

TABLE OF CONTENTS

CHAPTER 4 NATURAL RESOURCES MANAGEMENT

4.1.	NATURAL RESOURCES MANAGEMENT OVERVIEW.....	4-1
4.1.1.	Philosophy, Guiding Principles, and General Approach	4-2
4.1.1.1.	Program Goals and Objectives	4-5
4.1.1.2.	Actions, Timelines, and Funding	4-5
4.1.1.3.	Fish and Wildlife Inter-Agency Coordination.....	4-5
4.1.2.	Program Implementation: Oversight, Integration, Compliance, and Enforcement	4-6
4.1.2.1.	Oversight and Integration.....	4-6
4.1.2.2.	Programmatic Instructions	4-7
4.1.2.3.	Environmental Inspection and Compliance	4-8
4.1.2.4.	Enforcement.....	4-10
4.2.	ORGANIZATIONS AND STAFF OVERVIEW.....	4-12
4.2.1.	Natural Resources Department.....	4-12
4.2.1.1.	Resources Management Division	4-13
4.2.1.2.	Environmental Planning Division	4-13
4.3.	WILDLIFE MANAGEMENT BRANCH PROGRAMS.....	4-14
4.3.1.	Project Support.....	4-15
4.3.1.1.	ESA Consultations	4-16
4.3.1.2.	Incident Management	4-16
4.3.1.3.	NEPA Support.....	4-17
4.3.1.4.	Mitigation Management.....	4-17
4.3.2.	Federal ESA Compliance	4-18
4.3.2.1.	Manage Riparian, Beach, Estuarine Species and Habitats.....	4-22
4.3.2.2.	Manage Upland Systems.....	4-24
4.3.2.3.	Other Federal Threatened and Endangered Species Issues	4-25
4.3.3.	Ecosystem Management.....	4-25
4.3.3.1.	Ecosystem Data Management.....	4-26
4.3.3.2.	Exotics Control	4-27
4.3.3.3.	Non Federally Listed Species Monitoring	4-30
4.3.3.4.	Natural Resources Awareness	4-31
4.3.3.5.	Support Other Branches in Resources Management Division	4-31
4.3.3.6.	Support Applied Research	4-31
4.3.3.7.	Regional Issues	4-33
4.3.4.	Game Management.....	4-34
4.3.4.1.	Game Species Management Plans	4-35
4.3.4.2.	Game Data Collection.....	4-36
4.3.4.3.	Game Program Review.....	4-36
4.3.4.4.	Bison Herd Management	4-37
4.3.5.	Migratory Bird Management Program	4-37
4.3.5.1.	MBTA Compliance	4-38
4.3.5.2.	MBTA Compliance Through the NEPA Process.....	4-39
4.3.5.3.	Habitat Conservation	4-40
4.3.5.4.	Monitoring Programs.....	4-41
4.3.5.5.	Participate in DoD Partners in Flight Including MAPS Stations.....	4-42
4.3.5.6.	Raptor Management	4-43
4.3.6.	Marine and Fisheries Management Program.....	4-45

4.3.6.1.	Magnuson-Stevens Act Compliance.....	4-46
4.3.6.2.	Marine Mammal Protection Act Compliance.....	4-47
4.3.6.3.	Estuary Management.....	4-48
4.3.6.4.	Steelhead Management.....	4-49
4.3.6.5.	Tidewater Goby Management.....	4-49
4.3.6.6.	Marine Threatened and Endangered Species Issues.....	4-50
4.3.6.7.	Sport Fish Management.....	4-50
4.3.6.8.	Exotic Aquatic Animal Control.....	4-51
4.3.7.	Training.....	4-51
4.3.8.	Natural Resources Awareness Program	4-52
4.4.	LAND MANAGEMENT BRANCH.....	4-55
4.4.1.	Sustainable Ecosystem Management	4-56
4.4.1.1.	Wetland Management.....	4-56
4.4.1.2.	Ecosystem Mapping and Monitoring.....	4-64
4.4.1.3.	Invasive Weed Control.....	4-69
4.4.1.4.	Erosion and Sediment Control	4-76
4.4.1.5.	Fire Management.....	4-81
4.4.2.	Mission and Project Support.....	4-92
4.4.2.1.	Regulatory Compliance and NEPA Review	4-92
4.4.2.2.	Mitigation Implementation/Tracking	4-93
4.4.3.	Agricultural and Other Multiple Use Lease Management.....	4-96
4.4.3.1.	Seed Collection	4-97
4.4.4.	Outreach.....	4-97
4.4.4.1.	Internal Education	4-98
4.4.4.2.	External Education.....	4-98
4.5.	ENVIRONMENTAL PLANNING DIVISION.....	4-99
4.5.1.	NEPA Review	4-101
4.5.2.	Consultations	4-103
4.5.3.	Mitigation and Compensation	4-103
4.5.4.	Post-NEPA Follow-Up	4-108
4.5.5.	Long-Range and Master Planning.....	4-109
4.5.6.	Encroachment.....	4-109
4.5.6.1.	Quantification	4-111
4.5.6.2.	Buffer Acquisition	4-114
4.5.6.3.	Buffer Acquisition Management System (BAMS)	4-115
4.5.7.	Regional Aspects of Environmental Planning/Coordination.....	4-116
4.6.	OTHER BASE PROGRAMS THAT SUPPORT NATURAL RESOURCES MANAGEMENT	4-118
4.6.1.	Watershed Management	4-118
4.6.1.1.	Water Resources Management	4-119
4.6.1.2.	General Vegetation Management and Soil Conservation.....	4-120
4.6.2.	Grounds Maintenance and Landscaping.....	4-120
4.6.3.	Information Management.....	4-121
4.6.3.1.	System Administrator/User Community	4-122
4.6.3.2.	Data Integrity and Technology Advancements	4-122
4.6.3.3.	Information Integration: Storage, Access, and Dissemination.....	4-123

FIGURES

Figure 4-1.	Mule Deer	4-35
Figure 4-2.	Bison.....	4-37
Figure 4-3.	Golden Eagle Electrocutted on Power Line	4-44
Figure 4-4.	Sea Otter	4-47
Figure 4-5.	Base Earth Day Event 2009	4-53
Figure 4-6.	Artichoke Thistle Treatments – 2007 to 2010	4-73
Figure 4-7.	Historic Fennel Treatments.....	4-73
Figure 4-8.	Historic Treatments of Exotic Invasive Plants Within Camp Pendleton’s Riparian Habitats	4-75
Figure 4-9.	Base Wildfire	4-81
Figure 4-10.	Firefighter Helicopter	4-83

TABLES

Table 4-1.	Consultation Class Categories and Action Required.....	4-21
Table 4-2.	Riparian BO Goals for Listed Riparian and Estuarine/Beach Species Habitat and Populations at Camp Pendleton.....	4-23
Table 4-3.	Number of Brown-Headed Cowbirds Captured on Camp Pendleton 1983 - 2010	4-29
Table 4-4.	Disturbance Factor Determination	4-60
Table 4-5.	Vernal Pool Classification System	4-61
Table 4-6.	Vernal Pools by Areas and Class	4-62
Table 4-7.	Riparian Acreage Change – 1995 and 2003	4-65
Table 4-8.	Acreages by Land Type Maneuver Suitability Category	4-68
Table 4-9.	Invasive Exotic Plants Currently Found on Camp Pendleton	4-71
Table 4-10.	Erosion Control Projects Since 1997 Conducted or Proposed on Base	4-79
Table 4-11.	Documented Fire History on Camp Pendleton, 1968 - 2010	4-84
Table 4-12.	Prescribed Burns, Wildfires, and Fires Inside Impact Areas on MCB Camp Pendleton, 1997 - 2010.....	4-85
Table 4-13.	Fire Danger Rating System	4-89
Table 4-14.	Active Habitat Restoration Projects	4-95

[This page intentionally left blank.]

CHAPTER 4

NATURAL RESOURCES MANAGEMENT

This chapter presents the natural resources management program for MCB Camp Pendleton. The Base's natural resources management consists of a suite of conservation and management programs managed by Divisions and Branches in the Natural Resources Department. Each Program has specific policies, goals, objectives, and planned actions, which have been developed and prioritized to sustain military operational and support requirements, to achieve Camp Pendleton's overarching natural resources management goals, and incorporate the principles of ecosystem management in all programs.

Natural resources management programs are primarily managed by branches within the Resources Management Division. Each Branch (Wildlife Management Branch, Land Management Branch and Resource Enforcement and Compliance Branch [REC]) subdivides their Programs into Elements that are focused to achieve established Program-specific goals and objectives. Listed under each Element within the natural resources management programs are a series of actions that support the management of that element. This chapter will discuss the programs under management of the Wildlife Management and the Land Management Branch. Wildlife Management Branch programs include: 1) Project Support; 2) Endangered Species Act (ESA) Compliance; 3) Ecosystem Management; 4) Game Management; 5) Migratory Bird Management; 6) Marine and Fisheries Issues; and 7) Training. The Programs within the Land Management Branch include: 1) Sustainable Ecosystem Management; 2) Mission Support; and 3) Agricultural Management. Natural resources related recreation and education programs, including those within the REC, are presented in Chapter 5.

Also presented within this chapter are the mechanisms and processes in place for the implementation, oversight, integration, and enforcement of ecosystem management programs (Appendices B, C, and D) and planned actions. These mechanisms and processes are key to the success of natural resources management and to the long-term capability of Base lands to support the military mission.

4.1. NATURAL RESOURCES MANAGEMENT OVERVIEW

The Sikes Act defines the purpose of natural resources management on military lands as “the conservation and rehabilitation of natural resources on military installations; the sustainable multipurpose use of the resources, which shall include hunting, fishing, trapping, and non-consumptive uses; and subject to safety requirements and military security, public access to military installations to facilitate the use [of these resources].” Camp Pendleton's history of practicing responsible stewardship while accommodating multiple land uses dates back as far as the mid-1950s and early 1960s, beginning with a cooperative agreement with State fish and game biologists to establish a Base hunting and fishing program. Since then, the nation's growing awareness of issues concerning pollution, habitat loss, and land degradation has resulted in an increase in environmental protection legislation (e.g., Sikes Act [1960], National Environmental Policy Act [1969],

Clean Air Act [1970], the ESA [1973, as amended], Clean Water Act [1977], etc.). Camp Pendleton, likewise, has increased its investment in regulatory compliance and natural resources management.

By virtue of its vast amount of open space and its compliance and stewardship initiatives, Camp Pendleton contributes substantially to regional biodiversity conservation and planning efforts. Camp Pendleton's approach to natural resources management takes a long-term view of ecosystem processes and human activities, integrating conservation and management of biological resources with Marine Corps military land uses and requirements.

4.1.1. Philosophy, Guiding Principles, and General Approach

Natural resources management programs on Base are driven by the need to maintain sufficient natural areas and varied vegetation that will allow sound and realistic tactical training, as well as support sound ecological management. Base resource management programs must balance military mission requirements established under Title 10 U.S.C. with federal resource conservation laws, such as the ESA, Clean Water Act (CWA), Rivers and Harbors Act of 1899, and Migratory Bird Treaty Act (MBTA). Camp Pendleton's natural resources management philosophy is to enhance the ability and resiliency of its acreage to sustain current and future military training requirements through implementation of programs and actions (Appendices D, E, and F) that achieve the conservation objectives of relevant regulatory requirements. Camp Pendleton's intent is to preclude long-term damage and degradation to training lands by managing natural resources through processes and programs in accordance with the following guiding principles:

- Understand and include the mission/human elements/dynamics as essential components of the ecosystem.
- Sustain and restore ecosystem dynamics, such that the native plant and animal communities on Base are sufficiently resilient to withstand an expanded array of disturbances and incursions occasioned by military mission requirements on Camp Pendleton.
- Manage native vegetation to promote optimal community succession for ecosystem integrity with a focus on significant natural resources.
- Maintain native plant communities by natural processes and without artificial manipulation, except as needed to restore depleted natural resources, or where areas are isolated from natural dynamics of the ecosystem.
- Enhance the value of ecosystems by eradicating exotic plant species, promoting native plant communities, preventing new weed introduction and restoring areas to their original conditions after disturbance.
- Minimize occurrences and effect of wildfires caused by Base activities through the Fire Danger Rating system, firebreaks, and controlled/prescribed burns in coordination with adjacent land managers.
- Support greater biological diversity and distribution of native species, especially federally threatened and endangered species populations throughout the region/ecosystem.

- Establish self-sustaining populations of listed species that require little or no human intervention for maintenance.
- Control or remove exotic animal species with priority to those that adversely impact significant natural resources.
- Develop effective partnerships among private and government agencies to support ecosystem-wide initiatives and programs.

Most of the Base's natural resources programs and actions are driven by compliance requirements of the ESA and the CWA in managing 16 federally listed threatened and endangered species, and a regionally significant acreage of protected wetlands. Programs and actions to support these compliance requirements consume the majority of available funding and staff time. As such, Camp Pendleton has focused its programs, to the maximum extent possible, on ecosystems opposed to individual species/locations, so that management activities and programs required for federally listed threatened and endangered species have the potential to benefit other species. Base activities that use the same ecosystem are thus provided a level of flexibility that accommodates changes to the military mission. Camp Pendleton's Riparian and Beach/Estuarine Conservation Plans (Appendices B and C) exemplify this approach to threatened and endangered species management. Although the driver for the Riparian and Beach/Estuarine Conservation Plans was for the protection of federally listed species, the objective of the plans has been to manage and improve riparian and beach/estuarine habitats for all ecosystem users, including other native species and human users of the Base.

The common foundational elements to Camp Pendleton's ongoing natural resources conservation and management involve:

- The avoidance and minimization of adverse effects to federally listed species and other significant natural resources through the implementation of programmatic instructions (published rules and guidelines for land users on Base) and the National Environmental Policy Act (NEPA) process for evaluation of potential impacts of new activities and projects.
- Native habitat maintenance and enhancement through the implementation of the programmatic conservation plans, fire management, exotics species control, erosion control, pollution prevention, water quality management, etc.
- Monitoring and surveying to understand and track the Base's species and habitats, and using this data to evaluate the status, quality, distribution, and trends of those resources and management plans.

The Base's natural resources conservation and management programs will continue to be directed toward achieving the overarching natural resource management goals identified within Section 1.4.2. of this INRMP.

Central to the management of ecosystems and key to each conservation plan is the avoidance and minimization of adverse impacts to those ecosystems, and the listed species and their essential habitats within those ecosystems. While the Base cannot control natural conditions or events, it can and does manage anthropogenic disturbance to its ecosystems. Thus, a key element of the Base's approach can be characterized as the "managing of

impacts”. As such, management programs generally include components, for the management of limited temporary damage to habitat (e.g., from ongoing activities such as training, maintenance, and recreation) and for those that are *permanent* (e.g., from infrastructure development projects).

Ongoing military training and mission support activities create impacts to listed species and their habitat that are generally infrequent, limited and temporary in nature. Avoidance and minimization of these impacts are accomplished via programmatic instructions such as restricting activities from occurring near breeding areas during species’ breeding seasons. Further discussion of the implementation and enforcement of programmatic instructions is provided in Section 4.1.2. In addition to programmatic instructions, physical measures may be enacted to protect significant natural resources, including posting and relocation. For permanent projects, the NEPA process and Public Works Department site selection and approval process facilitate the avoidance and minimization of adverse impacts (see Environmental Planning Division, Section 4.5.). Additionally, the Consultation Class System, programmatic instructions, and pre-established mitigation, included in each ecosystem conservation plan, encourages avoidance and minimization of impacts through reduced project costs and efforts when listed species and their habitat are avoided.

An important aspect to Camp Pendleton’s natural resources management is the establishment of cooperative relationships with State and federal fish and wildlife agencies and local government and non-government organizations. While the Base is required to consult with federal agencies to ensure compliance with applicable statutes, Camp Pendleton also recognizes and values the professional expertise and experience of federal and State fish and wildlife agency personnel for other than compliance related issues. Cooperative relationships are becoming increasingly important as surrounding jurisdictions establish HCPs under the California NCCP, and as Camp Pendleton continues toward an ecosystem-based approach to resource management.

Ultimately, the success of Camp Pendleton’s natural resources management is reflected in the long-term sustainability of the Base’s mission support capability, its species populations and ecosystem functions, and its maintenance of regulatory compliance. Over time, many factors upon which this INRMP is based are likely to change, including military mission requirements, the Federal List of Threatened and Endangered Species, knowledge of the ecology and requirements of listed species and their ecosystem, as well as an understanding of the nature of anthropogenic impacts to those species and their ecosystem. The integration and implementation of the Base’s natural resources management, as outlined in this INRMP, will follow an adaptive management approach that acknowledges uncertainty, monitors the various components of the INRMP, and learns from experience with the end goal of improving future management actions and ecosystem health. Adaptive management can be described as a system for attaining “resilience in the face of surprise” (Lee 1993). Ultimately, the success of this INRMP depends upon both its ability to conserve natural resources through time, and its ability to accommodate the Base’s present and future mission requirements. Simply stated, success depends upon adaptation.

4.1.1.1. Program Goals and Objectives

In addition to the overarching natural resources management goals presented within Section 1.4.2., goals and objectives are presented within the Programs and Elements of each Branch. The intent of the goals within each Program is to be visionary, ideal and general in character, and to provide long-term guidance in defining the direction and purpose of the program. The Program Element Objectives represent more near-term, tangible, and measurable benchmarks to help meet program goals.

4.1.1.2. Actions, Timelines, and Funding

The actions listed within the Programs and their Elements in this chapter represent the ongoing, anticipated and desired actions that the Base has developed to ensure compliance with regulatory requirements, to facilitate implementation of protocols and procedures, to help meet natural resources management goals and objectives, and to address specific issues or needs. Listed actions may contribute to the accomplishment of one or more management program objectives; however, they are listed only under the primary Program/Element that they support.

Actions listed include both projects and actions that Camp Pendleton has committed to accomplishing and/or are required by laws, regulations, or other agreements and those projects and actions that Camp Pendleton desires to accomplish, but cannot commit to undertaking due to restrictions and limitations on fiscal and personnel resources. Actions that do not require funding are discussed as part of Program/Element narrative. Appendix M provides details for all actions listed within Programs and Elements and identifies which actions are “must funds” for the current fiscal year (Note: the federal government fiscal year is from 1 October to 30 September).

Programs and actions are reviewed and revised on an ongoing basis to ensure they reflect the results of studies, changes in regulations and mission requirements, and/or additional information at the local or regional level. Formal reviews and reports are developed to assist with annual reporting requirements to HQMC and to keep internal Base staff and resource agencies informed as to the status of and changes to programs. Actions are reviewed annually and the “must fund” designation adjusted as appropriate during the annual review and update process described in Section 1.2.1. Appendix M is updated annually.

4.1.1.3. Fish and Wildlife Inter-Agency Coordination

Camp Pendleton has been and continues to be involved in coordinated management and partnering efforts with fish and wildlife agencies at both the State (CDFG) and federal (USFWS) levels. Many of the components of Camp Pendleton’s Natural Resources Management Program that have been implemented over the last few decades were developed in coordination with the CDFG or USFWS, including the hunting and fishing programs and management of federally listed threatened and endangered species.

Sikes Act provisions and cooperative agreements for outdoor recreation, such as hunting and fishing, are implemented nationally by an MOU between the DoD and DoI. As early as 1969, Camp Pendleton was involved in species conservation with CDFG, when a joint plan

was implemented for lagoon and estuary habitat management (MCBCP 1969). At about the same time, in cooperation with the Department of Interior, the Base set aside a portion of the beach near the mouth of the Santa Margarita River as a tern nesting area. Signs were posted designating the area as a refuge, and to discourage vehicles and personnel from entering the area. In 1986, Camp Pendleton entered into an MOU with the USFWS for management of the just listed endangered LBV on the Santa Margarita River. This MOU was the first ecosystem-based approach within the DoD and provided an agreement on and framework for species-specific management of the endangered LBV. This MOU formed the basis for what was eventually to become a management program covering more than 10,000 ac of riparian wetlands, coastal estuaries, beaches, and dune areas.

In addition to working with the USFWS on regulatory and management issues, Camp Pendleton has contracted staff from the Federal Projects Branch of the USFWS to conduct surveys, research, and monitoring on Base. Examples of these projects include PPM monitoring (USFWS 2002b), upland habitat restoration, and maintenance for federally listed species (Upland Habitat Biological Opinion is currently in consultation with the USFWS).

4.1.2. Program Implementation: Oversight, Integration, Compliance, and Enforcement

While integration, implementation, and enforcement are a part of all the programs in this INRMP, this section highlights some of the initiatives geared specifically toward serving those functions. Included in this section are the: 1) organizations and processes involved in oversight and integration; 2) use of programmatic instructions; 3) environmental inspection and compliance; and 4) enforcement mechanisms. Other initiatives and processes that are important to the implementation and integration of this INRMP can be found elsewhere in the document. For example, essential to INRMP implementation is the funding of programs (and planned actions), which are presented in Section 1.7. Moreover, no single initiative or process presented within this section is solely capable of ensuring successful integration, implementation, or enforcement of natural resource programs, nor do any of these initiatives serve as a substitute for the established staff action process.

4.1.2.1. Oversight and Integration

Integration of the INRMP not only requires a coordination of efforts among the natural resources management programs and planned actions, but also an integration of land *management* with land *use* (e.g., training, maintenance, recreation, etc.). The integration and coordination of land management efforts is achieved, in part, through the evaluation and update of the INRMP itself. This ongoing review process, which is coordinated for the entire Base by the Environmental Plans Branch within the Resource Planning Division of the Natural Resources Department, provides a venue for evaluation, discussions of adaptive management, presentation of ideas for improvement, and assessment of progress towards goals and objectives with Base staff and resource agencies. The INRMP review process not only helps assure that the management actions are accomplished, but also provides for an evaluation on the integration of and consistency among the planned actions. Areas that are identified as not well integrated will be appropriately addressed (e.g., some planned actions may be added to, modified or removed from the INRMP as a result of this process).

Several mechanisms and processes help ensure the integration of land management with land use. These are described in other sections within the INRMP and include, but are not limited to: 1) the use of programmatic instructions (Section 4.1.2.2.); 2) the NEPA process (Section 4.5.); 3) planning and project support (Section 4.5.); 4) environmental training, education, and awareness programs (Section 5.5.); and 5) information and GIS management (Section 4.6.3.).

4.1.2.2. Programmatic Instructions

Programmatic instructions represent the published “general rules” that regulate and guide Base activities (e.g., military training, maintenance, construction, and outdoor recreation). By providing a programmatic operational framework for military and civilian users of the Base without the burden of unnecessary technical detail, programmatic instructions provide flexibility in concert with species/ecosystem conservation and help ensure avoidance and/or minimization of adverse impacts to federally listed species and other natural resources. Many programmatic instructions are applicable basewide and help avoid or minimize impacts to the environment in general (e.g., fire danger ratings); however, other programmatic instructions may be specific to actual locations of listed species (e.g., least tern nesting sites) or to general areas of the Base (e.g., riparian habitat and range and training areas).

Camp Pendleton programmatic instructions also serve to provide the USFWS with a framework for issuance of terms and conditions within BOs. Programmatic instructions proposed in BAs, once approved by their corresponding BOs, along with terms and conditions within BOs are incorporated into appropriate implementing documents and Base directives.

As “general rules”, programmatic instructions are disseminated by various methods including Base Orders, Base Bulletins, and as special conditions in documents approving recurring activities.

BASE ORDERS

Base Order P3500.1N – The Base Range and Training Regulations provides information, instructions, and procedures governing the use of ranges, training areas, and airspace operated and controlled by Camp Pendleton (see Appendix N for excerpts from the most current version of Base Order P3500.1N). Included in this order are specific programmatic instructions that address how units training on and over Camp Pendleton are to operate under given conditions. Conditions addressed include the various Fire Danger Ratings, basewide environmental procedures, areas off-limits to training, and natural resources considerations and restrictions.

The Base Regulations (Base Order P5000.2J) establish the responsibilities and procedures that govern the conduct of all persons and activities at Camp Pendleton. Within the Base Regulations is a chapter on Environmental Security with sections that outline the Base policies governing natural and cultural resources and environmental compliance and protection. Also within the Base Regulations is a section that applies to residents of on Base housing, including the Base’s policy on the possession of pets (exotic pets are

prohibited basewide, and housing areas adjacent to federally listed species have restrictions on the possession of normal domestic household pets, such as dogs and cats).

