxia curvirostra	Red Crossbill	MBTA	2, 14
	Carduelis psaltria	Lesser Goldfinch	MBTA	2, 3, 14
	Carduelis lawrencei	Lawrence's Goldfinch	MBTA	14
*	*Passer domesticus*	House Sparrow		2, 3, 14
Mammals				
	Notiosorex crafordi	Desert Shrew		Hypothetical
	Macrotus californicus	California Leaf-nosed Bat	CSC	1, 2, 14
	Myotis californicus	California Myotis		2, 7, 11, 12, 14
	Myotis ciliolabrum	Small-footed Myotis	CSC	Hypothetical
	Myotis thysanodes	Fringed Myotis	CSC	Hypothetical
	Myotis volans	Long-legged Myotis	CSC	Hypothetical
	Myotis yumanensis	Yuma Myotis		Hypothetical
	Lasiurus blossevillii	Western Red Bat	CSC	Hypothetical
	Lasiurus cinereus	Hoary Bat		2, 11, 14
	Lasiurus xanthinus	Western Yellow Bat	CSC	12, 14
	Parastrellus hesperus	Canyon Bat		11, 12

Scientific Name		Common Name	Special Status	Reference
	Eptesicus fuscus	Big Brown Bat		2, 14
	Euderma maculatum	Spotted Bat	CSC	Hypothetical
	Pipistrellus hesperus	Western Pipistrelle		2, 7, 14
	Corynorhinus townsendii	Townsend's Big-eared Bat	ST	1, 2, 7, 12, 14
	Idionycteris phyllotis	Allen's Big-eared Bat		Hypothetical
	Antrozous pallidus	Pallid Bat	CSC	1, 2, 7, 11, 12, 14
	Tadarida brasiliensis	Mexican (Brazilian) Free-tailed Bat		2, 7, 11, 12, 14
	Nyctinomops femorosaccus	Pocketed Free-tailed Bat	CSC	11, 14
	Nyctinomops macrotis	Big Free-tailed Bat	CSC	14
	Eumops perotis californicus	Western Mastiff Bat	CSC	1, 2, 14
	Sylvilagus audubonii	Desert Cottontail		2, 11, 14
	Lepus californicus	Black-tailed Jackrabbit		2, 11, 14
	Spermophilus beecheyi	California Ground Squirrel		2, 14
	Spermophilus tereticaudus	Round-tailed Ground Squirrel		2, 8, 11, 14
	Ammospermophilus leucurus	White-tailed Antelope Squirrel		2, 8, 10, 11
	Thomomys bottae	Botta's Pocket Gopher		2, 10, 11, 14
	Perognathus longimembris	Little Pocket Mouse		2, 10, 11, 14
	Chaetodipus formosus	Long-tailed Pocket Mouse		2, 11, 14
	Chaetodipus fallax pallidus	Pallid San Diego Pocket Mouse	CSC	1, 2, 14
	Chaetodipus penicillatus	Desert Pocket Mouse		2, 11, 14
	Chaetodipus rudinoris	Baja California Pocket Mouse		11
	Chaetodipus spinatus	Spiny Pocket Mouse		11
	Dipodomys merriami	Merriam's Kangaroo Rat		2, 10, 11
	Dipodomys deserti	Desert Kangaroo Rat		2, 11, 14
	Dipodomys panamintinus	Panamint Kangaroo Rat		2
	Peromyscus eremicus	Cactus Mouse		2, 14
	Peromyscus crinitus	Canyon Deer Mouse		2, 11, 14
	Peromyscus fraterculus	Northern Baja Deer Mouse		11
	Peromyscus maniculatus	North American Deer Mouse		2, 11
	Peromyscus truei	Pinyon Deer Mouse		11
	Onychomys torridus	Southern Grasshopper Mouse		2, 10, 11, 14
	Neotoma albigula	White-throated Woodrat		11
	Neotoma lepida	Desert Woodrat		2, 11, 14
	Rattus rattus	Black (Roof) Rat		11
*	*Mus musculus*	House Mouse		Hypothetical
*	*Canis familiaris*	Domestic Dog		2, 14