ENVIRONMENTAL GUIDEBOOK

The Camp Pendleton Environmental Guidebook is a quick-reference introduction to environmental issues, laws, and regulations confronting Marines, sailors, soldiers, and civilian employees on Camp Pendleton. The guidebook provides points of contact for users of the Base to obtain further information.

CATEGORICAL EXCLUSIONS (CX)

A Decision Memorandum is used to document the application of a NEPA CX for actions that have been found to have no significant effect individually or cumulatively on the human environment (see Section 4.5.1. for a more detailed discussion of NEPA review). The extensive array and locations of protected natural resources at Camp Pendleton has necessitated the inclusion of programmatic instructions and strict conditions in those Decision Memoranda. These programmatic instructions include project/location specific and general basewide instructions for avoiding impacts and ensuring that actions remain under the conditions of the approved CX.

BASE EXTERIOR ARCHITECTURAL PLAN (BEAP)

The BEAP establishes specific guidelines for standardization of the Base's exterior elements including landscaping. The BEAP is a design "Guide or Handbook" to assist facility officers, facility users, Facilities Maintenance Staff and lessees, and provides the framework needed to establish consistent standards that use sound planning design and environmental practices. The BEAP addresses specific design criteria or guidelines associated with the implementation of physical improvements basewide. These guidelines are directed toward site planning, architecture, landscape, street and parking standards, signage and other important features that affect the function and visual quality of the Base environment.

Key functions of the BEAP are to establish compatibility with natural features during the design process, preserve and enhance existing landscape and natural resources and provide an approved plant species and varieties list from which landscaping can be chosen during a new construction project or renovation that will preserve and protect the existing native vegetation. Included, as part of the Basewide Master Plant List, is a list of prohibited plants to ensure invasive exotics are not introduced to the Base during landscaping.

4.1.2.3. Environmental Inspection and Compliance

Monitoring the success of natural resources management is part of the role of the Marine Corps Environmental Compliance and Evaluation (ECE) program, the Self-Audit Program, and the Annual POA&M. The Marine Corps conducts internal environmental and natural resources audits and inspections through its Environmental Compliance and Evaluation Program. Camp Pendleton's Environmental Inspection and Compliance Program is consistent with Marine Corps guidance and policy, and consists of HQMC conducted Benchmark ECE assessments and annual Self-Audits conducted by Camp Pendleton.

MARINE CORPS ECE

HQMC-sponsored Benchmark ECEs are conducted once every 3 years, with a formal Annual Validation of POA&M (described below) report provided during intervening years. The results are used as a tool for the commander and the CMC to plan, program, budget, and execute initiatives to achieve compliance. Comparison of the Benchmark ECE results is made for overall trend analysis Marine Corps-wide. HQMC has established the following goals for the ECE Program:

- To provide the commander with a tool to evaluate the command's environmental compliance.
- To assess compliance levels and as required, provide recommended corrective actions or improvements.
- To provide a forum for the exchange of ideas and successes.
- To provide the CMC with a broad evaluation of environmental compliance across the Marine Corps.
- To provide a formal interface among installations, Fleet Marine Forces commanders, and the Inspector General of the Marine Corps.
- To integrate environmental awareness into every facet and function of the Marine Corps way of life.
- To improve overall compliance efforts through a continuous, integrated program.

The ECE is an evaluation similar to those conducted by the Inspector General of the Marine Corps or Field Supply Maintenance Analysis Office and is designed to provide commanders with an assessment of their environmental compliance status. It assesses the command's level of compliance, identifies actions necessary to correct deficiencies, provides follow-up on the implementation of those proposed actions, and facilitates continuous improvement in compliance efforts through the Self-Audit Program.

To standardize ECEs and ensure all environmental requirements are properly and thoroughly evaluated, a Windows-based automated database comprised of checklists, for use by commanders and ECE teams, was developed. This Automated Compliance Evaluation (ACE) software is the only authorized software for tracking Marine Corps ECEs. ACE is a large database comprised of several checklists. The ACE database presents all known federal requirements applicable across Marine Corps installations, specific state and local requirements unique to each installation, and requirements specified in the ECE Manual. To avoid any misinterpretation of requirements, the ACE system uses the exact requirements from the applicable source document to formulate questions. ACE provides the commander with a vehicle to evaluate the command's environmental compliance position by identifying actual environmental requirements. As a listing of specific requirements, it serves as a quick reference to installation users. ACE can be modified by the installation user to fit specific Marine Corps commands/units and tenants or media evaluations. Installation and command unique requirements, such as Camp Pendleton's use of the local Air Pollution Control District's Rule 6, have been built directly into the ACE database for Camp Pendleton. The most important management feature of the ACE database is the generation of a POA&M for each ECE or inspection conducted. The CMC

updates the installation unique ACE software annually with each installation receiving a specific checklist based upon state and local requirements.

ANNUAL ECE (SELF-AUDIT PROGRAM)

Working in conjunction with the HQMC sponsored ECE; Camp Pendleton conducts an annual ECE as part of a Self-Audit Program. This Self-Audit Program serves as an internal plan for the CO/CG of MCB Camp Pendleton to assess compliance throughout his/her command, including all tenant commands, activities and leases. The Self-Audit Program uses the ACE software and the HQMC provided list of requirements as a tool to track compliance. The goal of the Self-Audit Program is to assess compliance by annually visiting every permitted site and source, and every process potentially subject to an environmental requirement, including all natural resource programs and BOs terms and conditions. This annual self-audit verifies that all requirements are met and ensures the effectiveness of environmental programs. The Inspection and Compliance Division of AC/S ES coordinates Camp Pendleton's Self-Audit program.

4.1.2.4. Enforcement

Several organizations on Base provide enforcement capability to help ensure compliance with natural resource laws, regulations, and management initiatives. These include the Range Operations Division of AC/S O&T, Resource Enforcement/Compliance Branch (REC) of AC/S ES, Provost Marshal's Office (PMO) of AC/S Security and Emergency Services, Semper Fit Division of AC/S Marine Corps Community Services (MCCS), Area Commanders' assigned Environmental Coordinators, and the Resident Officer in Charge of Construction (ROICC) of AC/S Facilities described below.

Violations documented by Base organizations responsible for compliance are reported in accordance with existing regulations to the appropriate State or federal agency and HQMC. Violations are referred to the Base CO/CG for determination regarding investigation, adjudication, and corrective and/or punitive action. Law enforcement aboard the Base associated with individual actions beyond official federal duties, including poaching, is the responsibility of the PMO, or other entity as directed by the CO/CG, with technical assistance from the Natural Resources Department of AC/S ES. Occasionally, the services of State and federal fish and wildlife agency enforcement personnel are involved where their technical expertise or extra manpower is needed. Marine Corps policy is to permit access to installation lands by federal, state, and local conservation personnel for official purposes after proper safety and security measures are taken (HQMC 1998).

RANGE OPERATIONS DIVISION, AC/S O&T

The Range Operations Division, AC/S O&T is the on-site controlling agency for all ranges, training areas and air/sea space, providing safe, three-dimensional, and realistic training environments with real-time resolution of scheduling conflicts and control and coordination of training activities. As part of its management function, the Range Operations Division inspects ranges, training facilities, and training areas to ensure safe use and compliance with appropriate directives, including Base Order P3500.1N (*Base Range and Training Regulations*), which includes the Fire Danger Rating System and programmatic instructions protecting federally listed species and natural resources in general.

REC, AC/S ES

The REC is responsible for ensuring that fish and wildlife laws on Camp Pendleton are enforced in accordance with federal and State laws, MCOs, annual Base Bulletins, and other applicable regulations. The REC provides personnel who are authorized as federal officers to enforce State and federal fish and game regulations and administer the Base's hunting, fishing, camping, and other outdoor recreational programs. More information on the REC programs is provided in Chapter 5.

Federal citations (DD Form 1805) are used for violations of federal fish and wildlife laws. A copy of DD Form 1805 is forwarded to the Staff Judge Advocate with a complete report prepared by the issuing officer describing the circumstances surrounding the alleged violation. Personnel are not detained by Deputy Game Wardens after citations have been issued. Resource contraband is seized and noted on the citation and in the report. Citations are adjudicated in the Federal Court in San Diego.

A Camp Pendleton Base citation may be used to cite military personnel for violations of Base, federal or State regulations. A copy of the Base citation is forwarded to the CO/CG of the person being cited with a complete report prepared by the issuing officer (if requested) describing the circumstances surrounding the alleged violation. COs/CGs have the authority to impose punitive and non-punitive punishment under the Uniform Code of Military Justice (UCMJ) for violations of regulations.

PMO

The PMO provides overall law enforcement and physical security for Camp Pendleton and enforces federal criminal laws and military regulations. Military Police provide physical security for and patrol Camp Pendleton. Working in conjunction with Range Operations Division and Game Wardens, the Military Police enforce restrictions and closures of areas to nonmilitary activities and apprehend civilian and military personnel involved in unauthorized activities in designated natural resource and training areas.

SEMPER FIT DIVISION, AC/S MCCS

The Semper Fit Division of AC/S MCCS operates recreation programs aboard Camp Pendleton including recreation at the beaches and developed campgrounds. Lifeguards and management personnel control patrons' activities in accordance with established programmatic instructions to help avoid and/or minimize adverse impacts to federally listed species and other natural resources located near beaches and recreation facilities. In addition, beach campgrounds have a volunteer night host residing on-site who helps provide after-hours supervision.

ROICC

The ROICC is the command under NAVFAC SWDIV that is responsible for the post-contract award administration of construction, maintenance, and repair projects. Among other responsibilities, the ROICC serves as a Contracting Officer, empowered to obligate the Federal Government and to enforce the contractual requirements for which a given contractor is responsible. Permit and mitigation requirements developed during the NEPA

process and consultation and included in construction, maintenance, or repair contracts, are enforced by the ROICC as part of contract management and oversight.

4.2. ORGANIZATIONS AND STAFF OVERVIEW

AC/S ES provides the lead and overall coordination of environmental compliance and natural resources management. Fieldwork, surveys, and inventories are accomplished through AC/S ES managed contracts and cooperative agreements. AC/S ES also provides specific information on the flora and fauna present on Camp Pendleton and proactively maintains up-to-date resource data for activity and project planning, thereby minimizing resource data collection delays. The AC/S ES serves as the Base's lead for planning and addressing natural resource compliance issues such as wetland and endangered species regulatory requirements. The AC/S ES also provides technical, natural and cultural resources management support to installation action proponents regarding resource compliance requirements and Best Management Practices (BMPs) involved with their actions. Conservation education and training to military and civilian personnel is a constant focus of the AC/S ES to raise awareness and improve community relations with the goal of preventing resource damage.

The AC/S ES is composed of the Natural Resources Department, Environmental Compliance Department, Budget Branch and the Information Systems (IS) Branch. The Natural Resources Department provides strategic planning for and daily implementation of natural and cultural resources management. The Environmental Compliance Department provides strategic planning for and daily implementation of environmental protection and compliance regulations basewide on Camp Pendleton, for all environmental areas other than natural and cultural resources.

The mission of AC/S ES is:

“To develop and manage environmental programs to assure basewide compliance in order to protect the mission of the installation and maximize land use availability for operations and training.”

4.2.1. Natural Resources Department

Camp Pendleton's natural and cultural resources are managed by the Natural Resources Department whose staff and programs are divided into the Resources Management and Environmental Planning Divisions.

The mission of the Natural Resources Department is:

“To develop, manage and oversee implementation of the programs that protect and assure the ability of Base natural and cultural resources to support and sustain mission requirements and compliance with applicable environmental regulations.”

It is the Department's vision that:

“This and future generations of Marines & units are able to train and operate aboard MCB Camp Pendleton, with the necessary tactical flexibility, on a coastal California landscape that reflects historic southern California habitats and biodiversity.”

To that end, Natural Resources Department programs will be developed to ensure its mission and contribute measurably to the realization of its vision.

4.2.1.1. Resources Management Division

The programs managed by the Resources Management Division and its Branches (see introduction paragraph of this Chapter) include those that manage and monitor the natural ecosystems, flora and fauna of Camp Pendleton to ensure compliance with federal laws and regulations, long-term sustainment, conservation and rehabilitation of natural resources on Camp Pendleton, and allow ongoing and continued training and operations that ensure combat readiness.

The Resources Management Division is organized into four branches: 1) Wildlife Management; 2) Land Management; 3) REC; and 4) Archaeological Resources. The Wildlife Management Branch and the Land Management Branch and their programs are addressed in this chapter, Sections 4.3. and 4.4., respectively. The REC and its programs are addressed in Chapter 5 of this INRMP. The Archaeological Resources Branch and its programs are not addressed in the INRMP, but are covered in detail in the Base's ICRMP; the ICRMP review was completed by the California State Historic Preservation Office(r) in May 2008 (Cheever pers. comm. 2009).

4.2.1.2. Environmental Planning Division

The Environmental Planning Division provides: procedural and technical advice, project planning, environmental review, mitigation development, operation and maintenance planning, and project implementation on both military and nonmilitary NEPA documentation for: facility planning, construction plans, maintenance activities, military training operations, leases and other proposed actions that may affect natural and/or cultural resources.

The Environmental Planning Division is organized into three branches: 1) Environmental Plans; 2) Project Oversight; and 3) NEPA.

The Environmental Plans Branch provides technical and environmental advice to both military and nonmilitary land users regarding long-range facility and construction planning, maintenance activities, military training operations, and other proposed actions that may affect natural and/or cultural resources. This branch of the AC/S ES serves as the lead for coordination and integration of on-Base land use and natural resources planning with local and regional off-Base planning concepts, initiatives, and programs. The Environmental Plans Branch also coordinates reviews and continuous updates of the INRMP (see Chapter 1), and is responsible for finding and coordinating purchase of appropriate off Base mitigation lands, and tracking the inventory of the Pio Pico CSS Mitigation Bank and Riparian Mitigation Bank per USFWS BO #1-6-95-F-02, hereafter referred to as the

Riparian BO (USFWS 1995a). Trend analysis of the Base's Environmental Incident Reporting System (EIRS) database is also conducted by the Environmental Plans Branch.

The Project Oversight Branch facilitates: near-term project planning, NEPA Environmental Assessment (EA), Environmental Impact Statement (EIS), environmental review, mitigation development, and project implementation for military and nonmilitary construction projects, as well as training actions and new equipment fielding. The Project Oversight Branch provides technical environmental project planning guidance to Base personnel regarding natural and cultural resources management, and oversight of compliance issues/requirements.

The NEPA Branch provides procedural and technical advice on both military and nonmilitary NEPA documentation for facility planning, construction plans, maintenance activities, military training operations, and other proposed actions that may affect natural and/or cultural resources. Primary responsibilities of this branch include developing and reviewing initial environmental and planning submittals, facilitating a coordinated project approach for application of the NEPA planning process, and determining the level of NEPA review required by a given activity, project, or action. If a CX is the proper level of NEPA action, the NEPA Branch prepares and issues the CX; if not, the Project Oversight Branch supports the action sponsor in the development of an EA or EIS. The Environmental Planning Division programs are addressed in Section 4.5.

4.3. WILDLIFE MANAGEMENT BRANCH PROGRAMS

The Wildlife Management Branch manages all ESA Section 7 consultations with the USFWS for federally listed threatened and endangered species. This branch also monitors and reports on species-related compliance issues, including mitigation management and implementation, and manages rare and endangered wildlife species population programs (exclusive of vernal pool fauna, see Land Management Branch). The Wildlife Management Branch designs and implements population and habitat monitoring and improvement plans/programs for federally listed, game, and non-game species. The Branch implements the Riparian, Estuarine, and Beach Conservation programs, including all Terms and Conditions addressed within the Riparian BO, and establishes seasonal restrictions and harvest quotas for game and non-game species and stocking programs. In addition, the Branch designs, implements, and manages exotic wildlife species control programs.

Mission: To manage the wildlife resources of MCB Camp Pendleton in a manner that supports the Base mission, ensures compliance with applicable natural resources regulations, and provides for ecosystem sustainability.

Vision: That the Camp Pendleton landscape will continue to support both superior Marine Corps training and a broad diversity of native species and habitats.

Goals of the Wildlife Management Branch:

1. Provide timely and comprehensive wildlife management support to the Base, tenant units, and other customers.

2. Ensure wildlife management programs achieve substantive compliance with ESA, Sikes Act, MBTA and other applicable natural resources conservation laws, agreements, and EOs.
3. Manage ecosystem health and the natural landscape to sustain military training and biodiversity into the future.
4. Integrate the Marine Corps' mission(s) as an essential component of wildlife management programs.
5. Maintain positive working relationships with the other AC/Ss, Base tenants, USFWS, NMFS, CDFG, USFS and other key organizations.
6. Establish and refine SOPs and processes to ensure that Program Objective Memorandum (POM) and other routine program requirements are accomplished as a matter of course.

The Wildlife Branch has established seven programs that are designed to ensure compliance with all applicable laws and BOs, and achieve the above stated goals. These programs are: Project Support, ESA Compliance, Ecosystem Management, Game Management, Migratory Bird Management, Marine and Fisheries Management, and Training. Some programs are subdivided into Elements, which outline Objectives and Actions to be conducted to meet the Goals of each program. Each program and its corresponding elements were developed and organized to assist the Wildlife Management Branch staff in all areas for which they are responsible. Programs and elements were organized based on staffing levels, internal structure and potential workloads. Some aspects of these programs, elements and actions overlap other programs or elements, but were established and organized to best support realization of the established goal and/or requirement for the program. Each program and its corresponding elements are described in the following sections.

4.3.1. Project Support

The Project Support Program provides comprehensive Wildlife Management support and services to ensure compliance with applicable laws for all Base projects to include: CX review, EA/EIS review, BA preparation and review, conduction of consultations with regulatory agencies, and ensuring compliance with terms and conditions of agreements and Base management programs. It also: 1) ensures that required compensation measures are implemented as designated; 2) strives to find optimal balance of future compensation measures to yield maximum benefit to impacted resources while minimizing impacts to the training mission and Base budget; 3) develops and implements a Biological Monitoring Program; and 4) manages non-compliance and other incidents that impact natural resources. A compensation monitoring and tracking database will also be developed and used to streamline tracking efforts of non-project incidents.

Goal: Provide comprehensive and timely review and support for all applicable projects planned for or affecting the Base.

To achieve the Goal of the Wildlife Branch's Project Support Program, the Project Support Program is organized into four Elements. These Elements are: 1) ESA Consultations; 2) Incident Management; 3) NEPA Support; and 4) Mitigation Management. Elements are detailed in the following sections and identify Element Objectives and Actions planned to

be conducted to meet the Goals and Objectives of this Program. Listed below are Actions that support the Project Support Program aboard Camp Pendleton (see Appendix M for more details on these actions):

- ESA support for installation projects.
- Assess need and efficacy of expanding cowbird trapping to enhance reproduction of the California gnatcatcher.

4.3.1.1. ESA Consultations

Objective: Obtain non-jeopardy BOs in a timely fashion that allows maximum flexibility and minimal mitigation requirements for Base actions.

An important element of the Project Support Program is providing ESA consultation support, when required, for projects that may affect a federally listed threatened or endangered species. In addition to providing ESA consultation support on individual projects, the Wildlife Management Branch has pursued programmatic consultations with the USFWS to cover training activities and help streamline the consultation process of other actions (see Section 4.3.2.). Programmatic consultations have been established with the USFWS for ongoing activities and ecosystem conservation programs (Estuarine and Beach Ecosystem Conservation Plan and the Riparian Ecosystem Conservation Plan) within riparian and estuarine/beach habitats on Base. This consultation resulted in the Riparian BO (USFWS 1995a). The Base is in consultation with the USFWS for the corresponding Upland Habitat BO, Listed Upland Species Management Program. More detailed information regarding the consultation process and management of programmatic consultations is found in Section 4.3.2. under ESA Compliance.

4.3.1.2. Incident Management

Objective: Respond promptly to incidents and bring to full closure in a timely manner. Minimize occurrence of incidents.

Natural resources management and planning staff within AC/S ES contribute to the enforcement of laws, regulations, and management initiatives. AC/S ES utilizes the EIRS database, for the documentation and tracking of all environmental incidents (including non-compliance with BO terms and conditions, the Range Regulations and programmatic instructions). An environmental incident is an unplanned and/or unauthorized event that has the potential to adversely affect the environment or regulated natural resources. Examples of environmental incidents include: accidental sewage spills, activities not conducted in compliance with Range Regulations, and documented occurrences of unauthorized “take”. The Wildlife Management Branch reports environmental incidents as necessary and appropriate to the USFWS and/or other regulatory agencies on a case-by-case basis, depending on the nature of the incident. Wildlife/riparian-related incidents are compiled and submitted to the USFWS in the Riparian BO Annual Report. Also, to improve existing tracking and monitoring of NEPA projects, as well as mitigation and compliance with permits, incidents are entered into the Process Automation Management and Support Module (PAMS), which is the AC/S ES computer-based NEPA project tracking program and mitigation database, see Section 4.5.1.

The Wildlife Management Branch reviews incidents to identify series of repeated problems, or indicators of trends. If trends or repeat problems are evident, attempts to identify root causes are made and actions to reduce and/or eliminate similar incidents are developed. Programmatic instructions, Base Orders and public awareness programs are reviewed and updated with changes needed to inform Base personnel of any repeat problems and strengthen required control measures.

4.3.1.3. NEPA Support

Objective: Provide timely, comprehensive wildlife management support for Base projects.

All proposed projects are subject to the NEPA process to determine, in part, the appropriate level of NEPA documentation (CX, EA, or EIS), whether an adequate range of alternatives to the proposed action are considered, and what laws and regulations may be applicable (see Section 4.5.1.). The function of the NEPA Support element of the Project Support program is to engage wildlife managers where appropriate, and provide technical assistance to project proponents, throughout the NEPA process. During the review of proposed projects, wildlife managers will: 1) identify potential effects of the proposed action; 2) identify less damaging alternatives; 3) ensure that adequate mitigation is planned; 4) assess the level of regulatory interface required; and 5) assess consistency with natural resources management goals, objectives, BOs and conservation programs.

To improve tracking and monitoring of NEPA projects, mitigation, and compliance with permits, the AC/S ES has developed a computer-based NEPA project tracking program and mitigation database (PAMS) (see Section 4.6.3.). As a function of the NEPA Support element, the Wildlife Management Branch helps ensure and the mitigation database (PAMS) is maintained current and complete.

4.3.1.4. Mitigation Management

Objective: Provide comprehensive and timely review and support for all applicable Base projects.

The Wildlife Management Branch oversees mitigation/compensation requirements for impacts to wildlife species on Base. Mitigation/compensation may be required by BOs, NEPA documents and/or to compensate for project impacts that are caused by temporary and/or permanent loss of habitat. Mitigation/compensation requirements in riparian habitat for project impacts are calculated using the equations in the Riparian Ecosystem Conservation Plan and Riparian BO. Mitigation for impacts to wildlife species under the Riparian Ecosystem Conservation Plan is primarily accomplished through exotic vegetation removal. Exotic vegetation removal is conducted by the Land Management Branch (see Section 4.4.1.3.) in accordance with the *Exotic Plant Management Plan for Riparian Areas on Marine Corps Base, Camp Pendleton*. The Wildlife Management Branch works closely with the Land Management Branch and the Environmental Plans Branch to ensure that mitigation for impacts to wildlife species in riparian habitat is accomplished, tracked, and reported to the USFWS in accordance with the Riparian BO.

Mitigation/compensation requirements in upland habitat for project impacts are established on a project specific basis in coordination with the USFWS pending receipt of the Uplands

BO. The Uplands BO, once finalized with the USFWS, is anticipated to contain a programmatic approach to determine appropriate compensation types and ratios.

The Wildlife Management Branch also conducts mitigation/compensation that involves control or removal of exotic animals. Mitigation/compensation that is performed is evaluated for effectiveness, and to identify improved types and methods.

Listed below are actions that support mitigation/compensation for habitat impacts on Camp Pendleton:

- Assess success of threatened and endangered species mitigation and management.
- Meet USFWS success criteria for the 20 ac Pio Pico CSS Mitigation bank.
- Meet USFWS success criteria for the 28.7 ac Stephen's Kangaroo Rat Management Area within the Juliet Training Area, and establish additional on Base SKR mitigation areas as needed.
- Establish the Lima Training Area CSS Mitigation Bank.
- Utilize USFWS approved off Base mitigation banks whenever feasible to ensure no future permanent or temporary loss of Base training areas.

4.3.2. Federal ESA Compliance

While the Base's natural resources management philosophy is that management should be ecosystem-based, special emphasis is provided to manage federally threatened and endangered species and their habitats, to prevent "jeopardy" and to assist in the conservation and recovery of those species. As such, the Base maintains habitats sufficient to sustain existing species populations while also allowing for potential growth. The Marine Corps recognizes the importance of maintaining natural landscapes, wherever possible, as a mission-essential element in training and views effective conservation and management of natural resources to assist in the conservation and recovery of federally threatened and endangered species as compatible with the long-term viability of the military training mission itself.

Goal: Manage species and habitats in a manner that minimizes impacts to both mission and species, and achieve the species-specific goals established by the ESA and applicable BOs.

The Federal ESA Compliance Program strives to be able to demonstrate that management and compensation efforts on Camp Pendleton contribute to the conservation and recovery of federal threatened and endangered species located on the Base. To help balance the Base's training mission with the conservation and recovery of federal threatened and endangered species and their habitats, the following guiding principles have been established for Camp Pendleton's ESA Compliance Program:

- The primary focus of avoidance and minimization of impacts to listed species is on occupied habitat.
- Increase in size and distribution of threatened or endangered species populations on Base should relieve or reduce restrictions to training or support activities (Camp

Pendleton's mission should benefit from sound management practices that lead to an increase in listed species populations).

- Habitat enhancement, restoration, and other efforts conducted for management or compensation for permanent and temporary impacts from ongoing Base activities should not further reduce the overall land available to training.
- Programmatic instructions will be the primary tool for facilitating avoidance and minimization of potentially adverse impacts to the environment in general and listed species in particular.
- Programmatic instructions will be unambiguous and simple. Complex management rules foster difficulty in enforcement and achieving compliance.
- Management programs should provide incentives for avoiding permanent impacts to listed species occupied habitat and place limits on the amount of permanent impact that is allowable.
- A programmatic approach for processing/consulting on future construction projects (permanent impacts) will clearly define the required level of communication between the Base and the USFWS and make mitigation costs more predictable.
- Listed species management will be adaptive, incorporating knowledge gained over time and accommodating potential changes in natural resources and military training and mission support needs.

The primary legislation regulating actions that may directly or indirectly impact federally listed species is the ESA of 1973, as amended (16 U.S.C. 1531 *et seq.*). Camp Pendleton regularly consults with the USFWS to ensure that Marine Corps actions are not likely to jeopardize the continued existence of any endangered or threatened species, and are within compliance with Sections 7 and 9 of the ESA. Pursuant to Section 7 of the ESA, federal agencies such as the Marine Corps must consult with USFWS if their action "may affect" a federally listed endangered or threatened species (50 CFR 402). Such consultations may be formal or informal. When required by Section 7 of the ESA, Camp Pendleton prepares a BA of the effects of a proposed action on listed species. Section 9 of the ESA prohibits the "take" of a threatened or endangered species. A take includes the direct killing, harming, or harassing of a species, or destruction of habitat that may be important for the species' survival or recovery (see also "take" in the Glossary).

Camp Pendleton's management approach for federally listed threatened and endangered species is to: 1) implement measures to avoid and minimize adverse impacts from human activities; 2) proactively collect information on presence or absence, location, habitat availability and suitability, and life history requirements; and 3) offset impacts that do occur. For some species and some locations on Base, habitat enhancement and restoration have been, and will continue to be, used as compensation/mitigation and to help meet species management and recovery goals.

To ensure that ongoing and future military mission requirements (including training, support activities, maintenance, fire management, natural resources management, etc.) on Base are in compliance with the ESA, Camp Pendleton developed and consulted with the USFWS on conservation programs for federally listed species and their habitats on Base. In 1995, Camp Pendleton received a BO from the USFWS (USFWS 1995a) covering the Estuarine and Beach Ecosystem Conservation Plan (Appendix B) and the Riparian

Ecosystem Conservation Plan (Appendix C). The Base has submitted a BA and a proposed Listed Upland Species Management Program to the USFWS. Consultation with the USFWS on the potential impacts to listed species in upland habitats on Camp Pendleton and the associated Listed Upland Species Management Program is ongoing. The Listed Upland Species Management Program will be added as Appendix D and Upland Terms and Conditions will be added as Appendix O, once the BO is issued.

Over time, many factors upon which these programs are based are likely to change, including military mission requirements, the Federal List of Threatened and Endangered Species, knowledge of the ecology and requirements of the listed species, as well as an understanding of the nature of anthropogenic impacts to those species. Some changes are foreseeable, others are not. Therefore, it is important that Base conservation programs employ adaptive management principles and techniques, using the best available related science.

The general approach of these conservation plans and Camp Pendleton's management of federally threatened and endangered species and their habitats can be characterized as the "management and avoidance of impacts." They are divided into two components, one for the management of impacts that are *limited, temporary* damage (e.g., from activities such as training, maintenance, and recreation) and one for those that are *permanent* (e.g., from infrastructure development projects).

To manage temporary impacts from ongoing activities, a suite of basewide management and avoidance programs that directly and/or indirectly benefit listed species has been established to avoid and/or reduce and minimize adverse impacts to the ecosystem for the temporary impacts that do occur. These management and avoidance programs include predator control (e.g., cowbird control, exotic aquatics control, ant control, etc.), programmatic instructions, limited fencing, and habitat enhancement (e.g., exotic plant removal, dune restoration and enhancement, debris removal, etc.). The goal of these programs is to improve habitat value over time, thereby supporting larger populations of listed species. See Appendices B, C and D for the full details of these programs.

For activities that would result in a permanent impact to federally listed species and their habitats (often referred to as "projects"), the Base has established the following management strategy within its Estuarine and Beach Ecosystem Conservation Plan (Appendix B), Riparian Ecosystem Conservation Plan (Appendix C), and their BO (USFWS 1995a):

- A minimum habitat acreage guarantee has been made to the USFWS in the Riparian Ecosystem Conservation Plan (Appendix C), to prevent long-term accumulation of permanent impacts basewide. This regional commitment will help to support the current inventory of species and complement landscape linkages in the region.
- A Consultation Class System has been established to determine the level of communication/consultation required between the USFWS and the Base, based on the anticipated level of impact for a given project or action.

- Programmatic instructions for new projects were established to help avoid and minimize impacts to listed species and managed habitat during project design and construction.
- Appropriate type and amount of mitigation necessary for future projects was established in advance through consultation with the USFWS.

Each conservation plan contains a Consultation Class System that provides a programmatic approach for directing future consultations on projects. The purpose of this programmatic approach is to: 1) satisfy Section 7(a)(2) of the ESA requirements for future consultations; 2) provide a systematic method for dealing with future proposed projects in a consistent, predictable manner; 3) increase the Base’s mission flexibility and funds programming process; 4) identify activities that require a separate, individual consultation with the USFWS; and 5) reduce Base and USFWS staff time spent on consultations.

The Consultation Class System does not negate requirements for project specific consultations in the future. It simply clarifies which projects require separate, individual consultations and which are covered under a programmatic consultation (e.g., Riparian BO, or Uplands BO when complete). Potential adverse effects caused by projects covered under a programmatic consultation are offset by ongoing management programs and mitigated for in a manner and amount agreed upon in advance by the Base and the USFWS. As such, projects that are programmatically covered may be more efficiently processed and receive expedited approval. Reporting requirements vary depending upon classification level of the projects. Projects that are programmatically covered may not require any reporting, may require compilation into a single annual report to the USFWS, or may require a concurrence letter before implementation. Projects that are not programmatically covered require a separate consultation altogether.

Under the Consultation Class System, proposed activities are assigned to one of the following consultation class categories: I, II, III, or IV. The action required by Camp Pendleton and the USFWS for each consultation class category was established during formal Section 7 consultation on the management plans and is summarized in Table 4-1. Determination of consultation class level for a proposed project depends largely upon the timing, location, and size of the project relative to the species potentially impacted.

TABLE 4-1. CONSULTATION CLASS CATEGORIES AND ACTION REQUIRED

Consultation Class	Action Required
I	Impacts not offset by program. Individual consultation required.
II	Impacts primarily offset by management plan implementation. Concurrence letter from USFWS required for specific project.
III	Impacts completely offset by management plan implementation. USFWS notified annually of Class III projects occurring during previous year.
IV	No impacts to listed species. No reporting required.

Surveys and monitoring specified within the Estuarine and Beach Ecosystem Conservation Plan (Appendix B), the Riparian Ecosystem Conservation Plan (Appendix C), and their BO

(USFWS 1995a) are used to determine species populations, habitat levels, and ecosystem/habitat values that are used to help determine the effectiveness of Camp Pendleton's conservation and management programs. Survey and monitoring data are compared with previous data from Base surveys and regional data (when available) to help determine trends and identify if the trends are local or region-wide. Negative trends precipitate discussions with the USFWS to try to determine the cause and if management activities on Camp Pendleton would have any effect on the trends.

Federally listed threatened and endangered species within riparian and estuarine/beach habitats on Base are monitored at levels and frequency intervals specified within the Estuarine and Beach Ecosystem Conservation Plan (Appendix B), the Riparian Ecosystem Conservation Plan (Appendix C), and their BO (USFWS 1995a) (see Appendix F for frequency and results of surveys). Listed upland species are also monitored; however, the level and frequency intervals for future monitoring are presently under consultation with the USFWS. Site-specific surveys for listed species known to occur on Base are also conducted for individual projects where necessary. Surveys for listed species not presently known to occur on Base, or for candidate species that may become listed are also conducted when funds and opportunities become available.

The ESA Compliance Program is organized into three elements: 1) Manage Riparian, Beach, and Estuarine Species and Habitats; 2) Manage Threatened and Endangered Upland Species and Habitats; and 3) Other Threatened and Endangered Species Issues. These elements provide comprehensive Wildlife Management Branch support and services to ensure compliance with the ESA for all Base projects.

4.3.2.1. Manage Riparian, Beach, Estuarine Species and Habitats

Objective: Meet Camp Pendleton's responsibilities, per ESA and applicable BOs, to enhance and advance the conservation potential of listed riparian, beach, and estuarine species (see Appendices B, C and L).

This element covers the management of estuary/coastal and riparian areas on Camp Pendleton and provides for the continued management of these areas in accordance with Estuarine and Beach Ecosystem Conservation Plan (Appendix B), the Riparian Ecosystem Conservation Plan (Appendix C), and the Riparian BO (USFWS 1995a). Although riparian and estuarine areas are wetlands, this Program (4.3.2.) manages "ESA compliance" and not CWA compliance. Descriptive statistics and information on estuarine/beach and riparian areas on Base are presented in Sections 3.2.1.1. and 3.2.1.2.

Specific goals and commitments for quantities and quality of estuarine/coastal and riparian habitats and populations of specific species in these areas have been established (in consultation with the USFWS) in the Estuarine and Beach Ecosystem Conservation Plan (Appendix B) and the Riparian Ecosystem Conservation Plan (Appendix C) (Table 4-2).

Appendix L contains the reasonable and prudent measures, terms and conditions, and conservation recommendations from the Riparian BO (USFWS 1995a). These conservation plans and their BO serve to ensure that actions funded, authorized, or carried out by the Base in the performance of its military training mandate do not jeopardize the continued

existence of any listed or proposed species in estuarine/coastal and riparian areas. Included in these conservation plans and concurred with by the Riparian BO (USFWS 1995a) are goals for species population size or habitat acreage that identify Camp Pendleton’s conservation responsibility within the ecoregion for species recovery efforts and a habitat value system for riparian ecosystems on Camp Pendleton.

TABLE 4-2. RIPARIAN BO GOALS FOR LISTED RIPARIAN AND ESTUARINE/BEACH SPECIES HABITAT AND POPULATIONS AT CAMP PENDLETON

Species	Goal
Least Bell’s Vireo	Increase beyond 300 (singing males)
Southwestern Willow Flycatcher	Increase beyond 22 (singing males)
California Least Tern	Promote the growth of current tern populations over the entire SMR estuary (not only the north Beach colony) and at both Aliso Creek and French Creek (the 1995 survey identified 363 pairs, and the 2007 survey identified 1,422 pairs; see Table F-1 in Appendix F).
Western Snowy Plover	Promote the growth of current population of snowy plovers in the vicinity of the tern nesting colony sites (the 1995 survey reported 88 nests, and estimated 99.5 males and 70.3 females, and the 2007 survey reported 124 nests and 80 individuals; see Table F-14 in Appendix F).
Arroyo Toad	Promote increased arroyo toad populations in watersheds where found.
Tidewater Goby	Maximize the probability of a metapopulation persistence within the lagoon complex.

Camp Pendleton’s Riparian, Beach, Estuarine Species and Habitats Element management strategy is to reduce or eliminate anthropogenic impacts by using programmatic instructions, controlling where and when projects and activities take place, and increasing habitat quality by eradicating exotic vegetation and encouraging native vegetation growth, which, in turn, has been shown to support a greater number of listed species. In so doing, these conservation plans are also expected to support future federally listed threatened and endangered species and other species that utilize these habitats on Base.

Listed below are Actions that support compliance with the Riparian BO (USFWS 1995a) and management of federally listed threatened and endangered species and habitats within the riparian and beach systems aboard Camp Pendleton in a manner that minimizes impacts to both mission and species (see Appendix M for more details on these actions):

- Implement Riparian BO.
- Vireo and Flycatcher annual monitoring.
- Investigate limiting habitat factors—SW willow flycatcher.

- Arroyo toad annual monitoring.
- Endangered least tern monitoring.
- Least tern/snowy plover seasonal biologist.
- Seasonal endangered least tern/plover fence maintenance.
- Threatened snowy plover nest monitoring.
- Effects of least tern management on snowy plovers.
- Nesting habitat improvement–endangered least tern.
- Monitor stream water quality, flood regimes, and storm event frequency.
- Evaluate the level of unauthorized recreational usage of the beach and the potential impacts (if needed, develop possible solutions).
- Undertake measures to assess threats to the survival and recovery including the severity of threats posed by likely predators/competitors for:
 - Western snowy plover and California least tern.
 - LBV and southwestern willow flycatcher.
 - Arroyo toad and tidewater goby.

4.3.2.2. Manage Upland Systems

Objective: Meet CAMP Pendleton’s responsibilities, per ESA and applicable BOs to enhance and advance the conservation potential of listed upland species (see pending Appendices D and O).

For ESA coverage of ongoing and future military training and mission support activities within upland habitats on Base, Camp Pendleton submitted a programmatic BA to the USFWS in March 2000 for the management of listed upland species. The Base and the USFWS remain in formal consultation, and an Upland BO has not been issued to date. Submitted with the BA was the Base’s proposed Upland Species Habitat Conservation Plan. While in consultation, the Base is implementing the actions identified in the proposed management plan. The Base has identified all known locations of listed upland species and has implemented programmatic instructions (published in the Range and Training Regulations, Environmental Operations Map, CXs, and other documents) to avoid impacts to federally listed upland species wherever they occur. When potential effects cannot be avoided, Camp Pendleton will continue to initiate consultations with the USFWS on a project-by-project basis until the programmatic Uplands BO is finalized. Below are Actions that support the management of federally listed species and habitats within the upland system aboard Camp Pendleton in a manner that minimizes impacts to both mission and species, and in accordance with ESA and the proposed Upland Species Habitat Conservation Plan (see Appendix M for more details on these actions):

- Implement upland habitat conservation plan.
- Threatened California gnatcatcher population monitoring.
- Endangered SKR population monitoring.
- Endangered PPM population monitoring.
- Upland endangered species mitigation plan/bank.
- Undertake measures to assess threats to the survival and recovery including the severity of threats posed by likely predators/competitors for:
 - SKR.

- California gnatcatcher.
- PPM.

4.3.2.3. Other Federal Threatened and Endangered Species Issues

Objective: Maintain awareness of current and emerging regional threatened and endangered species issues with potential implications to Camp Pendleton (new species listings, critical habitat proposals, recovery plans).

Camp Pendleton maintains awareness of and reviews and comments on Federal Register notices regarding proposed listings, critical habitat, recovery plans and candidate species status. As these issues are identified, the Base reviews existing abundance and distribution data, conservation plans, management programs and programmatic instructions for applicability and support provided to those species and issues. As possible candidate, rare, sensitive (e.g., State listed species and migratory birds) and other (e.g., game and exotic) species are surveyed or monitored. Species specific monitoring helps the Base prepare for and comment on potential future listings, assist with the management of consumptive recreational programs, evaluate the efficacy of management techniques, and provide additional indices of ecosystem health. Mission permitting, the Base hosts and/or supports applied research on potential or candidate species. Listed below are Actions that support management of other federal threatened and endangered species issues in a manner that minimizes impacts to both mission and species aboard Camp Pendleton (see Appendix M for more details on these actions):

- Endangered Quino checkerspot butterfly surveys to demonstrate that project surveys are not required when funding is available (Sullivan pers. comm. 2012).

4.3.3. Ecosystem Management

The long-term success of conservation efforts, both on Base and within the region, depends upon natural resources management at the ecosystem level. Ecosystems are complex and dynamic by nature, with components that are interrelated and operating at different rates. The distribution and abundance of species and communities and underlying ecological and physical processes occur irrespective of land ownership or management boundaries. An ecosystem functions as a whole, not as a collection of parts; yet, its integrity may be disrupted by excessive “interference” of any single component. Thus, conservation and management initiatives that operate within arbitrary boundaries and fail to recognize the interconnectedness of processes within the larger context of an ecosystem may unduly waste scarce resources, or worse, contribute to greater ecological problems in the long-term.

Goal: Manage selected ecosystem components in a manner that provides long-term sustainability of resources to support the military mission, biodiversity and species richness (Note: ecosystem components are selected based on limited resources to target those believed to provide the most return for federally listed threatened and endangered species and training mission or emerging issues such as potential listings or new invasive exotics.).

The DoD has recognized the value of ecosystem management and has established principles and guidelines for natural resource managers on military installations (Section

1.3.3.). Ecosystem management requires a shift from the management of single species or habitats to the management of multiple species and habitats. Regulatory requirements have historically fostered a greater emphasis on a species-by-species management approach. Camp Pendleton's more recent endeavors (e.g., the Riparian and Estuarine/Beach Ecosystem Management Plans) better reflect the principles of ecosystem management; however, Camp Pendleton's future vision of its natural resources management is to further develop, promote, and refine its ecosystem based management program. The aim of this approach is to promote the conservation of native species and habitats, ensure the sustainability and biological diversity of terrestrial and aquatic ecosystems, and facilitate maximum support of the Base's military training mission and infrastructure, while simultaneously ensuring compliance with applicable laws and regulations.

Successful ecosystem management strategies require innovative and new approaches to land use decisions and regional involvement. Camp Pendleton is working to define and understand its regional relevance and is committed to fulfill its responsibility to regional conservation efforts. Ecosystem management requires the use of the best available scientific information in decision making and adaptive management techniques. It requires the cooperation of and participation with external agencies and forming partnerships necessary to assess and manage ecosystems that cross political boundaries.

To ensure that individual programs at Camp Pendleton are working towards an ecosystem approach, the Base has developed a vision of desired future conditions that integrates ecological, socioeconomic, and institutional perspectives. This vision incorporates a regional perspective and seeks collaboration with appropriate regional land use, management, and planning agencies.

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

The Wildlife Management Branch's Ecosystem Management Program is organized into eight Elements. These Elements are: 1) Ecosystem Data Management; 2) Exotics Control; 3) Species Monitoring; 4) Natural Resources Awareness; 5) Wildlife Conflict Management; 6) Support Other Branches in Resources Management Division; 7) Support Applied Research; and 8) Regional Issues. These Elements are detailed in the following sections and identify Element Objectives and Actions planned to support the Goals and Objectives of this Program.

4.3.3.1. Ecosystem Data Management

Objective: Collect and maintain natural resource data in systems that enable effective, efficient utilization of that data to support analysis and adaptive management decision-making.

The establishment and maintenance of a natural resources inventory is an essential component of conservation and adaptive management (U.S. DoD 1996). It enables the tracking of changes over time, contributes to an understanding of the structure and function of the larger ecosystem to which the Base belongs, assists project specific and master planning efforts, and facilitates an evaluation of impacts and the effectiveness of management efforts. Ultimately, maintenance of the natural resources inventory enables the systematic and cost-effective accomplishment of management program goals and objectives.

Camp Pendleton's natural resources inventory is largely, but not entirely, a GIS-based assemblage of data reflecting: 1) distribution and abundance (size, density) parameters for a range of flora and fauna on Base; and 2) physical characteristics, processes, and changes, including soil types, tide levels, water quality, and the frequency and extent of wildland fire and erosion. Additional information for some species/resources, such as habitat quality, number of breeding individuals, and an accounting of incidental take, is also part of the Base's inventory. Readily available and easily viewable data also supports the identification of data gaps and areas that may require additional study, as well as provides rapid indication of trends, and an indication of results of management activities.

Data within the inventory are generated from a variety of sources and at different scales, including project-specific surveys, species-specific monitoring, community-based surveys, research projects, and surveys of anthropogenic impacts. Many of the surveys and monitoring efforts on Base are driven by regulatory requirements, e.g., USFWS BO terms and conditions. As funding becomes available, additional surveys are conducted to augment the Base's inventory of information on natural resources (e.g., in the past the Base has funded reptile, amphibian, and bat surveys). The Base periodically accepts proposals from qualified outside investigators who wish to survey and monitor other populations or communities. This policy has resulted in reports that catalog Camp Pendleton's insect and arachnid species, and the annual status of golden eagle (*Aquila chrysaetos*) and other raptor nests. As noted from its objective, the main efforts of this Element are to ensure that the Base has a method that keeps available data accessible to a wide range of managers, in a format that is easily usable and provides data for use in other Elements and Programs. Additionally, the proper management and accessibility of data supports compliance with and helps meet the requirements of the HQMC Environmental Management System (EMS).

Listed below is an Action supporting the management of data/applications associated with the Wildlife Management Branch aboard Camp Pendleton (see Appendix M for more details on this action):

- Endangered species data management.

4.3.3.2. Exotics Control

Objective: Manage key exotic animals to enhance survivability of native species.

Exotic animals may pose a threat to native species and communities on Base (e.g., competitively excluding native species, altering the habitat in a manner that favors other exotics, predation, nest parasitism, etc.). Camp Pendleton conducts control efforts on several non-native invasive animals, including the beaver (*Castor canadensis*), brown-headed cowbird (*Molothrus ater*), bullfrog (*Rana catesbiana*), and the red swamp crayfish (*Procambarus clarkii*). Several potential exotic wildlife species may be candidates for control efforts in the future, including: feral pigs, fire ants, Argentine ants, Africanized honeybees, and feral dogs and cats. The Wildlife Management Branch has and continues to focus exotics control resources where they will best reduce exotic animal species for benefit to threatened and endangered species, the training mission, ecosystem functioning and health, and human health and safety. Ongoing efforts attempt to identify new threats, maintain information on potential threats and anticipate controls that may be required if they arrive at Camp Pendleton.

The introduction and spread of invasive non-native animals has been particularly prevalent in riparian and aquatic habitats on Base (USDA 1999). These infestations often coincide with habitat disturbance, making it difficult to separate the influence of one from the other. For example, introduced fish and amphibians tend to thrive in highly modified habitats, confounding habitat degradation with the exotic predators as the primary source of native amphibian declines. However, observations of successful breeding activity by native amphibians in extremely modified breeding sites that were free of exotics support the interpretation that the exotic species themselves are an important problem (Fisher and Shaffer 1996 & USDA 1999). These observations have helped lead Camp Pendleton's ecosystem management to maintain an aggressive program element for the control and removal of invasive exotics.