	Scientific Name	Common Name	Special Status	Reference
	Canis latrans	Coyote	T1	2, 11, 14
	Vulpes macrotis arsipus	Desert Kit Fox	CFP	2, 11, 14
	Urocyon cinereoargenteus	Common Gray Fox		2, 11, 14
	Bassariscus astutus	Ringed-tailed Cat	CFP	Hypothetical
	Procyon lotor	Northern Raccoon		2, 14
	Taxidea taxus	American Badger	CSC	2, 11, 14
	Mephitis mephitis	Striped Skunk		2, 14
*	*Felis catus*	Domestic Cat		2, 14
	Puma concolor	Mountain Lion		2, 14
	Lynx rufus	Bobcat		2, 11, 14
	Ovis canadensis nelsoni	Desert Bighorn Sheep	CFP	1, 2, 11, 14

***** ***Non-native species***

Federal Federal categories per the Endangered Species Act, administrated by the USFWS.

FE Endangered - any species officially listed by the USFWS that is in danger of extinction throughout all or a significant portion of its range.

FT Threatened - any species officially listed by the USFWS that is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range.

BGEPA Bald and Golden Eagle Protection Act of 1940.

MBTA Migratory Bird Treaty Act of 1918

Tribes

T1 Species of interest/concern as identified by tribes..

State State categories per the 1984 California Endangered Species Act

SE Endangered - any species officially listed by the California Fish and Game Commission that is in danger of extinction throughout all or a significant portion of its range.

ST Threatened - any species officially listed by the California Fish and Game Commission that is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range.

CSC California Species of Special Concern.

CFP Fully Protected by the California Department of Fish and Wildlife

References:

1 Marine Air Ground Task Force training Command (MAGTFTC). 2012. Integrated Natural Resources management Plan and Environmental Assessment. Fiscal Years 2012-2016.

2 Marine Corps Air Ground Combat Center (MCAGCC). 2012. Final Environmental Impact Statement, Land Acquisition and Airspace Establishment to Support Large-Scale Marine Air Ground Task Force Live Fire and Maneuver Training. July 2012.

3 Circle Mountian Biologicial Consultants, Inc. 2013. Final Report: Vertebrate Inventory, Human Impacts Analysis, and Management Recommendation For the Marine Corps Air Ground Combat Center, Twentynine Palms, San Bernardino County, California. Prepared for Marine Corps Air Ground Task Force Training Command and Naval Facilitites Engineering Command.

4 ICF International. 2010. Chuckwalla Presence/Absence Surveys in Lavic Lake, Lead Mountain, and Lava Training Areas, Marine Corps Air Ground Combat Center Twentynine Palms, California. Draft. July. Prepared for: Marine Air Ground Task Force Training Command and Naval Facilities Engineering Command Southwest.

Scientific Name	Common Name	Special Status	Reference

5 Marine Corps Air Ground Combat Center (MCAGCC). 2004. Bird/Wildlife Aircraft Strike Hazard (BASH) Plan, Expenditionary Airfield.

6 U.S. Geological Survey (USGS). 2007. Burrowing Owl Surveys and Management Recommendations, Marine Corps Air Ground Task Force Training Command, Twentynine Palms, California. Report prepared by D. Crowe and K. Longshore for Marine Air Ground Task Force Training Command.

7 U.S. Geological Survey (USGS). 2006. Monitoring Bat Roosts in Mines at Marine Corps Air Ground Combat Center, Twentynine Palms, San Bernardino, California, 2005. Report prepared by D. Stokes and R.N. Fisher for Marine Air Ground Task Force Training Command.

8 ICF Jones & Stokes. 2008. Final Report: Mohave Ground Squirrel Presence/Absence Surveys in San Hill, Acorn, Emerson Lake, and Maumee Mine Training Areas, Marine Corps Air Ground Comabt Center, Twentynine Palms, California. Report prepared for Marine Air Ground Task Force Training Command and Naval Facilities Engineering Command Southwest.

9 Cablk, M.E. and 1.S. Heaton. 2002 Nov. Mojave Fringe-Toed Lizard surveys at the Marine Corps Air Ground Combat Center at Twentynine Palms, California and nearby lands Administered by the Bureau ofLand Management. California: Marine Corps Air Ground Combat Center. Report M67399-00-C-0005. 115 p.