The *Exotic Aquatic Species on MCB Camp Pendleton, California; Control and Management* (Holland and Swift 2000) study states that a watershed approach will be most effective due to the prolific reproductive ability of most exotics. While spot removals, such as bullfrog control, have provided a localized short-term benefit, long-term watershed control strategies in partnership with upstream and neighboring entities are the most economic, effective and desired approaches. The following paragraphs provide information on several past and ongoing exotic species control efforts conducted by the Wildlife Management Branch.

In 1999, bullfrog control was initiated in reaches of the Santa Margarita River adjacent to the MCAS, as mitigation for effects to arroyo toads from several projects. Control has been continued at various levels of effort due to drought and operational conditions. Control efforts have included shooting and seining. Conditions of vegetation and water-flow in 2000 resulted in a highly successful effort with 9,209 bullfrog (larvae through subadults), 15,507 mosquitofish, 2,857 carp, 2,697 green sunfish, 7,792 crayfish, 1,365 bullhead, and 5 other exotic fish being removed.

Exotic aquatic species control and removal has also been and is currently conducted in the San Onofre and San Mateo watersheds. Exotic species control is conducted in the San Mateo Watershed as part of the ongoing steelhead monitoring, and also as part of the Santa Fe Pacific Pipeline mitigation. When ponds are shocked or seined to determine if steelhead

are present, exotics found are removed. In addition, exotic species control was done as part of the tidewater goby reintroduction carried out as mitigation for the NCTD Emergency Repairs of San Mateo Bridge. Species removed from San Mateo have included mosquitofish (*Gambusia affinis*), crayfish (*Procambarus* sp.), black bullhead (*Ameiurus melas*), and bullfrog (*Rana catesbiana*) tadpoles and egg masses (MCBCP 2003a).

The Camp Pendleton cowbird control program was initiated in 1983. Its purpose is to benefit the federally endangered LBV, southwestern willow flycatcher, and other host species by removing brown-headed cowbirds from riparian nesting habitat. Since cowbird control began, the number of sites occupied by vireos on Base has increased from 64 to about 700 in 2007 (see Appendix F, Section F-9). A summary of the number of brown-headed cowbirds captured on Camp Pendleton between 1983 and 2010 is shown in Table 4-3.

**TABLE 4-3. NUMBER OF BROWN-HEADED COWBIRDS CAPTURED ON CAMP PENDLETON
1983 – 2010**

Year	Drainage ^a	Number of Traps	Trapping Period	Male	Female	Juvenile	Total
1983 ^b	SMR	5	4/01-7/22	157	79	8	244
1984 ^b	SMR	13	4/03-7/20	269	215	1	485
1985 ^b	SMR	12	4/03-7/20	121	80	6	207
1986 ^b	SMR	12	3/31-6/30	186	134	7	327
1987 ^b	SMR	12	4/02-6/30	131	76	6	213
1988 ^b	SMR+2	27	4/01-6/30	252	140	8	400
1989 ^b	SMR+3	29	4/01-6/30	272	154	9	435
1990 ^b	SMR+5	32	3/15-6/30	385	268	12	665
1991 ^b	SMR+5	33	3/15-6/30	277	196	7	480
1992 ^b	SMR+5	33	3/15-6/15	226	211	0	437
1993 ^b	SMR+6	32	4/05-6/15	201	198	10	409
1994 ^b	SMR+6	33	3/15-6/15	307	187	1	495
1995 ^b	SMR+10	40	3/25-7/15	250	277	25	552
1996 ^b	SMR+10	40	3/15-6/30	385	201	4	590
1997 ^b	SMR+10	40	3/15-6/30	229	187	6	422
1998 ^b	SMR+10	37	3/15-6/30	223	211	3	437
1999 ^b	SMR+10	40	4/01-6/15	255	170	0	425
2000 ^b	SMR+10	40	4/01-6/30	208	119	4	331
2001 ^b	SMR+10	40	4/01-6/30	268	178	24	470
2002 ^b	SMR+10	40	4/01-6/30	268	226	1	495
2003 ^b	SMR+10	40	4/01-6/30	184	144	9	337
2004 ^b	SMR+10	40	4/01-6/30	350	324	6	680
2005 ^c	SMR+10	40	4/10-6/30	220	216	8	444
2006 ^c	SMR+10	40	4/01-6/30	225	212	10	447
2007 ^c	SMR+10	40	4/01-6/30	172	171	1	344

Year	Drainage ^a	Number of Traps	Trapping Period	Male	Female	Juvenile	Total
2008 ^c	SMR+10	40	4/01-6/30	129	117	5	251
2009 ^d	SMR+10	40	4/01-6/30	203	155	9	367
2010 ^d	SMR+10	40	4/01-6/30	196	169	3	368
Total				6,549	5,015	193	11,757

- ^a SMR Santa Margarita River.
 SMR+2 SMR plus Las Flores Creek and Pilgrim Creek.
 SMR+3 SMR+2 plus San Mateo Creek.
 SMR+5 SMR+3 plus San Onofre Creek and De Luz Creek.
 SMR+6 SMR+5 plus Aliso Creek.
 SMR+10 SMR+6 plus Christianitos Creek, Pueblitos Creek, Fallbrook Creek and Windmill Canyon.
- ^b Griffith Wildlife Biology 2004c.
- ^c TW Biological Services 2009a.
- ^d TW Biological Services 2011a.

Listed below are Actions supporting the eradication of key exotic animals aboard Camp Pendleton (see Appendix M for more details on these actions):

- Exotic Animal Management Implementation Plan.
- Exotic animal control for endangered species.
- Mosquitofish are removed from waters on Base where and when feasible (Rouse pers. comm. 2009).

4.3.3.3. Non Federally Listed Species Monitoring

Objective: Monitor non-federally listed species to support species richness assessments relative to military operations, changes in climatic conditions and species/ecosystem component management program and practices.

Species surveys help reveal the abundance and distribution of plant and animal populations on Camp Pendleton. Monitoring is essential for tracking and analyzing changes in population parameters and habitat type and quality over time. A high priority for natural resources management is the monitoring of federally listed threatened and endangered species on Base to ensure compliance with regulatory requirements and to assist in the recovery efforts for those species (details of those efforts are in Section 4.3.2.). The Base also conducts surveys and monitoring for non-federally listed species for a variety of reasons. Candidate, rare, sensitive (e.g., State listed species and migratory birds), and other species (e.g., game and exotic) may also be surveyed or monitored separately or as part of listed species surveys or monitoring. Monitoring on species-specific levels is used to help the Base with potential future listings, assist with the management of consumptive recreational programs, evaluate the efficacy of management techniques, and provide additional indices of ecosystem health. Data from monitoring is reviewed at the Branch and Division level for species trends that would support future management decisions, support regional survey efforts and contribute to the regional understanding of species (see also the Migratory Bird Program, Section 4.3.5.). Past monitoring and surveys for non-federally listed species have helped identify distribution and abundance data for potential candidate species. Listed below are Actions supporting the monitoring non-threatened and non-

endangered species aboard Camp Pendleton to prepare the Base for possible future listing proposals (see Appendix M for more details on these actions):

- Species of regional concern—monitoring (e.g., western pond turtle).
- Reptile and amphibian surveys.
- Off-Base surveys—assessment.
- Bat surveys in coordination with Bat Conservation International.

4.3.3.4. Natural Resources Awareness

The Natural Resource Awareness section was revised and moved to section 4.3.8. as of 23 June 2009 because it is a free standing program under the Wildlife Management Branch.

4.3.3.5. Support Other Branches in Resources Management Division

Objective: Provide comprehensive wildlife management support to Land, Archeology, and Game Warden Programs.

The Wildlife Management Branch coordinates with and supports each Branch in AC/S ES through informal meetings, staff support, and project coordination. Project, program, and management coordination with the Land Management Branch is continuous. The Project Oversight and NEPA Branches are given support by Wildlife Management Branch staff by reviewing, providing guidance and support on CXs, EISs, and EAs (see also Section 4.3.1.3.). Support is given to the Archeology Branch by internal coordination between the branches to ensure that wildlife projects/programs are in compliance with cultural resource guidelines and regulations, and that cultural resource projects/programs are in compliance with wildlife management programs and regulations.

4.3.3.6. Support Applied Research

Objective: Support research that has the potential to assist realization of Base conservation program objectives, improve adaptive management models and decision-making, and support sustainable military use.

Essential to adaptive management and to recovery efforts for listed species is the knowledge gained from experimental studies and investigative research. Camp Pendleton supports and allows, on a not-to-interfere-with-training basis, qualified researchers/professionals to conduct research that has the potential to provide information that supports effective avoidance, minimization, mitigation, and regional recovery efforts or provides additional information on an aspect of one of the Base's ecosystems. Such research is absolutely necessary if recovery efforts are to advance beyond trial and error for those species about which little is known. Investigative research can address specific questions about life history characteristics, habitat preferences, and response to disturbance, to better facilitate avoidance and recovery efforts. All research proposals are reviewed by appropriate Base professionals to help ensure the utility of the data collected, the study design and methodologies support the hypothesis, that unintended adverse impacts are avoided, and that the project supports regional natural resources management goals and objectives.

Following are examples of Base sponsored research efforts that have contributed to the understanding of the ecology of the species, potential threats, and management requirements of federally listed threatened and endangered species and ecosystems on Base:

- Upland Habitat Studies for Listed Species. The Base contracted the USFWS to develop methodology for identifying upland habitat areas that are important to actively manage for selected listed upland species, including the coastal California gnatcatcher, SKR and PPM. Development of this methodology will enable the Base to better maintain habitat for listed upland species populations during project planning and will identify sites for potential future mitigation, compensation, or stewardship. Among other required elements, this research will involve: 1) determining the utility of existing data and imagery for monitoring landscape level habitat changes; 2) mapping of selected areas and field verification of existing GIS layers; 3) locating, designating, and mapping all habitats within selected areas that have the potential to become suitable for federally listed upland species; 4) determining the general restoration approach for potential habitat areas; and 5) prioritizing the importance of selected habitat areas, including consideration of patch size and connectivity/proximity to adjacent populations and habitat (both on- and off-Base).
- Raptor Studies and Surveys. The Base formerly had an agreement with an independent researcher (Peter Bloom) to conduct annual raptor surveys on Base (final results are still pending) (Sullivan per. comm. 2012). The study was intended to give the Base a comprehensive and current list of raptors that inhabit and/or transit through the Base. The information from the study will be used to identify locations of raptor nests/roosting locations that will allow for future avoidance and minimization of potential impacts to nests (MBTA). This study and similar future studies also help keep the Base aware of presence/absence of the Bald Eagle (ESA). In general, raptors (as predators) are good indicators to the overall health of the ecosystems on Base.

In addition to contributing to the region through Base funded surveys and research, Camp Pendleton also supports limited research by providing access to the Base, when compatible with military training, safety, and natural resources management goals, for qualified research projects that are regional in nature. Such projects often support one or more of the natural resources management program goals and objectives, as well as contribute to the Base's overarching natural resources management goal of encouraging regional plans and incentives that address conservation of native biodiversity, ecosystem sustainability, and watershed management issues. Examples of non-Base funded research supported over the last several years include the following:

- California Gnatcatcher Habitat Utilization Research: Bill Wirtz (Pomona College).
- Monarch Butterfly (*Danaus plexippus*) Overwintering: Dave Marriott (The Monarch Program).
- Golden Eagle Survey (*Aquila chrysaetos*) of San Diego County: Dave Bittner and John Oakley (Eagle Survey Project).

- Status of Golden Eagle Population on Camp Pendleton: Peter Bloom (Independent Researcher).
- Long-Term Raptor Population Research: Peter Bloom (Independent Researcher).
- San Diego Bird Atlas: Phil Unitt (San Diego Natural History Museum).
- Foraging Behavior of Terns in Southern California: Dan Robinette and Patricia Heron Baird (California State University at Long Beach).
- Arroyo Toad Movement, Mortality, and Habitat Utilization in San Mateo Creek: Paul Griffin (University of California at San Diego).
- Capacity of the Santa Margarita River to Assimilate Nitrite and Other Constituents Associated with Treated Sewage Effluent: Rancho California Water District.
- Naval Weapons Annex, Fallbrook Arroyo Toad Movement Study.

4.3.3.7. Regional Issues

Objective: Encourage regional conservation knowledge and initiatives that advance recovery potential for listed species and reduce dependence on Camp Pendleton's populations, wildlife management issues, including distribution and abundance of species, in the coastal southern California region.

Ecosystem based management requires the stewardship of resources on Base, as well as involvement in management of those ecosystems at the regional level. While the management and protection of natural resources within the Base's boundaries are important (and contribute to regional conservation efforts), Camp Pendleton recognizes that long-term sustainability of the Base's ecosystems processes and watershed functionality requires a regional perspective and a coordination of efforts to achieve common goals. Adequate provision for, and promotion of, biodiversity conservation within the region surrounding Camp Pendleton will help to ensure properly functioning landscape linkages and wildlife corridors to Base ecosystems.

Implementation of an ecosystem based management approach requires decision-making on a host of issues, local and regional, short and long-term, and involvement by many different groups operating at many different organizational levels. Depending upon the issue, the level of Base involvement ranges from passive to active participation. In all situations of regional involvement, effective communication and the fostering of positive, long-lasting relations with surrounding communities and diverse interest groups greatly improves the success of the natural resources program and benefits the overall status of the Base.

A form of regional involvement is the generation and sharing of regionally useful data. Much of the knowledge gained from data derived on the Base can be directly applicable to issues of regional concern and has a clear benefit to local and regional management and planning efforts. Camp Pendleton routinely makes available data and copies of completed reports and surveys conducted on Base and is partnering with several groups to improve regional sharing of ecological data. Base-sponsored research, surveys, and monitoring contribute to the regional understanding of species, habitats, and ecosystem dynamics. In fact, several studies on Base have been part of larger, regional projects. For example, survey sites on Base have contributed to the international Monitoring Avian Productivity and Survivorship (MAPS) program (Section 4.3.5.4.) and to a regional study of the

diversity and autecology of amphibians and reptiles within the southern California portion of the California Floristic Province (Fisher 2000).

Another form of regional involvement and partnering by the Base is through public education and awareness programs (see also Sections 4.3.8. and 5.5.). Wildlife Management Branch staff conducts presentations on natural resources and Base management programs to a variety of on-Base and off-Base groups such as conservation organizations, service groups, and college classes. News articles are prepared periodically for the Base newspaper and interviews are given frequently to other local newspapers. Staff also participates with local high schools in a School-to-Career program, orienting students monthly to the environmental compliance and natural resources management professions, education requirements, and expertise being exercised at the Base.

Camp Pendleton works to ensure that its land use and regional planning efforts are complementary with surrounding biodiversity conservation efforts such that Base lands help support the region's habitat conservation needs, while also providing continued support of the Base's mission. This effort involves: actively monitoring and/or providing input to regional conservation planning and research efforts, attending species specific annual regional management meetings and discussions (e.g., least tern, snowy plover, and southwest willow flycatcher), and participating in regional forums for species and ecosystem management (e.g., the Santa Ana-Palomar Linkage project [see Section 2.5.4.4.]). The Wildlife Management Branch is evaluating the Base's ability to support or contribute to the survey of species at off-Base locations to help determine regional abundance and distribution.

4.3.4. Game Management

In support of the recreational hunting program on Camp Pendleton (Chapter 5), the REC (see Section 5.2.) manages game species on Base. The Base hunting program is subject to applicable federal and State regulations and is managed cooperatively with the CDFG.

Goal: Manage game populations for sustainable harvest using adaptive management and scientifically defensible methods to support a recreational hunting program that is consistent with the military mission and other Base species management programs.

Key tasks for the REC include: monitor hunted species populations and manage hunter effort to avoid overharvest, support the safe use of training areas for hunting, minimize conflicts with training, and promote a positive hunting experience. The REC determines the number of hunters, dates of seasons and bag limits. While these parameters are all maintained within California State Hunting Regulations, local conditions are reviewed before and during hunting seasons and are reduced, if necessary, for resource protection, maintaining species populations, and/or safety of hunters and users of the Base.

Staffing of the REC was converted from military to civilian billets in 2004 and 2005. This conversion included changing some of the billets to biological technicians and another one to a biologist. By transitioning to a staff with more focus on biology than law enforcement, it is anticipated that a reduction in the frequency of staff turnover, as experienced with military personnel, will be accomplished. The staffing of the biologist position has caused a

review of the Resources Management Division roles and responsibilities regarding game management, with the expectation that the REC will increase their involvement in the review of harvest data, review of authorized harvest limits, and identification of population enhancement measures.

Additionally, in 2004 a sportsman club was established on Base. This organization is expected to provide user input into the Game Management Program and volunteer labor for projects in support of the Program.

Wildlife game species at Camp Pendleton include California quail (*Callipepla californica*), mountain quail (*Oreortyx pictus*), mourning dove (*Zenaida macroura*), band-tailed pigeon (*Columba fasciata*), desert cottontail (*Sylvilagus audubonii*), brush rabbit (*Sylvilagus bachmani*), southern mule deer (*Odocoileus hemionus fuliginatus*), and many waterfowl species.

Sustainability in game management should favor using methods that do not require regular inputs of labor or materials to maintain continued benefits for wildlife and a harvestable surplus of game animals indefinitely. Management practices benefiting game species on Base include providing additional water sources, prescribed burns, restoring plant communities, and population monitoring for game species.

The REC Game Management Program is organized into four Elements. These Elements are: 1) Game Species Management Plans; 2) Game Data Collection; 3) Game Program Overview; and 4) Bison Herd Management. These Elements are detailed in the following sections and identify Element Objectives and Actions planned to assist in meeting the Goals and Objectives of this program.

4.3.4.1. Game Species Management Plans

Objective: Manage the Base's wildlife game species (deer, small game, and waterfowl) in a scientifically sound manner to provide a high-quality hunting experience for those permitted to hunt on Camp Pendleton.

Hunting and active management of the southern mule deer population at Camp Pendleton has been ongoing since at least 1955. To facilitate management of this species, the Base contracted Dr. Floyd W. Weckerly of Humboldt State University to analyze accumulated deer survey and hunting data, review the existing management plan, and develop a revised management plan for sustained yield hunting on Base (Weckerly 1998). Findings from that study indicated that the Camp Pendleton management program for the deer population is sound and effective. Dr. Weckerly provided additional recommendations to improve the



FIGURE 4-1. MULE DEER
(PHOTO SOURCE: TOM KOERNER, USFWS)

management plan for sustained yield hunting on Base (Weckerly 1998). Findings from that study indicated that the Camp Pendleton management program for the deer population is sound and effective. Dr. Weckerly provided additional recommendations to improve the

program. The REC plans to develop two additional plans for small game and waterfowl management.

4.3.4.2. Game Data Collection

Objective: Collect game species data that is scientifically to use in setting appropriate hunting bag limits, monitor for over-harvest, and identify health/disease conditions.

Since 1955, Base game wardens and wildlife staff have collected and evaluated game species data. Fairly extensive game data records, in annual Base hunting reports dating back to 1955, are available for deer hunting effort and harvest. Starting in 1987, in an effort to expand data input and reinforce game management plans, deer hunting reports began including deer age, weight, and sex. Currently, the REC staff collects hunter harvest information including harvest date, number of animals, species, sex, and age of game animals harvested. Additionally, lower incisors are collected from each harvested deer and used for age estimation. In many years since 1990, the Base has conducted helicopter surveys to estimate deer population size. Aerial deer surveys conform to CDFG methods and the Base shares results with CDFG. Information is also collected from deer road kills.

Less extensive data is collected for other game species on Base, including small game (since at least 1970) and waterfowl (since at least 1985). REC staff tally the number of doves, rabbits, pigeons, squirrels, and ducks harvested. They also measure hunter effort for small game and waterfowl hunters and record sex data for quail and waterfowl. Other monitoring methods have included performing quail cow-call counts and estimating juvenile and adult ratios for quail and doves.

4.3.4.3. Game Program Review

Objective: Annually review, report, and revise the Base Game Management Program to ensure that it is scientifically defensible, supports a recreational hunting program, concurs with a Bird Air Strike Hazard (BASH) program, and is consistent with military mission and other Base species management programs.

The Base Game Program is managed in cooperation with the CDFG and follows California law and the annual framework established by CDFG. Section 640, Title 14, California Code of Regulations (Management of Fish and Wildlife on Military Lands) and Sections 3450 through 3453 of California Fish and Game Code allow the Base sufficient flexibility in administering its hunting and fishing program, to avoid conflicts with military training and maintain sustainable game species populations.

The Game Management Program is reviewed by the REC, annually, to provide a quality, sustainable hunting experience for military and civilian patrons. Harvest bag limits, dates of seasons, and areas available for hunting are adjusted based on the results of these reviews, data that is collected from harvested animals, and from customer comments. Reviews will also identify any required changes to existing or proposed plans and any enhancements required to improve species populations or the quality of the program.

4.3.4.4. Bison Herd Management



FIGURE 4-2. BISON
(PHOTO SOURCE: AARON RINKER, USFWS)

Objective: Manage the Base bison population in a scientifically sound manner that minimizes mission conflicts and impacts to habitat and safety.

Most of California is not part of the bison's original range. The San Diego Natural History Museum, however, has 11 fossil records of an extinct species of bison that lived in the area about 100,000 years ago. The climate was likely much wetter and had more grasslands during that period (Lee 2008). In 1973, plains bison (*Bison bison bison*) were reintroduced onto Camp Pendleton as a gift from the San Diego Zoo because they did not have enough room to

keep the animals (Lee 2008). Between 1973 and 1979 fourteen bison were presented to Camp Pendleton as part of this program. From 1979 to 2008 the bison herd grew from 14 to approximately 150 individuals, according to the 2008 helicopter population survey (2008 CPEN bison survey results, unpublished report).

The Base's bison herd is not intensively managed, and is one of only two bison conservation herds in California; the other herd is on Santa Catalina Island. Management of the bison herd includes: monitoring the herd's growth rate and age composition, moving bison away from ranges that are actively firing euthanizing badly injured animals. Culling the herd may be necessary in the future to limit training stoppages caused by bison wandering onto active firing ranges.

Most bison in the United States have genes from domestic cattle. Bison were bred with cattle to produce animals with improved qualities for human food production (Lee 2008). In 2008, researchers from Texas A&M culled 10 bison and collected tissue samples for genetic and disease screening (Asmus pers. comm. 2011). They used mitochondrial and nuclear DNA to screen for cattle genes. Their results did not find evidence of cattle gene introgression or the presence of disease (Derr 2011). In 2010, researchers from the University of Missouri confirmed the presence of cattle genes in one bison using a more sensitive detection method, SNP 50 (Taylor et al. 2010).

Camp Pendleton began to formally review and evaluate its alternatives for bison herd management by writing an Environmental Assessment (EA) in compliance with NEPA guidelines. The anticipated completion time for the Bison Management EA is 2012.

4.3.5. Migratory Bird Management Program

Camp Pendleton's varied habitat assemblage supports a rich diversity of resident and migrant bird species. As of April 2009, 347 bird species have been recorded on Base, including resident breeders, migrants, and vagrants (i.e., birds wandering from their normal home range). Birds warrant protection and study because they are an important indicator of

ecological health. Because birds are specialized, differ in environmental requirements and tolerances, and are easily monitored, they provide insight into ecosystem integrity.

Several policies guide the Base in migratory bird conservation. The primary consideration with regard to the conservation and management of migratory birds is compliance with the Migratory Bird Treaty Act (MBTA) and the Bald and Golden Eagle Protection Act (BGEPA). Guidance for compliance with these laws is provided under Executive Order 13186 and the resulting Memorandum of Understanding (MOU) with the USFWS and the Final Rule for the Take of Migratory Birds by the Armed Forces (USFWS 2010c).

Goal: Develop and implement a migratory bird conservation and management program that complies with legal drivers and provides maximum flexibility to the Base's military training mission.

The migratory bird conservation program consists of four elements. These elements are: 1) MBTA compliance; 2) habitat conservation; 3) monitoring programs; and 4) participation in DoD Partners in Flight (PIF). These elements are detailed in the following sections and identify Element Objectives and Actions planned to support the Goal of this Program.

4.3.5.1. MBTA Compliance

Objective: Embed MBTA compliance requirements in relevant Base policies, programs, and procedures.

The MBTA prohibits the taking, killing, or possessing of migratory birds unless permitted by regulations promulgated by the Secretary of the Interior. Historically, courts held that the MBTA did not apply to federal agencies. In July 2000, the U.S. Court of Appeals for the District of Columbia Circuit ruled that the prohibitions of the MBTA *do* apply to federal agencies and that a federal agency's taking and killing of migratory birds without a permit violated the MBTA. On 13 March 2002, the U.S. District Court for the District of Columbia ruled that military training exercises of the DoN that incidentally take migratory birds without a permit violate the MBTA. However, in December 2002, Congress authorized an interim period during which the prohibitions on incidental take of migratory birds would not apply to authorized military activities. Readiness activities are defined as training and operations that relate to combat and adequate and realistic testing and training of military equipment, vehicles, weapons, and sensors for proper operation and suitability for combat use. Readiness activities do not include routine operation of installation operating support functions (HDR Engineering 2010).

Executive Order 13186 directs that federal agencies take responsibility for the protection of migratory birds. Pursuant to this Order, the Department of Defense entered into a Memorandum of Understanding (MOU) with the United States Fish and Wildlife Service on 31 July 2006. This MOU is designed to promote the conservation of migratory birds by ensuring DoD operations (with the exception of military readiness activities) are consistent with the Migratory Bird Treaty Act and avoid the take of migratory birds. The MOU does not authorize "take" of migratory birds but outlines the responsibilities of DoD personnel during installation activities that pertain to natural resource management, installation

support functions, operation of industrial activities, construction of facilities, and hazardous waste cleanup.

The MOU does not cover military training, which is covered under the Final Rule for the Take of Migratory Birds by the Armed Forces issued on 28 February 2007 (USFWS 2010c). This final rule authorizes the Armed Forces to take migratory birds as an incidental result of military readiness activities. Conditions of this authorization are the obligation of DoD installations to confer and cooperate when military readiness activities may have a significant adverse effect on a population of migratory bird species. To avoid reaching the threshold that could revoke this authorization the DoD should engage in early planning and scoping, involve USFWS in planning, develop a list of conservation measures for migratory birds, and include comprehensive migratory bird management objectives in planning documents. To operators in the field this provision provides significant benefit as training activities were previously subject to potential litigation and injunction. Camp Pendleton will, through this INRMP and National Environmental Policy Act (NEPA) review processes, continue to identify measures to monitor, minimize and mitigate—to the extent practicable—adverse impacts to migratory birds that may be attributable to our military readiness activities.

4.3.5.2. MBTA Compliance Through the NEPA Process

There is no authorization for the intentional or unintentional take of migratory birds during actions that are not considered military readiness activities. Thus, projects that are not actual military readiness activities must be reviewed for potential impacts to migratory birds through the Base NEPA process. Non-readiness activities are defined as range construction and maintenance, which includes prescribed burning, routine installation operations, maintenance, and construction, and natural resource programs such as exotic removal and habitat enhancement projects. In general, non-readiness activities that may potentially take migratory birds should be conducted outside the migratory bird-breeding season (15 February – 31 August). Specific guidance is available for some actions e.g., Decision Memorandum, Programmatic Categorical Exclusion: Routine, Recurring Tree Trimming, Basewide (NEPA 040151 – 15 June 2005) is a document that outlines all requirements for installation tree trimming activities.

The Base will address and document those actions necessary to support military readiness activities or other mission critical activities that cannot be modified to avoid or minimize impacts on migratory birds. Provided below is guidance on addressing and implementing such non-readiness activities that are likely to take migratory birds and/or their active nests (with egg(s) and/or chick(s)):

- A. If the activity cannot be delayed until the end of the migratory bird-nesting season, document the following information in the applicable NEPA documentation. Information to be recorded includes:
 - 1) Activity being conducted.
 - 2) Purpose of the activity.
 - 3) Why the activity has to be conducted during the nesting season.

- 4) Possible migratory birds that could be impacted by the actions (with emphasis on species of concern (SOC) – go to <http://dodpif.org/BCRMap.htm> to identify SOCs that may occur on the installation).
- 5) Project-specific conservation/management/minimization/mitigation measures, if any, being employed in and around the action area that benefits migratory birds.
- 6) Conservation measures the installation implements to manage and conserve migratory bird populations, as identified in the installation's INRMP, with emphasis on the birds that will be affected by the action.
- 7) The overall effect of the action on migratory bird populations affected by the action.
- 8) a. If active nest(s) is/are situated in a manner that could cause damage to military equipment or could be damaged by the use of such equipment (e.g., target equipment and communication network), explore the possibility of acquiring an intentional take permit under 50 CFR 21.41 (Depredation Permit) or 50 CFR 21.27 (Special Use Permit).
b. Contact the USFWS, inform them of the action, coordinate the document in 8a above, and seek comments on the proposed measures identified in 8a (5), if any. If possible, obtain the written concurrence of the USFWS on the proposed measures.

4.3.5.3. Habitat Conservation

Objective: Maximize migratory bird populations and habitat use by managing Base lands in a manner that supports migratory bird conservation.

In order to meet the overall objective of migratory bird habitat conservation, the Base will identify management actions that have the potential to adversely affect migratory bird populations and develop measures that would avoid or minimize the take of migratory birds as allowed by the MBTA.

Camp Pendleton's large contiguous area of open space provides few restrictions to migratory bird movement. The Base follows the development of regional conservation plans covering areas adjacent to Camp Pendleton to see how these plans establish preserves and corridor links to the Base and other habitats usable by migratory birds and provides consideration and prioritization of transit corridor connectivity in identifying encroachment collaborating opportunities for encroachment relief acquisitions. Strategies for habitat conservation objectives on Base include:

- Limiting disturbance events, such as prescribed burns, grazing, disking, and herbicide applications during breeding seasons. Camp Pendleton's existing and proposed conservation plans limit activities that may disturb habitat during the breeding season and Base Order P3500.1N (*Range and Training Regulations*) provides additional protection to bird habitats on Base year-round through programmatic instructions that limit impacts to existing vegetation.
- Control brown-headed cowbirds and conditions that attract them; control and eradicate nonnative plant species at the watershed/landscape scale and control and

eradicate nonnative animal species, including mammalian predators. Detailed information on Camp Pendleton's long established programs to control and eradicate nonnative plant and animal species including cowbirds and invasive plants is covered in Sections 4.3.3.2. and 4.4.1.3. All bird species that are impacted by cowbirds are provided some level of benefit by Camp Pendleton's effort to control cowbirds. Programmatic instructions and housing regulations preclude residents in some Base housing areas near sensitive species from having household pets that may prey on migratory birds, including federally listed threatened and endangered species.

- Take actions to minimize the deleterious effects of future development and preserve and protect habitat and the establishment on priorities for protection and restoration. Camp Pendleton intends to keep over 85% of its land as open space and to limit major development to existing cantonment areas (limited development throughout the training areas is required to provide ranges, targets, and infrastructure to support the training mission of the Base). This development goal supports bird conservation plans that focus on ensuring patch sizes, configuration, connectivity, and diversity of habitats and the minimization of effects on development.
- Manage vegetation communities to create soft edges appropriate to historical vegetation patterns; manage habitats for diversity and natural conditions; ensure that patch sizes, configuration, and connectivity of habitats support desired populations; and increase size and diversity of habitats. Camp Pendleton's ecosystem management approach is based on the concept of maintaining natural systems that support diversity and restore/maintain natural conditions. Where goals, objectives, and recommendations of conservation plans focus on the management of the needs of select focal or secondary species, Camp Pendleton will review those specific requirements to see how they correspond to the Base's other natural resources management goals and requirements.

4.3.5.4. Monitoring Programs

Objective: Develop and implement new and/or existing inventory and monitoring programs at appropriate scales using following national protocols and DoD PIF guidance.

In order to determine whether Base activities are having an impact (positive or negative), rigorous monitoring programs need to be in place. Currently, the Base participates in national level programs such as:

- MAPS – Monitoring Avian Productivity and Survival.
- Breeding Bird Survey.
- Christmas Bird Count.

Other monitoring programs should be developed to provide status assessments of migratory birds on Base. New monitoring programs should develop methodologies and provide data on pressing conservation issues affecting birds, through use of long term monitoring, standardized monitoring protocols, data collection on multiple species during specialized monitoring, and data gathering on species of concern. Base bird monitoring programs should follow the DoD PIF Coordinated Bird Monitoring Plan (see below). Some bird monitoring programs that should be implemented include standardized bird counts and

roadside raptor surveys in winter and spring seasons. In addition, the Base monitors regionally important species and species of concern to use as focal species for bird conservation projects. Species of interest include (but are not limited to): Coastal Cactus Wren, Burrowing Owl, Gray Vireo, Nuttall's Woodpecker, Wrentit, and Yellow Warbler.

4.3.5.5. Participate in DoD Partners in Flight Including MAPS Stations

Objective: Participate in DoD Partners in Flight (PIF) activities as appropriate. Operate MAPS stations as funding allows.

PIF was established in 1990 in response to growing concerns about declines in the populations of many land-bird species, and in order to emphasize the conservation of birds not covered by existing conservation initiatives. The original focus was on neotropical migrant species, but has spread to include most land-birds and other species requiring terrestrial habitats. PIF strives to combine resources of public and private organizations throughout North and South America to achieve success in conserving bird populations in the northern hemisphere.

Through participation in PIF, the DoD actively manages its natural resources to support mission needs and flight safety goals, while pursuing a sound conservation ethic that strives to benefit bird species throughout the Americas. DoD's strategy focuses on inventory, on-the-ground management, education, and long-term monitoring to determine changes in migrant bird populations on DoD installations.

The DoD PIF program vision is to support the military's training and testing mission while being a vital and supportive partner in regional, national, and international bird conservation initiatives. Wherever possible, PIF strives to implement cooperative projects and programs on DoD lands to benefit the health and well-being of birds and their habitats. PIF ensures that all Services have access to the land, sea and air resources necessary to ensure national security, recognizing that sustainable use of these resources aids the military mission and enhances the natural environment.

The DoD PIF Strategic Plan top priority goals and objectives for the next five- to ten-years established 4-7 August 2008 are:

- Mission Support: Develop and implement conservation strategies that balance mission support while minimizing impacts to priority birds and habitats, including those to address climate change, sustainability/readiness, and BASH.
- Stewardship: Contribute to sustaining viable bird populations through sound stewardship on DoD lands. Objectives include demonstrating national leadership on bird conservation issues, and promoting and implementing conservation strategies.
- Partnerships/Cooperation: Identify and participate in conservation partnerships outside of installation boundaries to establish relationships and to develop and implement plans for conservation. Also, cooperate internally at the installation-level with, for example, training components and public works departments.
- DoD Policies and Programs: Integrate bird conservation goals across relevant DoD policies and programs through strategic planning and decision-making in support

of the military mission, prioritizing actions that benefit species of concern, and preventing future listings.

- Guidance and Communication: Ensure productive and effective two-way communication within DoD and with non-DoD stakeholders. Guidance documentation to support policy and program management includes, but is not limited to, DOD policy and State Wildlife Action Plans (SWAPs), as well as DoD, regional, national, and international PIF plans.
- Habitat and Species Management: Encourage development and implementation of optimal habitat and species management practices, as appropriate and in accordance with mission requirements, to support DoD PIF goals and objectives.
- BASH (Bird/Wildlife Aircraft Strike Hazard): Support the reduction of BASH risk through ongoing cooperation among stakeholders, including air safety and natural resource managers, and by supporting technologies that assist in BASH risk reduction, such as radar acoustics.
- Monitoring: Implement a monitoring program to understand better the status of bird populations and the response of birds to environmental conditions, including management activities and to meet regulatory requirements.
- Research: Identify gaps in knowledge and investigate research needs relevant to mission support requirements and conservation of priority birds.
- Information and Education: Continue to develop and implant education and outreach information and materials to promote bird conservation and the DoD PIF Program (DoD PIF 2008).

The Base participates in the DoD PIF program by sending a USMC representative to annual planning meetings and participating in the Coordinated Bird Monitoring Plan (CBMP). The CBMP is a strategic plan that aids in the standardized development of bird monitoring programs on DoD installations. Part of this program is to archive data within the DoD PIF “Coordinated Bird Monitoring Database” managed by the USGS to ensure preservation of long-term monitoring datasets.

Two MAPS stations were established at Camp Pendleton in 1995 and operated annually thereafter—one in riparian habitat along De Luz Creek and the other in oak woodland near Case Springs, however, operation of the Case Springs station ceased after the 1999 season due to low capture rates. A third station was established in 1998 in riparian habitat along the Santa Margarita River west of Ysidora Basin. Data from the MAPS stations support the Base’s and regional understanding of avian population and survivability. Data from the two MAPS stations on Base have been used to support the determination that population sizes of several species of special concern, including willow flycatchers, LBVs, yellow-breasted chats and yellow warblers, have remained stable. Listed below is an Action that supports the continued operation of MAPS stations aboard Camp Pendleton and any other appropriate DoD PIF activities (see Appendix M for more details on this action).

- Neotropical migratory bird studies.

4.3.5.6. Raptor Management

Objective: Manage the Base raptor (e.g., eagles, ospreys, kites, harriers, vultures, falcons, owls, and hawks) populations in a scientifically sound manner that supports healthy

populations, contributes to a BASH program, complies with federal laws (BGEPA and MBTA), and is consistent with the military mission and other Base species management programs.

Base raptor management is conducted to support species diversity, comply with the MBTA, and the BGEPA and support the military mission and other Base species management programs. The BGEPA (16 U.S.C. 668–668d) prohibits without specific authorization take, possession, selling, purchase, barter, offer to sell, transport, export or import, of any bald or golden eagle, alive or dead or any part, including nest or egg thereof. Use of bald eagles for falconry is prohibited. Take under this act is defined as “to pursue, shoot, shoot at, poison, wound, kill, capture, trap, collect, molest or disturb (USFWS 2010c).”



FIGURE 4-3. GOLDEN EAGLE ELECTROCUTED ON POWER LINE
(PHOTO SOURCE: USFWS)

A series of raptor studies and efforts identifying distribution, status and banding has been conducted on Base for over 20 years, and was completed in the spring of 2005. The researcher who conducted this study will continue distribution, abundance and reproduction monitoring on Base. Additional distribution and status surveys are projected to be conducted every five years.

Records in the Wildlife Management Branch office document that hawks and at least two golden eagles have been reported as electrocution mortalities on Base. As a result, in 2005, the Base began organizing an avian protection program intended to reduce electrocution and injury to large birds from power lines, and related power outages. The Base program uses the industry standards established by the Avian Power Line Interaction Committee in the Suggested Practices for Avian Protection on Power Lines: The State of the Art in 2006 (visit www.aplic.org) as a guideline for its program. The program involves partnering between the Wildlife Management Branch and Facilities Maintenance Department (High Voltage shop). The avian protection program promotes compliance with federal laws including the BGEPA and MBTA. The program identifies and prioritizes power lines, wind turbines, and communication towers for modification that are hazardous to large birds, and states that construction of all new utility and energy systems and associated infrastructure should be designed to avoid and minimize impacts on migratory bird populations. Also, the Wildlife Management Branch NEPA review process will identify existing utility poles that need modification when they are scheduled for relocation or replacement in support of Base construction projects.

Data obtained through the various raptor surveys is shared regionally and reviewed to see if any changes to current activities, programs or programmatic instructions may be required. It is not unusual for tree trimming schedules and locations to be changed as a result of these

reviews. Raptors are occasionally identified as predators of federally threatened and endangered species. Those that have been identified preying on least terns or snowy plovers are live trapped and relocated or removed until breeding is complete, in accordance with the USDA MBTA permit.

Listed below is an Action that supports raptor population management on Camp Pendleton (see Appendix M for more details on this action).

- Track population changes of raptors.

4.3.6. Marine and Fisheries Management Program

Mission: 1) Develop and implement proactive marine and fisheries management programs that support populations of threatened, endangered and native species so that all applicable conservation measures are met in order to provide maximum flexibility for military training requirements; 2) continue to utilize the best technology and research methodology to characterize aquatic habitat and species interactions in support of enhanced flexibility for military training requirements; and 3) develop exceptional recreational sport-fishing conditions for service members and their families stationed aboard Camp Pendleton.

The Wildlife Management Branch is responsible for coordinating saltwater fisheries and marine fauna issues for Camp Pendleton, and the management of freshwater fisheries on Base. While Camp Pendleton's authority/control for management activities ends at the mean high-tide line, the Base is responsible to ensure that any of its actions or activities that may impact resources beyond the beaches are conducted in accordance with regulations and laws governing those resources. Camp Pendleton takes this responsibility seriously since a large portion of the military training mission requires use of sea-space and the airspace over it. Management of aquatic fauna on Base balances the needs of the training mission with the support of recreational game programs, as well as with the protection of federally listed threatened and endangered species, and other natural resources as required by law. In addition to the CWA and other laws that govern the minimization of pollution into our waterways, aquatic resources on Base and offshore are subject to natural resources management laws including the Magnuson-Stevens Act, Marine Mammal Protection Act (MMPA), and ESA (see Section 4.3.2. regarding the management of federally listed threatened or endangered marine or anadromous species). The Base also has a recreational fishing program that is subject to additional applicable federal and State regulations (Section 5.2.3.).

Goal: Develop and implement a marine and fisheries management program that supports sustainable populations of native species, meets the conservation objectives of applicable regulations and provides maximum flexibility for military training requirements.

The Wildlife Management Branch's Marine and Fisheries Issues Program groups-efforts that are supported by the Base's fisheries biologist into one program, for ease of management. This program is organized into seven elements. These Elements are: 1) Magnuson-Stevens Act Compliance; 2) MMPA Compliance; 3) Estuary Management; 4) Steelhead Management; 5) Marine Threatened and Endangered Issues; 6) Sport Fish Management; and 7) Exotic Fish Control.

4.3.6.1. Magnuson-Stevens Act Compliance

Objective: Comply with Magnuson-Stevens Act, notably the Essential Fish Habitat (EFH) and the Southern California Eelgrass Mitigation Policy aspects.

The Magnuson-Stevens Fishery Conservation and Management Act (Public Law 94-265, 1996) is a national program for the conservation and management of the fishery resources of the U.S. Its purpose is to prevent overfishing, to rebuild overfished stocks, to ensure conservation, to facilitate long-term protection of EFHs, and to realize the full potential of the Nation's fishery resources. On Base, the Santa Margarita estuary is considered an EFH under the Magnuson-Stevens Fishery Conservation and Management Act.

The 1996 amendments to this Act set forth a number of mandates for NOAA National Marines Fisheries Service (NOAA Fisheries Service), Regional Fishery Management Councils, and federal action agencies to identify and protect important marine and anadromous fish habitat. The Councils, with assistance from NMFS, are required to delineate EFH in fishery management plans for all managed species. EFH is defined as those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity.

All of Camp Pendleton's nearshore resources are designated as EFH (those waters and substrate necessary to fish for spawning, breeding, feeding or growth to maturity), falling under either the Pacific Groundfish Management Area or the Pacific Coastal Pelagic Fishery Management Area (all marine and estuarine waters from the shoreline along the coasts of California, Oregon and Washington offshore to the limits of the exclusive economic zone [200 miles]). EFH at Camp Pendleton may include streams, estuaries, and offshore subtidal habitats that may be important for marine and anadromous fish species. The Coastal Pelagic Species Fishery Management Plan includes 81 species potentially found offshore of the Base, and the Pacific Coastal Pelagic Fishery Management Area is specifically designed to protect lower trophic species (e.g., anchovies, sardines, mackerel, and market squid) and pertains to five listed species known to occur offshore of the Base (NMFS 1991, 1998 & Rouse pers. comm. 2011).

Although the concept of EFH is similar to that of "Critical Habitat" under the ESA, measures recommended to protect EFH by NMFS or a Council are advisory, not prescriptive. To maintain compliance with the Magnuson-Stevens Act, the Wildlife Management Branch coordinates with NMFS (as part of the NEPA process) to ensure that Base projects and activities that occur within waterways on the Base or offshore of the Base do not adversely affect EFH.

The Southern California Eelgrass Mitigation Policy was developed, in collaboration by the NMFS, USFWS and CDFG, in order to standardize and maintain a consistent policy regarding mitigating adverse impacts to eelgrass resources. Eelgrass (*Zostera marina*) vegetated areas are recognized as important ecological communities in shallow bays and estuaries because of their multiple biological and physical values. Eelgrass habitat functions as an important structural environment for resident bay and estuarine species, offering both predation refuge and a food source. Eelgrass functions as a nursery area for many commercially and recreationally important finfish and shellfish species, including

those that are resident within bays and estuaries, as well as oceanic species that enter estuaries to breed or spawn. Eelgrass also provides a unique habitat that supports a high diversity of non-commercially important species whose ecological roles are less well understood (NMFS 1991).

4.3.6.2. Marine Mammal Protection Act Compliance



FIGURE 4-4. SEA OTTER
(PHOTO SOURCE: MIKE BOYLAN, USFWS)

Objective: Understand and comply with the MMPA.

The 1972 MMPA established a federal responsibility to protect and manage marine mammals and their products (e.g., the use of hides and meat). The primary authority for implementing the Act belongs to the DOI (USFWS division) and Commerce (NOAA Fisheries division). The USFWS manages walruses, polar bears, sea otters, dugongs, marine otters, and manatees. NMFS (of NOAA Fisheries) manages cetaceans and pinnipeds (namely whales, porpoises, seals, and sea lions).

The MMPA prohibits, with certain exceptions, the take of marine mammals in U.S. waters and by U.S. citizens in international waters, and the importation of marine mammals and marine mammal products into the U.S. Take of a marine mammal is defined to include harassment, hunting, capturing or killing, or the attempt of such actions. Harassment is further defined to include an act of pursuit, torment, or annoyance that has the potential to injure or disturb a marine mammal by causing disruption of behavioral patterns, including, but not limited to, migration, breathing, nursing, breeding, feeding, or sheltering.

The USFWS and NMFS may issue permits under MMPA Section 104 (16 U.S.C. 1374) to persons, including federal agencies, that authorize the taking or importing of specific species of marine mammals. Federal agencies that fund, permit, or carry out activities that may adversely impact marine mammals are required to consult with the USFWS or NMFS regarding potential adverse effects of their actions on marine mammals.

Marine mammals are generally not known to use beach or estuarine habitats along Camp Pendleton's coast. However, offshore of the Base, the presence of cetaceans and pinnipeds are fairly common. At least 21 species of cetaceans have been reported off the coast of southern California (Eder 2002). Cetacean species include toothed whales or odontocetes, such as sperm whales, beaked whales, dolphins, and porpoises. Baleen whales or mysticetes include six rorquals, the northern right whale (*Eubalaena glacialis*), and the California gray whale (*Eschrichtius robustus*). Off Camp Pendleton, six species of cetaceans occur in moderate to high numbers, either regularly or seasonally. These include the California gray whale (*Eschrichtius robustus*), short-beaked common dolphin (*Delphinus delphis*), long-beaked common dolphin (*Delphinus capensis*), the coastal and offshore stocks of the bottlenose dolphin (*Tursiops truncatus*), Risso's dolphin (*Grampus griseus*), and Dall's porpoise (*Phocoenoides dalli*). Of the pinnipeds that regularly occur off the coast of southern California, only the Pacific harbor seal (*Phoca vitulina richardii*)

and California sea lion (*Zalophus californianus*) are likely to occur off Camp Pendleton, though in small numbers (see Section 3.2.3.2.).

Camp Pendleton's authority and jurisdiction for resource management ends at the mean high-tide line. As a result, Base management for Marine mammals consists of contacting the USFWS and/or NMFS, as appropriate, should marine mammals or their products be found stranded or washed ashore on Camp Pendleton's beaches, and coordinating with USFWS and NMFS (as part of the NEPA process) to ensure that Base projects and activities that occur along the shore or offshore of the Base do not adversely affect marine mammals. An example of this process is the Base's review and consultation on the introduction of the Expeditionary Fighting Vehicle (EFV) (replacement of the Assault Amphibious Vehicle [AAV]). As a result of the review and consultation, Camp Pendleton established Programmatic Instructions for the use and operation of the EFV in offshore areas that will minimize potential impacts on marine mammals in areas where EFVs are operating.