10 U.S. Geological Survey (USGS). 2002. Herpetofauna and Small Mammals Surveys on the Marine Corps Air Ground Combat Center, Twentynine Palms, California, March 1999-October 2001. Report prepared by R. Hirsch, S. Hathaway, and R.N. Fisher for Marine Air Ground Task Force Training Command.

11 San Diego Natural History Museum (SDNHM). 2013. Vertebrate Invetory of the Marine Corps Air Ground Combat Center, Twentynine Palms, California. Report prepared by M.A. Stepek, S.B. Tremor, L. Hargrove, D.C Stokes, and B.D. Hollongsworth for Marine Air Ground Task Force Training Command and Naval Facilities Engineering Command Southwest.

12 San Diego Natural History Museum (SDNHM), CGS Incorporated and Vernadero Group. 2014. Bat Surveys in Sunshine Peak Training Area at Marine Corps Air Ground Combat Center, Twentynine Palms, California. Report prepared for Marine Air Ground Task Force Training Command and Naval Facilities Engineering Command Southwest.

13 Pratt, G.F. 2005. Terrestrial Arthropods of the Marine Corps Air Ground Combat Center, Twentynine Palms, California, 2001-2005.

14 Marine Air Ground Task Force training Command (MAGTFTC). 2006. Integrated Natural Resources management Plan and Environmental Assessment. Fiscal Years 2002-2006.

15 Cutler, T.L., D.J. Griffin, and P.R. Krausman. 1999. A Wildlife Inventory and Management Recommendations for the Marine Corps Air Ground Combat Center, Twentynine Palms, California. Prepared for MCAGCC and Southwest Division, Naval Facilities Engineering Command, San Diego, CA under Contract N68711-96-LT-60025. University of Arizona, Tucson, AZ. 142 pp.

16 University of California, Riverside. 1993. Marine Corps Air Ground Combat Center Natural Resources Management Plan, 1992. Departments of Earth Science and Botany and Plant Sciences, Riverside, CA. Prepared for MCAGCC, Twentynine Palms, CA. through Naval Facilities Engineering Command, Southwestern Division, San Diego, CA. 16 pp + app.

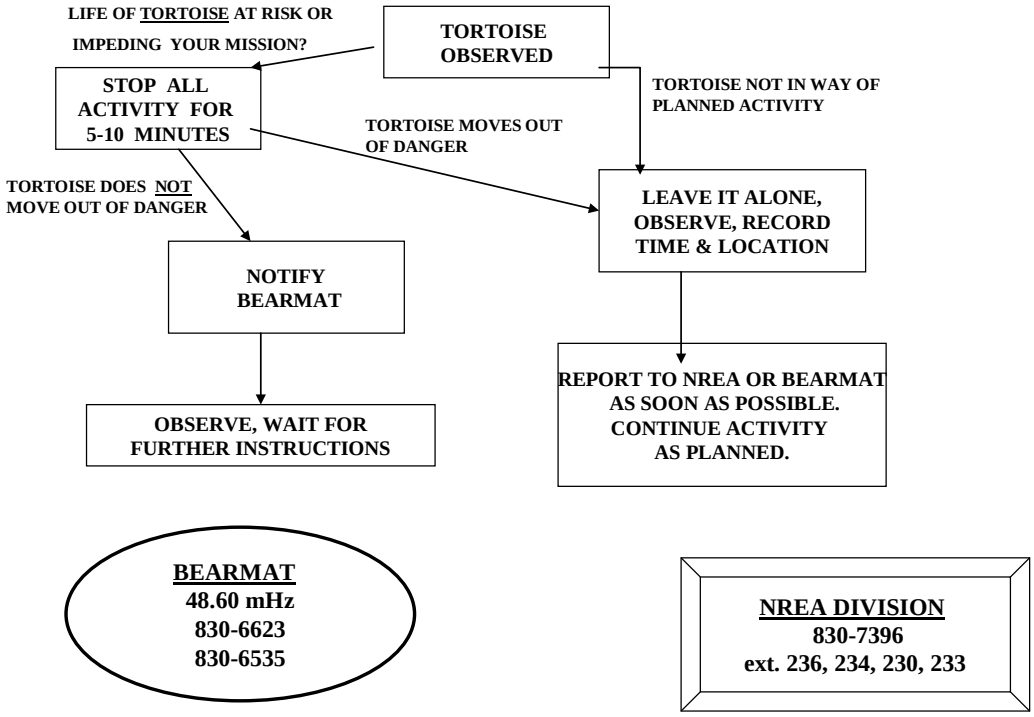
17 Hirsch, R., S. Hathaway, and R. Fisher. 2002. Herpetofauna and Small Mammal Surveys on the Marine Corps Air Ground Combat Center, Twentynine Palms, CA March 1999-Ocober 2001. U.S. Geological Survey, Western Ecological Research Center. Sacramento, California.