4.3.6.3. Estuary Management

Objective: Manage Base estuaries to maximize the capability to support listed species, EFH, and an appropriate level of military activities, per the ESA.

The management of estuary/coastal zone areas on Base is in accordance with the Estuarine/Beach Ecosystem Conservation Plan (Appendix B) and the Riparian BO (USFWS 1995a). This Estuarine/Beach Ecosystem Conservation Plan is designed to ensure that estuarine and beach communities on Camp Pendleton are sufficiently resilient to withstand natural and human disturbances including military training activities. This includes: 1) conservation of listed species and their associated habitats; and 2) maintaining and enhancing the functionality and biodiversity of the Santa Margarita River Estuary and the coastal lagoons located at: Cocklebur, French, Hidden, Aliso, Las Flores, San Onofre, and San Mateo Creeks. Conservation efforts are accomplished through the active management efforts listed in Appendix B (e.g., protective fencing, warning signs, predator management, and exotic vegetation control) and through application of the Programmatic Instructions to facilitate avoidance and minimization of impacts within the land areas designated as management zones. Funding for future enhancement activities listed under the conservation recommendations, terms and conditions, and reasonable and prudent measures of the Riparian BO (USFWS 1995a) are actively pursued to promote recovery of estuarine species. Management prescriptions emphasize avoiding permanent impacts from construction in estuary and beach areas. Within estuarine areas management primarily takes the form of precluding human activities to allow natural processes to take place. Activities that are normally allowed in estuaries are usually limited to monitoring and surveying and exotic fish and exotic vegetation removal. If other activities are proposed their impacts are evaluated via the NEPA process.

The effectiveness of Camp Pendleton's estuary management program is determined through the measuring and monitoring of species population, habitat quantity and habitat values per the terms and conditions of the Riparian BO (USFWS 1995a), or more frequently through comparing those values against goals and commitments established (in consultation with the USFWS) in the Estuarine and Beach Ecosystem Conservation Plan

(Appendix B). Results are provided to and reviewed with the USFWS to determine if changes reflect regional trends and/or if changes to the Estuarine/Beach Ecosystem Conservation Plan (Appendix B) are warranted.

4.3.6.4. Steelhead Management

Objective: Manage the San Mateo Creek so as to allow steelhead access to upstream breeding ponds, climatic conditions and adequate water flows permitting, per the applicable BOs.

The Southern California steelhead has only been observed on Camp Pendleton intermittently since the 1950's. Most occurrences from 1940 - 1980 are attributed to locally stocked *O. mykiss*, and post 1980 sightings are attributed to native steelhead straying from other drainages within the region. In 1999, a juvenile was observed migrating in San Mateo Creek, which was the first reoccurrence of steelhead on Base since 1993 (2 adults) and prior to that in 1989 (some 38 cm trout) (NOAA 2000 & USFWS 1998g). Until 1999, the occurrence of the species was thought to be extirpated from much of its historic range in southern California south of Malibu Creek. Additional *O. mykiss* observations were made on Base in 1999 (CDFG 2000b). The most recent confirmed observations of steelhead on Base are of one individual within San Mateo Creek in December 2003, and few individuals in Santa Margarita River in 2009 who were likely migrating to the Pacific Ocean; see Appendix F, Section F.16.2. (Rouse pers. comm. 2009). Nonetheless, to protect potential steelhead habitat and ensure that Base activities are in compliance with ESA, Camp Pendleton is developing a programmatic BA for Base activities and management programs that may affect the steelhead. Consultation with NMFS and completion of a BO will follow submission of the BA. In the interim, the Base has and will continue to support and participate with the CDFG's ongoing surveys for steelhead, exotic removal efforts in potential breeding ponds, and the CDFG funded effort of steelhead habitat enhancements in the upper portions of San Mateo Creek. The potential for steelhead use of the San Mateo Creek is taken into consideration when planning and conducting management activities and when reviewing actions/activities proposed in the San Mateo watershed under the Estuarine and Beach Ecosystem Conservation Plan (Appendix B) and the Riparian Ecosystem Conservation Plan (Appendix C). An example of this protocol was demonstrated during the repair of a flood-damaged crossing in San Mateo Creek. Specifications of the crossing were changed to include culvert requirements that would support steelhead use of San Mateo Creek. Other ongoing efforts that support steelhead use of the San Mateo Creek include, but are not limited to, rehabilitation efforts in estuarine/beach areas that are temporarily disturbed from non-routine maintenance and construction activities, exotic vegetation control, exotic fish population control, and the restricting/prohibiting of training activities in the creek during periods of high water flow.

4.3.6.5. Tidewater Goby Management

Objective: Maintain a sustainable Tidewater Goby (*Eucyclogobius newberryi*) population on Base.

The Riparian BO specifically directs the Base to conduct presence/absence surveys for tidewater gobies every three years, and surveys have been continuously conducted since 2002. The data shows localized extirpation and recolonization events that are concurrent

with documented tidewater goby biological lifecycle history. The Riparian BO directs the Base to assess the severity of threats to tidewater gobies posed by non-native species. The Base employs an aggressive aquatic exotic species removal program to remain in compliance.

4.3.6.6. Marine Threatened and Endangered Species Issues

Objective: Establish and maintain the capability to identify, understand, and consider potential marine threatened and endangered species issues that may require inclusion in the Base management program and afforded ESA protections.

Federally listed marine threatened and endangered species are generally not known to use beach or estuarine habitats along Camp Pendleton's coast. However, offshore of the Base, there is the possibility for the presence of or future listing of marine threatened and endangered species that may effect or be affected by operations on Camp Pendleton (see Section 3.2.3.2.). The effort of this Element is to develop the resident capability to establish and maintain awareness of federally listed species that have the potential to be found in the waters off Camp Pendleton, or species found in waters off Camp Pendleton that have the potential to become listed, and therefore their consideration during the NEPA review process by the Wildlife Management Branch may be included. While federally listed marine threatened and endangered species have not been an issue for Camp Pendleton in the past, the introduction of the EFV highlighted the need to maintain awareness of these species and work with NOAA Fisheries Service to reduce impacts to these species and Base operations.

4.3.6.7. Sport Fish Management

Objective: Manage the Base fisheries to provide a high quality recreational fishing program and experience, for Base and area Marines and service members consistent with the military mission and other Base species management programs.

In support of the recreational and fishing programs on Camp Pendleton (Chapter 5), the Wildlife Management Branch provides management for game species on Base. The Base fishing program is subject to applicable federal and State regulations and is managed cooperatively with the CDFG. Although no native freshwater game fish species are permissible to catch on Camp Pendleton, a few ponds and lakes have been historically managed for exotic game fish as part of a recreational fishery program. Inland freshwater fishing is not authorized in rivers or creeks, with the occasional exception of Santa Margarita River (above Stuart Mesa Road in winter months only). Inland fishing may be authorized at Horseshoe Lake, Case Spring Ponds, Lake O'Neill, Whitman Pond, Pilgrim Creek Pond, Broodmare Ponds, Wildcat Ponds, Windmill Lake, and Las Flores Slough (from I-5 bridge west to the ocean). Fishing is permitted at Pulgas Lake for catch and release only. See Section 5.2.3. for details on the fishing program.

Lake O'Neill is stocked occasionally with exotic game fish, including largemouth bass (*Micropterus salmoides*) (approximately 200 individuals in May 2003), bluegill (*Lepomis macrochirus*) (approximately 2,000 juveniles in May 2003), black crappie (*Pomoxis nigromaculatus*), channel catfish (*Ictalurus punctatus*), rainbow trout (*Salmo gairdnerii*) (approximately 6,000 pounds in January 2004) and red-eared sunfish (*Lepomis*

microlophus) (approximately 200 individuals in May 2003). As part of the exotic aquatic animal control program (Section 4.3.6.8.) and in support of the sport fishing program, exotics removed from other locations on Base, which are fishable game species, may be placed in Lake O'Neill.

A Fisheries Management Plan and an Update has been developed for Lake O'Neill (Cates and Shaw 1993 & Berg 1995a). A Fisheries Management Plan is also available for Pulgas Lake (Berg 1995b). These plans have been developed to manage and improve recreational fishing on Base.

On 23 June 2003, three solar-powered, floating Solar Bee™ pond circulators were installed in Lake O'Neill to redistribute water from the bottom to the top of the lake. The mixing action accelerates the biological and photosynthetic processes and aids in stabilizing oxygen and temperature levels of the lake thereby creating an environment to sustain fish for sport fishing. Before the introduction of the Solar Bee™ units, the lake was susceptible to blue-green algae. Oxygen and temperature measurements are collected twice daily and evaluated monthly to ensure the equipment is operating correctly and algae blooms and summer fish kills are minimized.

4.3.6.8. Exotic Aquatic Animal Control

Objective: Obtain reasonable control (distribution and abundance) of key exotic fish and aquatic animal species with intent to reduce predation of native species.

Exotic aquatic animals may pose a threat to native species and communities on Base (e.g., competitively excluding native species, altering the habitat in a manner which favors other exotics, predation, etc.). The Base conducts control efforts basewide on several exotic species, including the red swamp crayfish (*Procambarus clarkii*) and several exotic fish species (e.g., mosquitofish (*Gambusia affinis*), carp (*Cyprinus carpio*), black bullhead (*Ameiurus melas*), and green sunfish (*Lepomis cyanellus*). Efforts are focused in water bodies that are habitat to the tidewater goby and steelhead and downstream from the fish barrier at the outlet of Lake O'Neill to check that the barrier is functioning. Control efforts include shocking, seining, and setting fish traps—all are programmed and conducted annually. Selected game species captured during control efforts may be relocated and released into Lake O'Neill (see Section 4.3.6.7.). A contract to develop an exotics management plan was funded and contracted out in 2004. This effort will review current procedures and provide recommendations regarding locations, times, and procedures to improve the program. For example, currently, fisheries biologists are pursuing the use of alternative exclusionary devices to prevent the potential introduction of non-native species from Lake O'Neill into the Santa Margarita River.

4.3.7. Training

Wildlife Management Branch staff receives training to ensure proficiency in their areas of expertise, and provide technical currency and updated knowledge in biology/wildlife-related subject matter and management issues. Training focuses on species behavior/biology, regulatory issues and management practices that aid in the implementation and enforcement of environmental laws and regulations. In addition to classes and workshops on biology/wildlife-related subjects, training may include

information technology instruction (GIS, database software and data management) and government policies/protocol (CompTRAK, contracting classes, leadership, human resources, etc.). Classes and workshops are selected from a variety of sources and can include: formal classes from universities and colleges, formal training from other federal agencies (e.g., USFWS National Conservation Training Center), attendance at conferences held by DoD and other professional organizations (e.g. National Military Fish and Wildlife Association), and participation in annual/periodic regional species meetings and conferences.

Goal: Provide necessary training for staff to effectively support both Base environmental and military mission requirements.

Objective: Provide training opportunities to staff to enhance their capabilities to manage wildlife resources in support of the Base mission.

4.3.8. Natural Resources Awareness Program

Objective: Provide Base units and users with a thorough understanding of their role and responsibilities for conserving Base natural resources, and inform the general public about Base efforts to conserve southern California's resources in conjunction with military training.

The Wildlife Management Branch conducts a variety of community outreach and educational programs that serve to enhance public awareness of natural resource management programs, federally listed and other regulated species, and steps the Marine Corps is taking to balance training with resource protection on Camp Pendleton. Educating Base residents, visitors, and the surrounding communities about Camp Pendleton's unique natural resources, stewardship initiatives, and contributions to regional conservation goals helps to demonstrate the Marine Corps' commitment to environmental protection and preservation of its natural resources. The natural resources awareness program takes a multifaceted approach to: 1) help ensure that military training is in compliance with federal laws and regulations regarding endangered species; 2) provide basic knowledge of natural resources to military families through school programs; and 3) inform nearby communities of the commitment the Base has to preserving local natural resources.

MILITARY TRAINING

The primary mission of Marine Corps Base Camp Pendleton is to train Marines. The Base is home to the largest stretch of undeveloped coastline in southern California, and the coastal and foothill terrain provides opportunities for a wide variety of military training; however, federal environmental laws and regulations dictate how training and day-to-day operations can be implemented on military installations. In an effort to ensure that training is accomplished in compliance with federal laws like the Endangered Species Act and the Migratory Bird Treaty Act, the Wildlife Management Branch staff conducts slide presentations for Marines on natural resources, Base management programs, and training requirements and restrictions. Regular briefs are prepared and presented to S3/S4 Marines, as well as to units who may be training in sensitive areas or areas with specific requirements for compliance with federal laws. Brochures and information sheets are available on specific topics, such as for units who are training on the beach. The brochure

informs them of important regulations protecting Endangered nesting birds during the breeding season, and how to safely use the beach for training during that time. Biologists also attend monthly Environmental Coordinator meetings and represent the Wildlife Management Branch on basewide environmental issues, as well as provide presentation of any new and current information available regarding the Wildlife Program.

SCHOOL PROGRAMS

Education and outreach programs directed at the youth that reside on Base serves to promote a conservation ethic and pride in young people, for where they live. Often military families come to southern California from elsewhere, so providing these children with information and knowledge about their new surroundings can ease that transition and help instill a sense of “residency”. Wildlife-oriented programs are prepared and presented to schools on-Base, and current plans are to expand the program to other nearby schools off-Base, as well. Senior high school students (K-12) are given the opportunity to see skins,



FIGURE 4-5. BASE EARTH DAY EVENT 2009
(PHOTO SOURCE: USMCB CAMP PENDLETON)

skulls, and live examples of native species, presented by a professional wildlife biologist, which can be found on Camp Pendleton. In the future, the program plans to expand the available materials for use in classrooms by providing games, posters, activity and coloring books, and other reusable materials to the students and teachers at Base schools.

Camp Pendleton’s natural resources department also hosts frequent “School-to-Career Days”, where high school students who may be

interested in a wildlife career are given an opportunity to shadow Base biologists, and learn more about the field of wildlife biology and Camp Pendleton’s natural resources.

The Wildlife Management Branch participates in, supports, and/or hosts events for many educational days throughout the year. Annual current and planned future activities that provide education, recreation, and community involvement for Base students and their families are:

- Earth Day.
- Science Discovery Day.
- National Public Lands Day.
- International Volunteer Day.
- California Coastal Clean-up Day.
- Endangered Species Day.
- International Migratory Bird Day.

MULTIFACETED OUTREACH PROGRAM

Interpretive signs provide an opportunity to communicate natural resources information and Marine Corps policies to users and visitors of Camp Pendleton. The signs are intended to show Base users how successful the Marine Corps has been at accomplishing their training mission while significantly protecting natural resources on Base. The Marine Corps is proud of the work done to protect threatened and endangered species on this top-notch training facility, and feel it is important for military and civilian families to see, learn, and get intrigued about how unique and interesting Camp Pendleton is. Interpretive signs have been installed in a few locations on Base, and the goal is to continue to develop signs throughout the Base, for the enjoyment of all Base users for now and the future.

Current Natural Resources Awareness Signs:

- I-5: bison, grey whales, and least terns.
- Wire Mountain Housing: vernal pools.
- Del Mar Recreational Beach: estuary ecology, training, and endangered species.

Future Sign Locations Planned:

- Lake O'Neill: self-guided nature trail.
- Warden's Office Trail: coastal sage scrub and riparian ecosystems.

Posters and brochures have been designed and produced highlighting different wildlife topics on Base, and many others are still needed to keep Base users informed of natural resources issues basewide. It is not just the military and their families, but also civilian employees working on Camp Pendleton that need to be aware of laws, regulations, and safety information associated with their jobs and workplaces. Facilities Maintenance Department (FMD), Public Works (PWO), and the ROICC are just a few examples of Base operators who need natural resources information on a regular basis. In addition to continuously keeping the lines of communication open, the Wildlife Management Branch makes posters and brochures available for Base operators. Current and future natural resources awareness projects include:

- Threatened and Endangered species: all 16 of the Base's federally listed species shown (with photos) where they are located on Base, and some information about construction and maintenance avoidance and minimization measures for each species.
- Cliff swallows: MBTA regulations explained regarding breeding season, nest removal, exclusionary devices, etc.
- Snake identification and safety: photos of rattlesnakes compared with similar species that live on Base, along with advice on what to do during rattlesnake encounters.
- Quagga mussels: educating recreational boaters about how to stop the spread of invasive mussels.
- Recreational beach use: describes sensitive beach resources and rules and regulations that campers and other beach users should be aware of.

- Bats: describes bat ecology and the importance of bats to the local ecosystem, how to discourage use of buildings by bats, and what to do if bats are already using buildings, etc.

A SharePoint website specific to the Wildlife Management Branch is currently available and accessible to civilian and military employees [<https://intranet.emportal.usmc.mil/sites/pe/NRD/wmb/default.aspx>]. The site is updated regularly with news, photos, articles, and links to related sites about Camp Pendleton's natural resources, species status updates, training regulations, supporting documents, and other topics of interest. In addition, articles will be written and submitted regularly to the Base newspaper "The Scout", which is accessible online. These articles will focus on local and regional topics of interest concerning current wildlife issues, and raise awareness of seasonal restrictions in a timely manner.

REGIONAL AWARENESS

Volunteer Opportunities - An annual restoration project event is planned on Base for volunteers on National Public Lands Day, which gives Base residents, users, and the public an opportunity for hands-on participation in the protection of their local natural resources. Opportunities for the public to participate in Earth Day, and some of the other "clean-up days" that occur on Base are also provided. The goal of these activities is to give local residents a sense of pride and ownership of the Base in their lives, and in turn building public support for the military mission.

Field Trips - Local chapters of the Audubon Society are invited to come to the Base for birding field trips (e.g., San Diego Bird Festival, Christmas Bird Count, Breeding Bird Survey, etc.), which are led by biologists from the Wildlife Management Branch, and each spring a professor from Cal Poly Pomona brings a herpetology class on Base for a field trip to provide students the opportunity for hands-on experiences in native habitats. This aspect of the Natural Resources Awareness Program will be expanded to increase the spread of knowledge to the local communities about the environmental stewardship taking place on Base. The positive contributions to the sustainability of local natural resources made by the Marine Corps should be effectively projected to the public, and occasionally allowing field trips on Base can help to disseminate this message.

4.4. LAND MANAGEMENT BRANCH

The Land Management Branch (LMB) is responsible for ensuring landscape sustainability through a variety of programs such as erosion control, invasive weed management, habitat restoration, wetlands management, watershed management, rare plant management, and ecosystem mapping and monitoring. The LMB has also been given the responsibility for management of animal species that occupy vernal pools in order to provide comprehensive ecosystem management of those unique natural resources.

Mission: Employ ecosystem management and multiple use principles to ensure mission requirements and flexibility while sustaining the carrying capacity of the Base's training ranges.

Vision: Support military land use through the 21st century using high quality, science-based natural resources management that ensures compliance and stewardship.

Goals of the Land Management Branch:

1. Manage ecosystem health to sustain military training ranges and mission requirements.
2. Provide service oriented environmental compliance support to enhance the military mission.
3. Maintain a positive working relationship with military customers, regulators, and others.
4. Distill complex ecological data for decision makers to make educated decisions concerning resource sustainability.

The LMB conducts two programs designed to help achieve the mission and goals of the Branch, ensure compliance with all applicable laws and BOs, and ensure landscape sustainability. These programs are Sustainable Ecosystem Management and Mission and Support. Each program is subdivided into program elements. Elements outline Objectives and Actions to be conducted to support achieving the Goals and Objectives of each program. Each program and its corresponding elements were developed, named, and organized to assist the Land Management Branch staff manage all areas for which they are responsible. As such, the organization of programs and elements was established based on staffing levels, internal structure and potential workloads. Many of the aspects of these programs, elements and actions overlap other programs or elements, but were established and organized to best support the mission and organization. Additionally, some of the programs and elements perform similar functions to those in other Branches, but are in regards to land management functions. Each program and its corresponding element are described in detail in the following sections.

4.4.1. Sustainable Ecosystem Management

The Sustainable Ecosystem Management Program provides for: landscape sustainability through activities that restore and maintain ecosystems, actions that measure impacts and effects of actions and activities to the vegetation portion of Base ecosystems, identification of changes to ecosystems from natural and non-natural sources, and establishment of actions to restore and improve Base ecosystems.

Goal: Conserve soil resources which support the training landscapes and their ecosystems; comply with regulatory framework.

The Sustainable Ecosystem Management Program is organized into five program Elements: 1) Wetland Management; 2) Ecosystem Mapping and Monitoring; 3) Invasive Weed Control; 4) Erosion and Sediment Control; and 5) Fire Management. These program elements are detailed in the following sections and identify Element Objectives and Actions planned to be conducted to meet the Goals and Objectives of this program.

4.4.1.1. Wetland Management

Goal: Manage the wetlands program to reflect a no net loss philosophy.

Objective: Conduct inventory and habitat evaluations of estuarine and freshwater wetlands basewide.

Wetlands are highly-productive complex ecosystems. Wetland management is a challenge nationally, and more so in California because it has urbanized or converted to agricultural use a majority (>90%) of its original wetlands (USGS 1999). EO 11990 and MCO P5090.2A (Marine Corps Environmental Compliance and Protection Manual) guides wetlands protection on Base. MCO P5090.2A established a Marine Corps policy of no overall net loss of wetlands and avoidance of loss of size, function or ecological value of wetlands. Further, the Order states that the Marine Corps will preserve and enhance the natural and beneficial values of wetlands while conducting its activities. Management actions are taken to ensure that all facilities and operational actions avoid, to the maximum degree feasible, wetlands destruction or degradation regardless of wetland size or legal necessity for a permit. These actions include: 1) developing and publishing avoidance and minimization measures in the Base Training Regulations and other Base Orders; 2) reviewing proposed actions and projects for potential impacts to wetlands and obtaining CWA 404 permits as required; and 3) providing oversight or conducting wetland repair/restoration for impacts.

Wetlands on Camp Pendleton include lakes, ponds, rivers, creeks, estuaries and vernal pools. Wetlands can be generally defined as land that is periodically flooded. The regulatory process under the CWA uses the USACE definition: “Those areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas (33 CFR 328.3).” In accordance with Section 404 of the CWA, USACE regulates the discharge of dredged or fill material into waters of the U.S. The term “waters of the United States” is defined as:

- All waters currently used, or used in the past, or may be susceptible to use in interstate or foreign commerce, including all waters subject to the ebb and flow of the tide.
- All interstate waters including interstate wetlands.
- All other waters such as intrastate lakes, rivers, streams (including intermittent streams), mudflats, sandflats, wetlands, sloughs, prairie potholes, wet meadows, playa lakes, or natural ponds; the use, degradation, or destruction of which could affect foreign commerce including any such waters: 1) which could be used by interstate or foreign travelers for recreational or other purposes; or 2) from which fish or shellfish are, or could be taken and sold in interstate or foreign commerce; or 3) which are used or could be used for industries in interstate commerce.
- All other impoundments of waters otherwise as defined as waters of the U.S. under the definition.
- Tributaries of waters identified above.
- The territorial seas.
- Wetlands adjacent to waters (other than waters that are themselves wetlands) identified in the paragraphs above [33 CFR Part 328.3(a)].

Due to the importance of these resources to ecosystems and wildlife on Base, management of many of the aspects of wetlands are addressed or supported by several other programs (see also Sections 4.3.2.1. Manage Riparian, Beach, Estuarine Species and Habitats, 4.3.6.1. Magnuson-Stevens Act Compliance, 4.3.6.3. Estuary Management, 4.4.1.3. Invasive Weed Control, and 4.4.2.1. Regulatory Compliance and NEPA Review). Additionally, most wetlands receive protection and management through one of the Base's three Conservation programs. The Land Management Branch serves as the overall coordinator for management activities that affect wetlands.

The LMB is developing a standardized wetland vegetation classification and mapping system for Camp Pendleton to allow and ensure that change analysis can be consistently and reliably performed on Base. Standardization is key to ensuring that data collected is usable for analysis. Past surveys have not always used methodologies that allow accurate identification of changes or impact to wetlands over time. GIS methodology is being developed along with the standardized classification and mapping to ensure the ability to accurately report and show where wetlands are located, what changes are taking place and to help determine if the changes are the results of natural or anthropomorphic actions.

LMB staff evaluates projects that are in close proximity to wetlands to ensure compliance with federal laws and to recommend BMPs and actions to avoid wetland impacts. Before the start of any projects that may discharge dredged or fill material into a jurisdictional wetland or other waters of the U.S., LMB staff obtain any necessary 404 permits from the USACE, as well as 401 certification from the RWQCB. Any facility or activity that cannot be sited to avoid wetlands must be designed to minimize wetlands degradation and must include compensatory mitigation as required by wetland regulatory agencies in all phases of project planning, programming and budgeting. Within this policy, use of Marine Corps lands and lands of other entities are permissible for mitigation purposes for Marine Corps projects when consistent with EPA and USACE guidelines or permit provisions.

Actions that support the wetlands program aboard Camp Pendleton are listed below (see Appendix M for details of these actions).

- Basewide Wetland Mapping.
- Wetlands on Base Tracking.

A number of areas on Camp Pendleton contain wetland habitat that is ephemeral and geographically isolated. A vernal pool is a type of isolated ephemeral wetland (IEW) that is differentiated from other forms of IEWs by its assemblage of specific floral species. The term "isolated wetlands" is a regulatory description of wetlands that are geographically isolated, and are not part of a system of surface waters that are tributary to navigable waters. Isolated wetlands are not subject to regulation under Section 404 of the CWA if they are not hydrologically connected to Waters of the U.S.; however, from an ecological perspective, they play an essential role in the biodiversity of the upland landscape, in which they support a wide variety of plants and animals, including native and endemic species, some of which are specific to an area, or particular type of pool (RECON 2007a). Vernal pools host a faunal assemblage that, like the associated flora, is adapted to the wet-dry cycle typical of these seasonal wetlands. Vernal pool-supported fauna includes a number of

insects (e.g., crane flies, water beetles, and water striders), amphibians (e.g., frogs, toads, and salamanders), reptiles (including some snakes), birds (e.g., grassland and brushland species, wading birds, ducks, and herons), and mammals (e.g., opossums, rabbits, raccoons, and coyotes), but by far the greatest diversity is associated with invertebrate species (RECON 2007a). Although there are some species that exist only in vernal pools, many animals use vernal pools solely as stopover sites for foraging and resting during seasonal migration. For example, migratory birds will rest and feed at vernal pools as they migrate to their spring nesting habitat. Some species of butterflies also use vernal pools in their annual migrations. Thus, isolated wetlands occupy an important niche in California's environment. Not only do vernal pools help to maintain biodiversity, they also support rare and endangered species, and provide many of the functions and services associated with other, non-isolated wetlands.

Vernal pools on Camp Pendleton occur naturally on hummocky soils, with impervious subsurface layers in swales between "mima mounds" or in other depressions that impound water. Typically, water ponds in these depressions in the winter and spring, and then dries later in the year. Specialized plant and animal species adapted to this seasonal wet and dry cycle thrive in many vernal pools on Base, including four federally listed as threatened or endangered species: spreading navarretia, *Navarretia fossalis* (Section 3.2.4.17.), San Diego button-celery, *Eryngium aristulatum* var. *parishii* (Section 3.2.4.16.), Riverside fairy shrimp, *Streptocephalus woottoni* (Section 3.2.4.14.), and San Diego fairy shrimp, *Branchinecta sandiegonensis* (Section 3.2.4.15.).

Camp Pendleton has completed two inventories of vernal pools and is in consultation with the USFWS for the management of the four listed species that are associated with vernal pools (in the Uplands BA). The latest survey conducted during the winter 2004/2005 (one of the three wettest years on record; see Chapter 3, Table 3-2), identified approximately 576 new vernal pools and expanded the footprint of some of the previously mapped pools. In total, 2,403 vernal pools are now known to occur on Base, with a total vernal pool surface acreage mapped at 39.75 acres (RECON 2007a).

For wetlands, in general, Camp Pendleton is developing a standardized Geo-database/data management system and methodology to determine how vernal pools and their micro-watersheds are mapped. This will ensure that data obtained during monitoring and mapping is done in a repeatable, consistent method—allowing change detection, identification of potential causes of the changes and required management. This is especially important because of the extreme environmental variability experienced from year-to-year by these pools.

VERNAL POOLS

A vernal pool is a type of ephemeral wetland that occurs within soil types where there is a seasonally perched water table. A vernal pool is defined as a (naturally occurring) shallow depression underlain by a substrate (e.g., hardpan, clay, and basalt) that holds water for an extended period during the rainy season, but is typically dry most of the year. Vernal pool habitat has the capability to support a unique biota of plants and animals, including federally listed Brachiopod species, as mentioned earlier. Vernal pools on the Base occur primarily on coastal terraces within about three miles from the beach which include, but are

not limited to: Cocklebur Mesa, Las Pulgas bluffs, Las Flores Mesa, Stuart Mesa, and Wire Mountain (see Figure 3-34). Often, military operations, such as artillery, mortar, air delivered explosives, and vehicles create “man-made” depressions that support species normally associated with vernal pools. For example, even road ruts created by vehicle traffic are discovered to support fairy shrimp presence. In such cases, the Base (Land Management Branch) manages those resources, per the ESA, but they are not recognized, counted, or managed as vernal pools.

Surveyed vernal pools within the Base are given a classification value based on the characteristics of disturbance, presence, diversity, and abundance of indicator species. Weighted counts are totaled to derive a diversity index. Species presence is weighted as follows: vernal pool endemics–4, wetland indicator species–2, mesic clay species–1, and upland species–0.

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

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

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

Diversity Index:

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

The level of disturbance is calculated by determining the number of disturbance types and the extent these disturbances are affecting the basins.

TABLE 4-4. DISTURBANCE FACTOR DETERMINATION

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

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

The diversity index, disturbance level, and field data information on the quality of the pool are used to determine their class as follows: Class 1) I–disturbance factor low to high, high diversity; 2) Class II–disturbance factor low to very high with moderate-2 to high diversity;

3) Class III—disturbance factor low to very high with moderate diversity; and 4) Class IV—disturbance factor low to very high with low diversity. Table 4-6 displays the number of vernal pools by areas and their class as documented during surveys conducted from 1997-1999. The number of vernal pools in an area occupied by either the San Diego or Riverside fairy shrimp is noted in parentheses.

TABLE 4-5. VERNAL POOL CLASSIFICATION SYSTEM

Class	Disturbance Factor	Diversity Index
I	Low	High
I	Moderate	High
I	High	High
II	Low	Moderate 2
II	Moderate	Moderate 2
II	High	Moderate 2
II	Very High	High
III	Low	Moderate 1
III	Moderate	Moderate 1
III	High	Moderate 1
III	Very High	Moderate 1-2
IV	Low	Low
IV	Moderate	Low
IV	High	Low
IV	Very High	Low

Vernal Pools

Goal: Management will be set forth through uplands BA and BO.

Objective: Complete accurate basewide inventory and Pool Classification; develop GIS based monitoring.

Vernal pools in general and all pools occupied with listed species receive protection from activities on Base through the use of programmatic instructions (e.g., range regulations) to avoid and minimize adverse impacts. Habitat is considered “occupied” if a federally listed species (e.g., listed fairy shrimp in a vernal pool) was found present during a current or historical survey. Any project that impacts occupied pools requires consultation with USFWS and mitigation/compensation. Projects that have the potential to impact vernal pools are evaluated on a micro-watershed scale. Vernal pools that meet the USACE three-

parameter wetland criteria in the Wetlands Delineation Manual are wetlands, and are also managed in accordance with Section 4.4.1.1. and the Marine Corps “no net loss” policy.

**TABLE 4-6. VERNAL POOLS BY AREAS AND CLASS
(NUMBER OF OCCUPIED VERNAL POOLS)**

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

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

Currently for vernal pools, the range regulations state that: “1) digging, including construction of fighting positions, is prohibited in vernal pools; 2) vehicle/equipment operations near known vernal pool habitat should be kept on existing roads, year-round; and 3) bivouac/command post/field support activities (showers, messing, fueling, water purification, etc.) should be kept at least 50 meters from identified vernal pools.”

Mitigation for permanent impacts are anticipated to be primarily in the form of enhancement of protected pools (e.g., exotics control), habitat restoration, and creation of more occupied pools (e.g., via translocation of shrimp to existing unoccupied pools). In addition to mitigation project(s), stewardship (i.e., management programs) compensates for some of the training impacts. As funds are available, exotic plant control and general weeding are performed in and adjacent to vernal pools to enhance the persistence and survivability of native species. Incidental impacts, such as by vehicles, are documented and investigated to determine the cause and remedial actions required to restore the impacted resource. Vernal pool quantity and quality surveys are also conducted to help determine

programming requirements and priority for “out years” (future) actions. Actions that support the vernal pool program aboard Camp Pendleton are listed below (see Appendix M for details on these actions).

- Vernal pool ecosystem management.
- Vernal pool survey.
- Vernal pool mitigation monitoring per BO.

FAIRY SHRIMP

Goal: Maintain regional commitment of populations through avoidance and minimization and enhancement projects for Riverside and San Diego Fairy Shrimp.

Objective: Determine accurate basewide shrimp populations and spatial distribution and relate to regional populations.

Two federally endangered fairy shrimp are found aboard Camp Pendleton, the San Diego fairy shrimp (*Branchinecta sandiegonensis*) and the Riverside fairy shrimp (*Streptocephalus woottoni*).

Management for listed fairy shrimp is primarily through the management and control of human activities that may create impacts to occupied pools and natural processes. Impacts are avoided and minimized through the use of programmatic instructions that are published in the Range Training Regulations and other Base Orders. These programmatic instructions limit training and other activities in and near occupied pools. Location of occupied pools are updated and published semiannually in the Base’s Environmental Operations Map Book that is provided for all users of the Base. Additional management for the federally listed fairy shrimp is dependent upon the results of the pending Uplands BO.

To monitor, identify, and track changes and trends, and determine effectiveness of management actions including avoidance and minimization measures, an accurate baseline needs to be established. Although fairy shrimp inventories were completed in 1998, vernal pool surveys conducted during the 2004/2005 winter, with its above average rainfall, identified 657 additional pools, which were recorded via GPS and added to existing records. Beginning in the winter/spring 2006-2007, fairy shrimp surveys for these new pools and other pools whose occupancy status is unknown will be conducted as funding permits. Surveys were not conducted during 2006-2007 due to lack of sufficient rainfall, however, funding was deferred to the next wet season. Once a comprehensive inventory and a functioning geodatabase and data management system are completed, surveys will be conducted every 5 years. The data management system will provide a systematic method to keep track of information collected regarding distribution and pool occupancy of fairy shrimp and will enable informed trend analysis.

Site-specific surveys for listed fairy shrimp species are performed for individual projects where necessary. All surveys follow the protocol outlined in the 1996 USFWS’ “Interim Survey Guidelines to Permittees for Recovery Permits under Section 10(a)(1)(A) of the ESA for the Listed Vernal Pool Branchiopods.” Any permanent project that impacts occupied pools or jurisdictional wetlands requires mitigation/compensation.

Actions that support fairy shrimp management aboard Camp Pendleton are listed below (see Appendix M for details on these actions).

- Fairy shrimp survey.
- Shrimp mechanized impact study.
- Shrimp extirpation monitoring.
- Shrimp habitat impact tracking.
- Vernal Pool Group 68 mitigation.

4.4.1.2. Ecosystem Mapping and Monitoring

Goal (Mapping): Map ecological baseline variables in order to ensure sustainable training ranges. Map habitat as required for the Upland and Riparian BO's.

Objective (Mapping): Map vegetation associations, fire severities, weed infestations, for upland, riparian, wetlands and estuary habitats.

Goal (Monitoring): Monitor ecological variables that track primary ecosystem health indicators to ensure training rangeland sustainability and to meet vegetation requirements in Riparian and Uplands BO.

Objective (Monitoring): Develop ecological triggers for monitoring that support adaptive decision-making.

Vegetation mapping and monitoring are fundamental to the understanding and prediction of species distribution and determining ecosystem health. Land managers, planners and decision makers require a consistent and repeatable hierarchical system to organize distinct plant assemblages. There are many competing vegetation classification strategies to make sense of the distinct vegetation types around us. The Base has adopted the modified Holland classification system for use in basewide vegetation mapping and monitoring. In addition, further refinement of mapping rules are being developed to allow for change analysis of vegetation types over time. These rules will standardize variables, identify minimum mapping units and define the plant composition of communities to allow for transition and comparison from one classification system to another.

The GIS vegetation coverage in use by Camp Pendleton's natural resource managers and planners was originated by SANDAG in the early 1990s and updated in 1995. SANDAG's vegetation mapping was part of a county-wide effort to support the region's habitat conservation planning efforts. Thus, the SANDAG vegetation databases are regional in nature, varying in levels of detail and scale. Finer vegetation details were collapsed into broader categories and limited field reconnaissance was conducted during map ground-truthing efforts.

Basewide vegetation mapping was conducted in 2003 using aerial photography and field inspections. The GIS layer produced from this project is now available for basewide use.

The Riparian BO requires that riparian areas on Base be mapped every 2 years, and it has its own vegetation classification system designed to help determine overall habitat value of the riparian ecosystem on Base. The classification system in the Riparian BO is cross-linked to the modified Holland system in GIS.

In 2003 and in 2005, aerial photographs were taken and orthorectified for all Base riparian and estuarine areas to provide the basis for vegetation mapping and change analysis. The 2003 mapping was received in January 2006 (AMEC 2006). Table 4-7 shows the changes in the distribution of riparian habitats between 2003 and the 1995 baseline. The most significant change was a decrease in exotic weeds that is attributed to the ongoing, intensive exotic weed removal programs. Most of the other changes in habitat acreage were identified as likely being attributable to refinements in mapping methodologies and the natural dynamics of floodplain vegetation, resulting from such variables as flood scour and drought cycles (AMEC 2006). The lack of established rules and methodology from the 1995 baseline preclude duplicating the 1995 process. As noted above, standardization of rules and methodology is being done to ensure that future mapping efforts can be used to provide accurate and reliable change analysis.

TABLE 4-7. RIPARIAN ACREAGE CHANGE – 1995 AND 2003

Vegetation Description	Acreage 2003	Acreage 1995	Acreage Change	Percent Change
Coastal Salt Marsh	383	324	59	15.3%
CSS	1106	842	264	23.9%
Disturbed/Developed Lands	303	321	-18	-6.0%
Arundo	186	549	-363	-195.4%
Exotic-Other	41	28	14	32.9%
Tamarisk	26	65	-39	-149.5%
Freshwater Marsh	172	314	-142	-82.2%
Grass-forb Mix	960	1327	-367	-38.2%
Mixed Woodland	786	323	462	58.8%
Mixed Willow Exotic	82	*	82	*
Open Water/Open Gravel	608	539	68	11.3%
Riparian Scrub	2722	2154	569	20.9%
Riparian Woodland	1730	2011	-281	16.2%
Sycamore Grassland	369	549	-180	-48.9%
Total	9475	9346	129	1.4%

* Mixed willow exotic category not used in aggregated 1995 mapping categories.

The long-term trend monitoring and analysis of natural resources is essential for tracking ecosystem processes and trends, and for adapting management initiatives to best suit Base resources and the military mission. The shift in focus from single species monitoring to monitoring sites with multiple species, and the inclusion of abiotic and anthropogenic factors allows for a broader evaluation of ecological processes and potential causal relationships. Included in the Ecosystem Mapping and Monitoring Element is the Base’s Long Term Ecological Trend Monitoring (LTETM) project. The LTETM project was

initiated in 1991 and is a continuation of and modification to the U.S. Army Land Condition-Trend Analysis (LCTA) project that was initiated in 1990.

A successful LTETM program provides scientifically valid baseline and long-term monitoring data. The program was designed to determine the status and trends in natural resources on military lands, assess the effects of military training and training support activities on those resources, and provide information regarding resource sustainability. LTETM monitoring is a dynamic process whose major components include: 1) identifying sustainability targets; 2) defining important attributes within the systems; 3) collecting data; 4) managing data; and 5) providing results and feedback to management. By documenting natural year-to-year variability, responses to natural stresses, acute and chronic effects of land management and military activities, and situations where sustainability targets are at risk, the LTETM program can help ensure that stewardship goals and responsibilities are achieved and that mission training and management uses are conducted on a sustainable basis.

The overall purpose of the LTETM program is to monitor ecological sustainability at Camp Pendleton using approaches that are technically sound, and when appropriate, statistically valid. The following LTETM goals support this purpose:

1. Identify sustainability thresholds and develop a tiered approach to evaluate condition and trigger management actions.
2. Document and understand the range of natural variation (spatial and temporal) in resource conditions.
3. Measure condition of important ecosystem attributes relative to thresholds or baseline conditions using scientifically defensible, repeatable approaches.
4. Document and monitor training disturbance.
5. Provide early warning signs of problems and help identify agents of change.
6. Determine effectiveness of management activities.

Plot locations were determined by a stratified random process using soil and land cover types. Approximately two hundred and fifty 100-meter-long line transect, permanent sample sites (“core” plots) and 38 “special use” plots to monitor fire, erosion, restoration efforts, and the effects of military training on recognized plant species were established in a stratified random manner based on Holland community types using 5 steel pins placed at 25 m intervals per plot. Within each plot, abiotic, biotic, and anthropogenic factors important to the vegetation community are located and collected to provide a quantitative measure of community dynamics, which allows managers to analyze and refine change detection. The Base is working with the Center for Environmental Management on Military Lands (CEMML) at Colorado State University to: 1) revise the LTETM and ensure that data collected is statistically significant to be used as a measurement of ecological sustainability; 2) determine what sample sizes are needed to detect certain types of changes; 3) ensure the correct data is collected for each vegetation community; and 4) develop different levels of thresholds for each vegetation community that will identify and alert decision makers regarding certain types of changes and when actions may be required based on changes recorded at sample locations.

The accurate measurement of change detection and thresholds of change, such as a percentage loss of a specific community type, denoted by ecological indicators, allows managers to concentrate resources (such as restoration projects) on these areas or modify land uses. Additionally, LTETM's ability to evaluate the effect of military training on ecological communities allows the Base to continue its commitment to improve sustainable multiple use. LTEM monitoring priorities are based on information about system dynamics and LMB priorities:

Higher priority

- Coastal sage scrub – This vegetation type: is a focal habitat for species of concern, is difficult to restore once a type conversion occurs, and predominates at lower elevations and on moderate to gentle slopes where most training activities occur. Following repeated disturbance, this type often converts to annual grassland or a sparse shrubland with poor native composition. Among the major vegetation types, CSS is arguably the most dynamic and sensitive. Fire and weed management, and active restoration through seeding and planting are the primary tools for managing this type.

Moderate priority

- Oak woodland and savanna – Outside of riparian oak woodlands and on steep, protected slopes, where vegetation can be very thick, oak woodlands and savannas occur in areas that are highly desirable for training. This is due to the tactical value and aerial concealment offered by the trees, as well as, shade and shelter from weather. This type occupies a small acreage on the landscape, but has a disproportionately high ecological value. There may be opportunities for protecting and managing some stands to minimize soil compaction, fuel load accumulations and associated fire risk to trees/saplings/seedlings, and other risks.
- Chaparral – Chaparral stands are well adapted to disturbance but may be converted to other types, the main driver being frequent fire that exhausts the energy and seed reserves of a particular site. This cycle is further propagated by invasion of nonnatives, which alter the fuels and subsequently the fire regime, especially where ignition sources are plentiful, such as in the area in and around the live-fire impact areas. Although chaparral within its natural ecological range is desirable to provide landscape diversity. It is estimated that up to 60% of chaparral acreage on Camp Pendleton has been lost between 2000 and 2005.
- Native perennial grasslands – These communities are often interspersed with annual grasslands and sparse CSS. They are generally found at lower elevations, and may harbor vernal pool ecosystems. These communities are being degraded over time due to invasion and competition from nonnatives. Active restoration, thatch management, and fire management are the primary management tools for maintaining native grasslands. As the distribution and abundance of annuals and nonnatives increases, it is more likely that shrublands that undergo a type conversion will transition more readily to annual grasslands vs. native grasslands.

Lower priority

- Nonnative annual grasslands – Once created, these communities are stable and react to disturbance in predictable ways. Conservation targets for these communities are

to contain them within their current distribution/extent and avoid colonization of these areas by noxious and aggressive invaders such as artichoke thistle, fennel, yellow star thistle, and other thistles. Active restoration of annual grasslands is expensive but can be accomplished at small scales if desired.

Analysis of GIS topography and LTETM vegetation data was conducted to determine potential and existing areas suitable for troop vehicle maneuvers on Base. According to topography data a total of 90,926 ac were classified as 0-30% slope, 31,559 acres were 30-60% slope and 3,206 ac were >60% slope; according to vegetation data a total of 82,591 ac were determined suitable for vehicle maneuvers and 43,333 ac were excluded based on the low mobility ratings assigned to the various vegetation types present. Vegetation types considered open or maneuverable included burned, disturbed habitat, exotics, and all grassland types. Vegetation types considered dense and therefore unfavorable for vehicle maneuvers included coastal sage scrub, all types of chaparral, all types of woodlands, and coastal sage scrub-chaparral mix. The open herbaceous vegetation determined able to support vehicle maneuvers was overlaid with topography data to produce the final maneuver mobility map. The majority (90.1%) of the open herbaceous vegetation suitable for maneuvers fell on 0-30% slopes, while only 17 acres (0.1%) fell on slopes >60% (Table 4-6). The largest areas of contiguous open herbaceous vegetation on 0-30% slopes occurred in the northern part of Kilo One training area and the southwestern part of Oscar Two. Criteria were also met in portions of the following training areas: Tango, Edson Range, Mike, November, X-Ray, Kilo Two, Papa Three, Bravo Two, Echo, and Delta.

TABLE 4-8. ACREAGES BY LAND TYPE AND MANEUVER SUITABILITY CATEGORY

Land Type	Acres	Percent of Total
Central Impact areas	22,887	18.2
Riparian Mapping Area (impact areas excluded)	9,360	7.4
Non-maneuverable upland vegetation (impact areas excluded)	11,086	8.8
Dense upland vegetation difficult for maneuver (shrub and woodland) (impact areas excluded)	61,147	48.5
Upland vegetation suitable for maneuver (open herbaceous) (impacts areas excluded)	21,443	17.0
Total	125,924	
Open upland herbaceous vegetation suitable for maneuver (impact areas excluded):		
0-30% slope	19,304	90.1
30-60% slope	2,100	9.8
>60% slope	17	0.1
Total	21,421	

¹ Acreages presented are slightly different because of small boundary differences between the vegetation map and slope map data layers.

To support erosion control efforts, the Base began identifying and monitoring locations of erosion problems basewide in the late 1980s (Kellogg & Kellogg 1988). In 1997, a database of erosion sites was developed to assist the Base in prioritizing its limited resources to better focus on areas where success was readily achievable. This database has evolved into a geodatabase that includes data, photos, causes of the erosion, treatment goals, treatment processes and monitoring data on all identified erosion sites on Base (see Section 4.4.1.4.).

Actions that support the ecosystem mapping and monitoring program aboard Camp Pendleton are listed below (see Appendix M for details on these actions):

- Habitat monitoring (aerial photography).
- Vegetation mapping/tracking/trend analysis.
- Riparian BO habitat monitoring.
- Oak-Woodland Ecological Monitoring
- LTETM.
- Exotic plant mapping/tracking/analysis.
- Basewide wetland mapping.
- Map monitor rare dune habitat (BO).
- Watershed management analysis (WMA).
- Monitor riparian transects per BO.
- Digitize historic aerial photos for baseline habitat.
- Estuary plant community distribution mapping and monitoring per BO.
- Perennial grassland monitoring.
- Range sustainability design/monitor.

4.4.1.3. Invasive Weed Control

Over one thousand non-native plant species have become naturalized in California wildlands since the late 1700s when European settlement began (USDA 1999). While many of these plants have caused little impact to the environment, others can be both invasive and damaging to natural ecosystems. Non-native invasive plants have the potential to cause vast ecological and economic damage, and sometimes pose human health impacts in infested areas. Among the potential adverse impacts caused by exotic invasive species include:

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

- A decrease in the quality or availability of training lands in areas of heavy infestation.
- Human health risks.