APPENDIX E

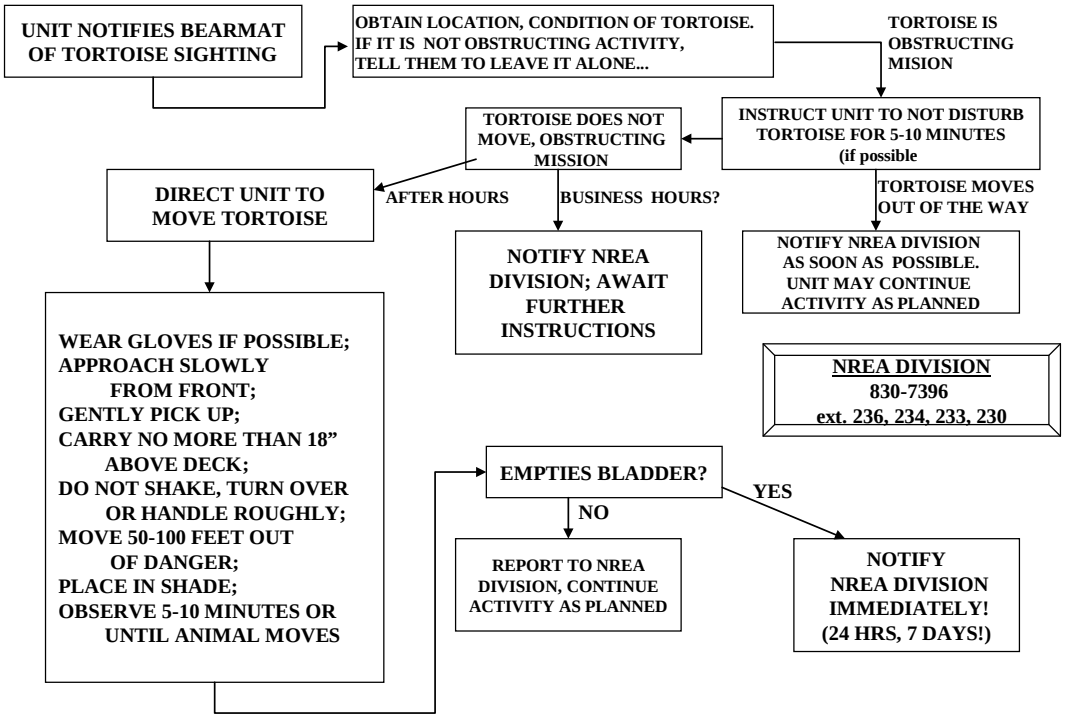
Desert Tortoise Contact Flowcharts

DESERT TORTOISE CONTACT FLOWCHART

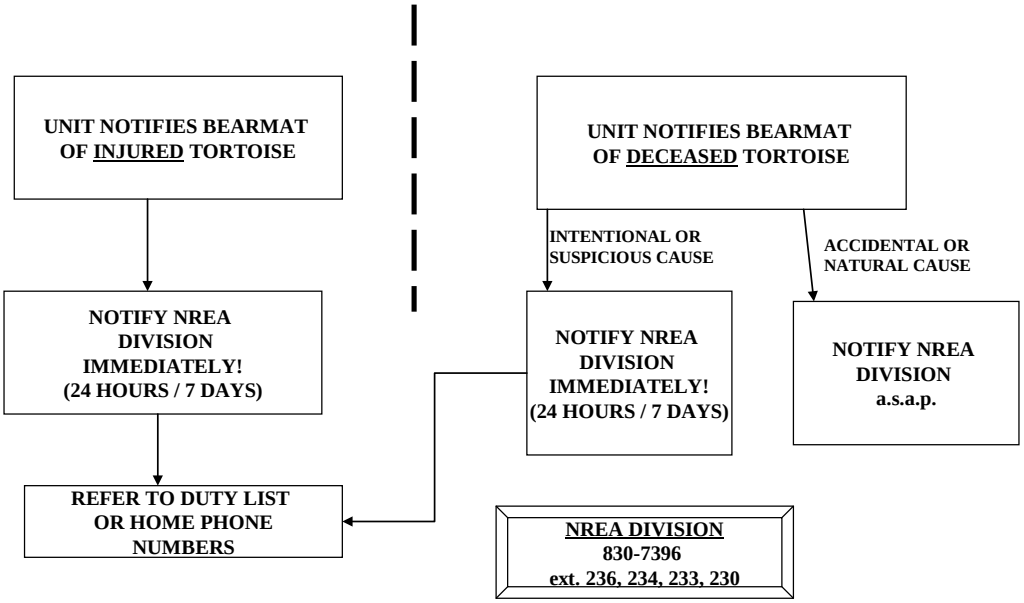
(UNITS IN FIELD)



BEARMAT -- DESERT TORTOISE CONTACT FLOWCHART (see next slide if injured or dead)



BEARMAT -- DESERT TORTOISE CONTACT FLOWCHART (INJURED OR DEAD)

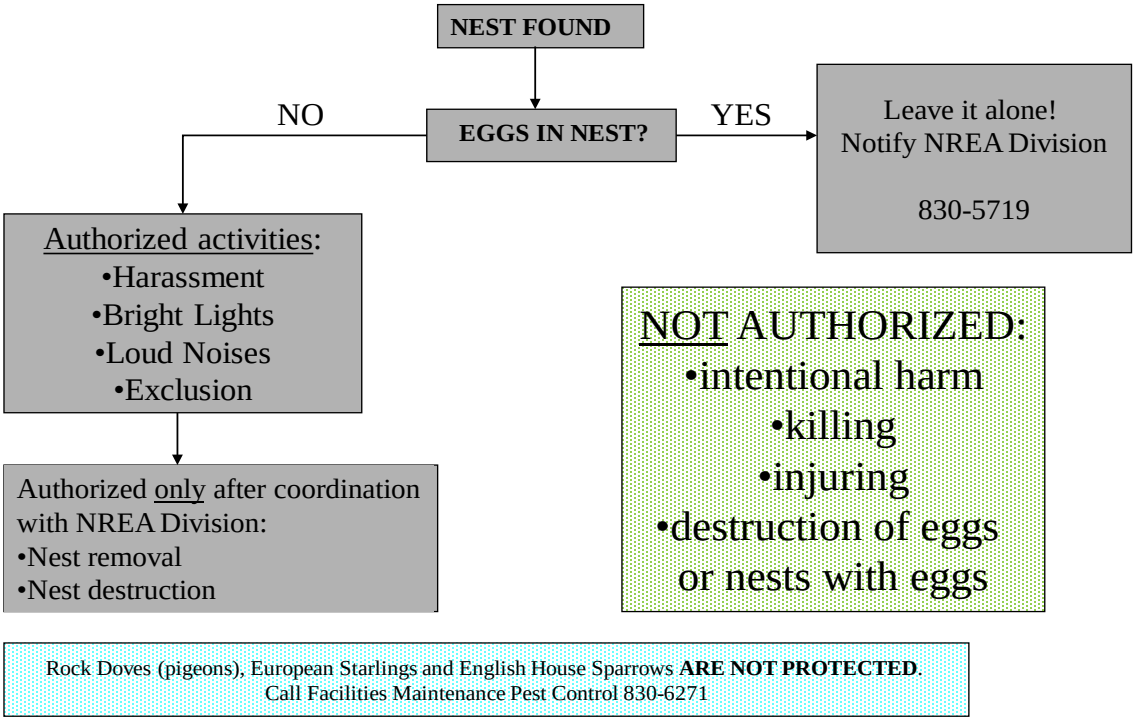


This Page Intentionally Left Blank

APPENDIX F

Bird Nest Response Matrix

Response Matrix for Bird Nests in Vehicles and Buildings



Rock Doves (pigeons), European Starlings and English House Sparrows **ARE NOT PROTECTED**.
Call Facilities Maintenance Pest Control 830-6271

This page is left intentionally blank.

APPENDIX G

Letter of Instruction on Depredation

UNITED STATES MARINE CORPS
MARINE AIR GROUND TASK FORCE TRAINING COMMAND
MARINE CORPS AIR GROUND COMBAT CENTER
BOX 788100
TWENTYNINE PALMS, CALIFORNIA 92278-8100

5090
4E
OCT 11 2017

LETTER OF INSTRUCTION 49-17

From: Commanding General
To: Distribution List

Subj: PREDATORY ANIMAL MANAGEMENT ACTION

Ref: (a) NAVMC 5090.4A
(b) CCO 3500.4K
(c) NREA Interim General Hunting Rules
(d) CCO 1630.6C
(e) Bureau of Land Management - California Hunting & Shooting Handout
(f) California Fish and Wildlife Hunting Regulations
https://www.wildlife.ca.gov/regulations

Encl: (1) Operational Risk Management Matrix
(2) NREA Interim General Hunting Rules
(3) Hold Harmless Agreement

1. Situation. Increased population of coyotes in the designated Range Training Areas (RTA) has culminated in desensitized or aggressive coyote behavior, endangering Marines, their families, domestic animals, and protected wildlife.

2. Mission. In accordance with the references and in order to control coyote population in designated RTAs aboard the Combat Center, abatement of coyotes is authorized on 14 and 15 October 2017, per reference (c).

3. Execution

a. Commander's Intent and Concept of Operations

(1) Commander's Intent. The intent of this plan is to reduce the number of coyotes in designated RTAs through the use of limited and regulated depredation actions.

(2) Concept of Operations. The Natural Resources and Environmental Affairs (NREA) Division will oversee and staff the event per reference (b). Volunteers will be required to undergo range safety training prior to commencement of event. Volunteers will be paired into two-man teams and depart to designated areas. Teams will return at the conclusion of each day. There will not be an overnight portion for this event.

b. Subordinate Element Missions

(1) Marine Air Ground Task Force (MAGTF) Training Directorate

(a) Provide, de-conflict, and approve the use of the following RTAs: East, Sand Hill, and Acorn.

DISTRIBUTION STATEMENT B: Distribution authorized for MAGTFTC, MCAGCC directorates, special staff sections, and operational forces.

(b) Approve and provide vehicle and range deviations as needed.

(c) Provide radio communications with NREA during the event and if needed, dispatch assets for emergency situations in the RTAs.

(2) Installation Support Directorate, NREA

(a) Serve as lead agency.

(b) Request the use of the following RTAs through Range Facility Management Support System: East, Sand Hill, and Acorn.

(c) Submit vehicle deviations to the MAGTF Training Directorate. Include RTA assignments and call signs on the deviation request.

(d) Provide volunteers with information detailing restrictions or hunting limits within individual RTAs per reference (c).

(e) Conduct a check-in brief on 13 October 2017, check for valid California Hunting license, 4x4 vehicles, and firearms. Provide volunteers with required briefings, event information, and radio with extra battery, maps, enclosure (1), and assignment to their designated hunting areas.

(f) Assign two volunteers to each RTA. Assign each volunteer a call sign based on the RTA, which they are assigned to.

(g) Conduct check-in and checkout of volunteers at Building 2096.

(h) Provide BEARMAT with radio communications and updates throughout the conduct of this event.

(i) Provide all volunteers with a copy of enclosure (2).

c. Coordinating Instructions. The point of contact for this Letter of Instruction (LOI) is Chief Conservation Law Enforcement Officer (CLEO) Russell Elswick at (760) 830-3042 or russell.elswick@usmc.mil.

(1) NREA will choose six volunteers to depredate coyotes in the designated RTAs during established hunting times.

(2) Volunteers will be invited by NREA to participate in the event by name and will provide and utilize licenses, weapons, and vehicles that have received prior approval from NREA and MAGTF Training Directorate. Weapons caliber will be limited to .300 WinMag and lower.

(3) NREA will conduct a mandatory Unexploded Ordnance, Desert Survival, and Natural/Cultural Brief at 1700 on 13 October 2017, in Building 2096. CLEOs will check weapons, license, vehicles, and equipment. Volunteers will be provided enclosure (3) for review and signature. Two volunteers will be assigned to hunt in each designated RTA and provide the volunteers with maps and radios.

(4) On 14 and 15 October 2017, volunteers will check-in at Building 2096 between 0400 and 0700. CLEOs will check volunteer vehicles and provide the volunteers with radios, frequency, and call signs.

(5) After verifying volunteers provided their information, NREA will dispatch volunteers to their assigned RTA and depredation will commence.

(6) Volunteers will notify BEARMAT when departing and returning to Mainside and upon arrival and departure of assigned RTA with call sign, via radio.

(7) NREA will conclude the day by checking out volunteers at Building 2096 between 1800 and 2000 on 14 October 2017, and between 1600 and 2000 on 15 October 2017.

(8) NREA will advise BEARMAT when all RTAs have been cleared at the end of the day.

(9) Volunteers will present their collective take of coyote(s) to NREA at checkout. Do not leave the carcass in the field.

(10) Times:

1. 13 Oct 17/1700-2030: Briefs, license, gear, weapons, and vehicle check.

2. 14 Oct 17/0400-0700: Check-In, 1800-2000: Checkout.

3. 15 Oct 17/0400-0700: Check-In, 1600-2000: Checkout.

(11) If injured, volunteers will attempt to utilize self or buddy assist aid and recovery. If unable to clear the RTA due to the severity or nature of an injury, volunteers will contact BEARMAT for Medevac via primary or secondary communications.

(12) Volunteers must be active duty, retired, military family members, or civilians employed aboard the Combat Center. Volunteers will submit the make, model, caliber, and serial number of the firearm(s) used for the hunt. Volunteers will read and obey all rules and guidelines found in enclosure (2). Volunteers will store and transport weapons in accordance with reference (d).

(13) Volunteers will provide their vehicle information to NREA no later than 29 September 2017. NREA will obtain a deviation letter from MAGTF Training Directorate for volunteers' privately owned vehicles. Vehicles used by volunteers will be equipped with four-wheel drive and carry a minimum of five gallons of water per vehicle.

(14) Volunteers will check in at 1700 at Building 2096 on 13 October 2017, and provide proof of a valid California Hunting License, receive mandatory briefs, and bring weapon and vehicle for inspection.

(15) Participation is at the volunteer's own risk. Should a volunteer injure themselves and require more than buddy or self-aid, they will request assistance through BEARMAT. The volunteer will state name, location, and request for assistance.

(16) Volunteers will abide by all California Hunter Safety Rules and Practices and shall follow all applicable rules and regulations per references (e) and (f). Before they discharge their firearm at a confirmed coyote within their designated RTA, the shooter will ensure he or she is no closer than 150 yards of an occupied structure, will clear the target area,

will not shoot over any road, and will set up the shot so the target has a suitable back stop. A suitable backstop provides enough soil to absorb any errant rounds, and will not contain ricochet hazards like large rocks or boulders. Shooters will always comply with the four Firearms Safety Rules.

(17) Present coyote carcass upon completion of hunt. Report the following: location (RTA), expenditure of ammunition, time, date, and number of shots fired.

4. Administration and Logistics. Directives issued by this Headquarters are published and distributed electronically. Electronic versions of Combat Center LOIs can be found at http://www.29palms.marines.mil/Staff/G1-Manpower/Adjutant-Office/Letters-of-Instruction/.

5. Command and Signal

a. Command. This LOI is applicable to active duty, civilian, and contractor personnel participating in or supporting this event.

b. Signal. This LOI is effective the date signed.

R. MARTINEZ
Chief of Staff

Distribution: B