One of the more severe environmental problems facing the Base's natural areas is the spread of non-native invasive plants into native habitats. Of the more than 900 plant species found on Base, 200 (25%) are considered non-native to California. A fraction of those non-natives are considered a threat to the Base's native habitats and are actively managed for under the Invasive Weed Control Program in accordance with Executive Order 13112 (EO 13112).

The purpose of Camp Pendleton's Invasive Weed Control Program is to develop and implement a strategy for the control of such plants on Base. "Control" is considered, as appropriate:

- The eradication, suppression, reduction, or management of invasive species populations.
- The prevention of invasive species introductions and their spread from previously infested areas.
- The reduction of potential adverse effects of invasive species through techniques such as the restoration of native species (EO 13112).

Subject to the availability of funds and staff, management activities under the Invasive Weed Control Program includes: 1) prevention of the introduction of invasive species; 2) detection and rapid response to and control of new invasive species in a cost effective and environmentally sound manner; 3) monitoring and tracking invasive species populations accurately and reliably; 4) providing for restoration of native species and habitat conditions in ecosystems that have been invaded; 5) conducting research on invasive species and developing technologies to prevent introduction and providing for environmentally sound control of invasive species; and 6) promoting education and awareness of invasive species.

To help reduce exotic invasive plant species on Base and to compensate for temporary and permanent impacts from ongoing training activities, Camp Pendleton has conducted removal efforts in riparian and uplands areas on Base. Additional efforts include on-Base and off-Base education through inter-departmental meetings, posters, handouts, display boards, and participation in off-Base weed management meetings/forums and groups (e.g., California Invasive Weed Symposium and California Invasive Plant Council [Cal-IPC]). Additionally, the BEAP includes, as part of the Basewide Master Plant List, a list of prohibited plants to ensure invasive exotics are not introduced to the Base during landscaping activities.

The Invasive Weed Control Program is managed by ecosystem type. Programs currently exist for invasive plant control within upland, riparian and coastal dune habitats. An aquatic invasive plant control program is being developed to identify susceptible waters, species of concern, control technology, and goals. Until then, aquatic invasive plants are managed through the riparian ecosystem program.

TABLE 4-9. INVASIVE EXOTIC PLANTS CURRENTLY FOUND ON CAMP PENDLETON

Common Name	Latin Name	Camp Pendleton Management Goal	Cal-IPC Rating
Giant Reed	<i>Arundo donax</i>	<1% cover	High
Onionweed	<i>Asphodelus fistulosus</i>	Eradicate	Moderate
European Sea Rocket	<i>Cakile maritima</i>	<1% cover	Limited
Heart-Pod Hoary-Cress	<i>Cardaria draba</i>	Eradicate	Moderate
Ward's Weed	<i>Carrichtera annua</i>	Eradicate	n/a
Yellow Star-Thistle	<i>Centaurea solstitialis</i>	Eradicate	High
Purple Pampas Grass	<i>Cortaderia jubata</i>	Eradicate	High
Selloa Pampas Grass	<i>Cortaderia selloana</i>	Eradicate	High
Artichoke Thistle	<i>Cynara cardunculus</i>	Eradicate	Moderate
Stinkwort	<i>Dittrichia graveolens</i>	Eradicate	Moderate
Devil's Thorn	<i>Emex spinosa</i>	Eradicate	Moderate
Lehmann Lovegrass	<i>Eragrostis lehmanniana</i>	Eradicate	n/a
Sweet Fennel	<i>Foeniculum vulgare</i>	Management in selected areas	High
Crown Daisy	<i>Glebionis coronaria</i>	Eradicate	Moderate
Ivy-Leaf Morning-Glory	<i>Ipomoea cairica</i>	Eradicate	n/a
Perennial Pepperweed	<i>Lepidium latifolium</i>	<1% cover	High
Notch-Leaf Marsh-Rosemary	<i>Limonium sinuatum</i>	Eradicate	n/a
Natal Grass	<i>Melinis repens</i>	Eradicate	n/a
Fountain Grass	<i>Pennisetum setaceum</i>	Eradicate	Moderate
Cotton Fireweed	<i>Senecio quadridentatus</i>	Eradicate	n/a
Johnson Grass	<i>Sorghum halepense</i>	Eradicate	n/a
Spanish Broom	<i>Spartium junceum</i>	Eradicate	High
Tamarisk; Salt Cedar	<i>Tamarix ramosissima</i>	<1% cover	High
Ice plant: Sea-Fig	<i>Carpobrotus chilensis</i>	Management in selected areas	Moderate
Ice plant; Hottentot-Fig	<i>Carpobrotus edulis</i>	Management in selected areas	High
Mexican fan palm	<i>Washingtonia robusta</i>	Management in selected areas	Moderate
Florist's-Smilax	<i>Asparagus asparagoides</i>	Management in selected areas	Moderate
Australian Saltbush	<i>Atriplex semibaccata</i>	Management in selected areas	Moderate
Purple Falsebrome	<i>Brachypodium distachyon</i>	Management in selected areas	Moderate
Turnip; Field Mustard	<i>Brassica rapa</i>	Management in selected areas	Limited
Compact Brome	<i>Bromus madritensis</i>	Management in selected areas	High
Red Brome	<i>Bromus rubens</i>	Management in selected areas	High
Italian Thistle	<i>Carduus pycnocephalus</i>	Management in selected areas	Moderate
Bull Thistle	<i>Cirsium vulgare</i>	Management in selected areas	Moderate
Bermuda Grass	<i>Cynodon dactylon</i>	Management in selected areas	Moderate
Jimsonweed	<i>Datura stramonium</i>	Management in selected areas	n/a

Common Name	Latin Name	Camp Pendleton Management Goal	Cal-IPC Rating
German-Ivy	<i>Delairea odorata</i>	Management in selected areas	High
Pride Of Madeira	<i>Echium candicans</i>	Management in selected areas	Limited
Eucalyptus	<i>Eucalyptus</i> spp.	Management in selected areas	Limited
Bridal Veil Broom	<i>Genista monosperma</i>	Management in selected areas	n/a
Sweet Alyssum	<i>Lobularia maritima</i>	Management in selected areas	Limited
Crystalline Iceplant	<i>Mesembryanthemum crystallinum</i>	Management in selected areas	Moderate
Slender-Leaf Iceplant	<i>Mesembryanthemum nodiflorum</i>	Management in selected areas	n/a
Myoporum; Ngaio	<i>Myoporum laetum</i>	Management in selected areas	Moderate

EARLY DETECTION RAPID RESPONSE (EDRR)

Goal: Prevent the introduction of new populations of highly invasive exotic plants on Base in order to minimize spread and prevent long-term costs associated with controlling larger infestations.

Objective: Perform annual monitoring of all major Base roads, construction sites, and other major vectors for new infestations; treat new infestations promptly when discovered; monitor discrete infestations to prevent further spread.

Initiated in 2004, the EDRR program is essential to preventing new infestations of invasive plants from establishing on Base. If overlooked, new infestations have the potential of becoming larger infestations that may prove to be more costly for the Base to remove in the future.

The primary component of the EDRR program is an annual program that incorporates roadside mapping and monitoring of all highly trafficked roads on Base with a rapid response treatment element that targets all identified invasive plant species. After target species are positively identified as an undesirable exotic plant, contract personnel are directed to treat the infestation usually within two weeks of discovery.

The EDRR program also relies on Construction Site Monitoring protocol to reduce the introduction of invasive exotics via new construction projects on Base. This protocol, implemented in 2010, was directly responsible for identifying two highly invasive plant species that were consequently treated and are being monitored annually.

UPLAND ECOSYSTEMS

Goal: Develop, implement, and refine a basewide invasive plant control program using an ecological and science driven approach to yield a landscape comprised of greater than 80%

coverage of native plant species. Additional guidance and completion of an upland weed management plan is pending the completion of the Uplands BO.

Objective: Eliminate persistent infestations on Base including: artichoke thistle (*Cynara cardunculus*), yellow star thistle (*Centaurea solstitialis*), chrysanthemum, fountain grass, and pampas grass; manage the spread of fennel (*Foeniculum vulgare*) into sensitive habitats; monitor the spread of invasive species following wildfires.

The Upland Invasive Weed Control Program typically focuses on high priority sites, targeting weedy, invasive upland species such as artichoke thistle, yellow star thistle, fennel, and other Cal-IPC list 1-A weed species. These target exotics are listed high priority due to their negative ecological impact, invasive potential, and wide distribution on Base and in southern California.

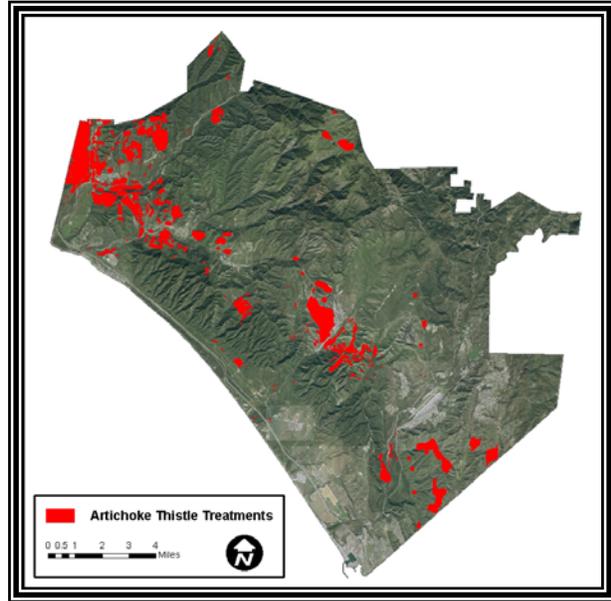


FIGURE 4-6. ARTICHOKE THISTLE TREATMENTS – 2007 TO 2010

One of the first exotic plant species treated on Base was artichoke thistle. A large, spiny perennial thistle that can grow to 2.5 meters in height, artichoke thistle is particularly invasive in Camp Pendleton’s grasslands and in some cases can impede military training. A basewide control program for artichoke thistle was initiated in 1984, and dependent on funding, currently occurs on an annual basis. Contract personnel typically survey large areas of Base that have known populations of artichoke thistle and treat any remaining individuals with spot herbicide treatments. As of 2011, it’s considered under control throughout most areas of the Base, with the exception of a several impact areas designated as off-limits and the State Park lease (added in 2001). Treatment costs are expected to decline; however, it will likely require annual monitoring in the foreseeable future (Figure 4-6).

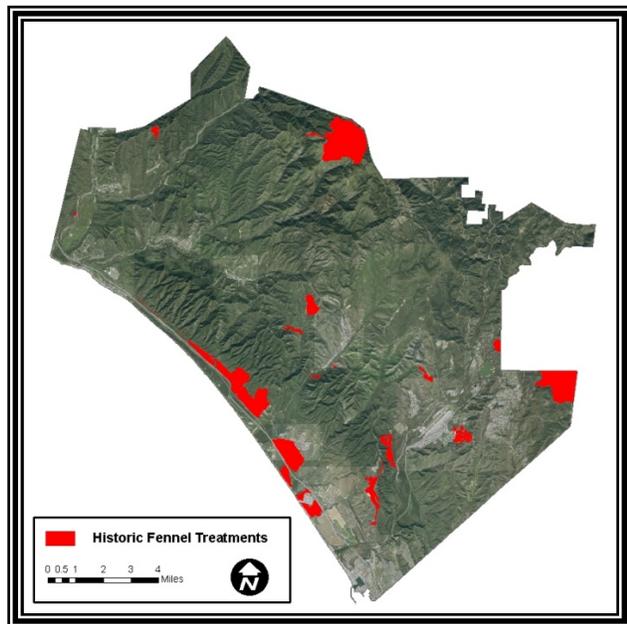


FIGURE 4-7. HISTORIC FENNEL TREATMENTS

The most widespread invasive exotic plant on Base is fennel, with nearly 40,000 acres infested in varying degrees. A perennial species with high seed production, fennel is particularly

invasive within Camp Pendleton's grasslands and habitat transition zones. Due to the extent of the infestation, management must be directed towards sites that have or are adjacent to sensitive resources (i.e., federally protected species and sensitive habitats) and where control will be most effective. Since control efforts began in the late 1990s, approximately 4,000 acres have been treated (Figure 4-7).

In certain cases, the spread of exotic invasive plants can be exacerbated following wildland fire. In 2004, post-fire weed control efforts were initiated on 160 acres following the Chappo Fire (22 Area). To prevent the spread of fennel and other target exotics into coastal sage scrub habitat, post-fire weed control efforts took place on 200 acres following the Horno Fire of 2007. Depending on funding and fire severity, post-fire invasive plant treatments will be ongoing.

RIPARIAN ECOSYSTEMS

Goal: Near-eradication (reducing cover to less than 1%) of giant reed (*Arundo donax*), salt cedar (*Tamarix* spp.), perennial pepperweed (*Lepidium latifolium*) and other problematic invasives; prevent the introduction of new riparian invasive exotics.

Objective: Implement a maintenance treatment program for all riparian areas on an annual basis; monitor for new riparian exotics and treat accordingly; maintain GIS geodatabase of all annual treatments for tracking purposes.

The Riparian Invasive Weed Control Program focuses on control and/or eradication of invasive species listed in Table 4-9 within riparian habitats on Base. Since 1995, the Base has allocated approximately \$8.2 million toward riparian invasive plant removal efforts, the majority going towards removing large infestations of giant reed and salt cedar from the Santa Margarita River corridor.

In 1995, there were extensive giant reed infestations along the entire length of the Santa Margarita River, located both on and off Base property. The Base and adjacent landowners approached the control of giant reed from a regional perspective, enabling removal efforts to begin as far upstream as possible in order to preclude downstream spread or re-infestation from upstream sources. Camp Pendleton has since been partnering with other federal agencies, The Nature Conservancy (TNC), and private landowners by participating in "Team *Arundo*" workshops to implement a systematic multi-year giant reed control program on the Santa Margarita River. Initial control techniques have varied over the years and have included mechanical removal, mowing/mulching, foliar applications of herbicides, cut-stump applications of herbicides, and more recently native plant restoration. The final stretch of river infested with giant reed and salt cedar was treated from 2010-2011. To date, nearly 700 acres of giant reed and 200 acres of salt cedar have been removed from Camp Pendleton's riparian habitats.

Following initial treatments, most sites require at least 4 years of follow-up maintenance treatments to achieve target control goals. These maintenance treatments are primarily accomplished through an annual riparian weed maintenance program that targets Camp Pendleton's riparian corridors (over 4,700 acres) on a rotating schedule. While targeting high priority exotic species like giant reed, the maintenance program also targets exotics listed in Table 4-9 and serves as a monitoring program for any newly discovered riparian weeds. Figure 4-8 displays an overview of the riparian areas and highlights historical treatment areas on Base.

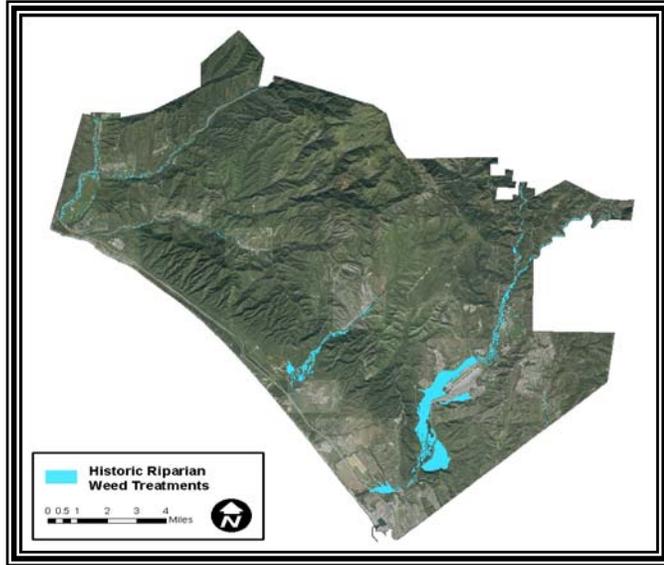


FIGURE 4-8. HISTORIC TREATMENTS OF EXOTIC INVASIVE PLANTS WITHIN CAMP PENDLETON'S RIPARIAN HABITATS

Management of these invasive exotics in riparian habitats is the primary method of compensation that the Base employs to mitigate for permanent impacts to riparian habitats identified in the Riparian Ecosystem Conservation Plan (Appendix C). Riparian mitigation acreages are discussed in detail in section 4.4.2.2 Mitigation Measures.

COASTAL DUNE ECOSYSTEMS

Goal: Eradicate existing invasive exotic plant infestations and prevent the introduction of invasive exotic plants into coastal dune and beach habitats.

Objective: Complete initial treatments of invasive exotic plant infestations along Camp Pendleton's coastal dune and beach habitats; implement a maintenance treatment program for all coastal dune and beach habitats on an annual basis; implement the coastal dune restoration plan developed by The Nature Conservancy (Garcia and Associates 1996) as funds become available.

Due to the extent of sensitive natural resources within Camp Pendleton's coastal dune habitats (i.e., California least tern and western snowy plover nesting sites, and rare plant populations), the Coastal Dune/Beach Weed Control Program was created to control and/or eradicate exotic invasive species listed in Table 4-9 that are detrimental to those habitats. The program currently includes initial treatments within areas that have never been treated and maintenance treatments within previously treated sites.

Initial treatments, which began in 2004, typically occur within 40-50 acre sites for a period of 2 years. Treatments target exotic invasive plants that are particularly damaging to coastal dune habitats, including several ice plant species (*Carpobrotus* spp., *Mesembryanthemum* spp.), European sea rocket (*Cakile maritima*), onionweed (*Asphodelus fistulosus*) and giant

reed (*Arundo donax*). As of 2011, approximately 200 acres of coastal dune/beach habitat has been initially treated along 5 miles of Camp Pendleton's coastline. An annual maintenance program was initiated in 2011 to re-treat sites that have already undergone initial treatments.

4.4.1.4. Erosion and Sediment Control

Goal: Conserve soil resources which support the training landscape and their ecosystems; comply with regulatory framework.

Objective: Strategic erosion control will maximize the capability of the landscape to support military training and sensitive habitats.

Erosion and sedimentation are typically naturally-occurring processes caused by the actions of wind, water and gravity, which can also be accelerated due to unnatural disturbances. Sedimentation is the process of soil particles settling out of suspension in a water flow (e.g., stream and run-off) and accumulating. Pollutants can be attached to sediment and transported into surface waters. The purpose of sediment control is to catch sediment *before* it reaches waters of the U.S. Training and construction activities near surface waters have the potential to cause water pollution or stream degradation, if the proper erosion and sediment control measures are not implemented. There are several different areas where erosion and sediment control techniques have been or are being researched and implemented on Camp Pendleton. These areas include (but are not limited to) construction sites, agricultural zones, natural landscape features (e.g., coastal bluffs), wildfire footprints, and fire/fuel breaks.

Erosion can limit the training capacity of the Base by reducing access in training areas, creating unsafe conditions for users of the Base, or threatening infrastructure stability. Additionally, federal landowners are required to control and prevent erosion by conducting surveys and implementing conservation measures (Soil Conservation Act PL 74-46; 16 USC S.5901). This includes both point source (originating from a single location such as a culvert or gully) and non-point source (originating from a dispersed area such as a barren slope), especially that which may affect water quality MCO 5090.2A states:

“The Marine Corps will support and accelerate the development and implementation of non-point source pollution management programs that ensure water quality protection. The Marine Corps will place a special emphasis on preventing non-point source pollution from ground disturbing actions (e.g., construction, military training, farming, and natural resources management). The Marine Corps will manage its land to control and prevent soil erosion and to preserve natural resources by conducting surveys and implementing soil conservation measures. Altered or degraded landscapes and associated habitats are to be restored and rehabilitated whenever practicable.”

As noted above, Marine Corps stewardship responsibility includes the prevention of soil erosion and the restoration of eroded sites where possible. To meet these requirements, Camp Pendleton has established a program of applied research to identify locations, causes and magnitudes of erosion on the installation. From this foundation, various strategies and

BMPs are being implemented and refined to develop the most effective long-term management program.

Camp Pendleton's 1988 Soil Erosion Inventory (Kellogg and Kellogg 1988) concluded that roughly 39% of sheet and rill erosion on the Base was due to natural causes, and 61% was accelerated by human activities. Of the accelerated erosion, 84% was estimated to result from excessive fire frequency, 12% from firebreaks, 4% from unpaved roads and trails, and minor amounts from other sources. Due to the high percentage of accelerated erosion resulting from excessive fire frequency on Base, fire mapping and communication with the fire department are essential. Fire mapping plays a vital role in documenting the fire data over time and to more efficiently plan erosion control techniques. Additionally, surveys are conducted following wildfires (e.g., along steep slopes) to determine where and when to apply erosion control efforts.

Wildland fire contributes to erosion as the vegetative cover stabilizing soil is temporarily removed from the surface. In scrublands with fires too frequently, sites may lose their resiliency to fire's cumulative effects namely loss of topsoil, soil moisture, rooting crowns, and seed bank storage, thus promoting the competitive advantage of plants adapted to short fire cycles. This may result in long-term conversion of native shrub communities to annual grassland communities. As noted above, soil erosion after wildland fires is believed to be the largest source of sedimentation on Camp Pendleton primarily because burning periodically eliminates plant litter and canopy cover, the primary features that protect the soil from the direct impact of raindrops.

In 1990, Camp Pendleton began a systematic review of training lands to identify locations on Base experiencing erosion. Since then, the Base has expended substantial time, effort, and funds in an attempt to adequately identify, monitor, and address erosion problems Basewide. As part of its commitment to managing natural resources and as partial compensation for temporary impacts incurred from training and other activities across the Base, Camp Pendleton developed a Soil Erosion Management Practice Handbook in 2000. It provided a standardized approach to soil erosion prevention and control at MCB Camp Pendleton. Existing erosion sites were categorized and prioritized. The handbook also provided a consistent process to prioritize future sites, along with an approach to track erosion control projects and evaluate new erosion control methods. Likewise, it determined the BMPs and the conditions under which to use them to minimize soil loss or potential for future losses.

The prioritization process developed in the Soil Erosion Management Practice Handbook was upgraded with a database implemented in 1997, based on field datasheets to prioritize limited resources and focus on areas/sites where erosion repair was feasible. In 2005, the database was further upgraded into an electronic geodatabase complete with photo hyperlinks and a basewide map booklet. Field inventories and the database have identified and helped to prioritize locations where existing and potential erosion problems exist. At present, erosion and sediment control activities are focused on specific sites based on criteria such as proximity to training, transit routes and Waters of the U.S. Other factors that are considered include:

- Safety, such as for emergency or military vehicle access on secondary roads.
- Potential impacts on high-value facilities or crucial training areas.
- Likelihood of sediment entering a jurisdictional wetland, or impacting an identified species or significant cultural resources.
- Volume of potential soil loss.
- Cost-effectiveness of the control measure.

To demonstrate the diversity of erosion projects on Base, below are summaries of four erosion control projects initiated in 2005:

- Rehabilitation of highly traveled, heavily eroded slopes in the Red Beach Training Area to enable Marines to utilize the area more fully again and also decrease sedimentation onto the beach. Approximate costs were \$200,000.
- Implementation of required erosion prevention BMP designs (i.e., water bars, swales and detention basins) on five distinct sites on an India training area firebreak that provide firebreak maintenance personnel an opportunity to see exactly how these BMPs should be constructed (e.g., size, angles, locations, etc.), in relation to the landscape and critical intersections with Waters of the U.S. Approximate costs were \$120,000.
- Restoration of a severely eroded coastal bluff location in beach Section F. This bluff protects an important stretch of coastal mesa that has not been intruded upon by multiple canyons and gullies typical along the coastline. Due to the quantities of rain in 2005 and a poorly engineered drainage outlet system, a major head-cut occurred which threatened to continue to expand if not addressed. Approximate costs were \$125,000.
- Erosion and sedimentation reduction into Waters of the U.S. by incorporating a new “hybrid” firebreak design based on varied treatments within firebreak widths. With the consent of the fire department, certain firebreak widths are now being maintained by a combination of disking and mowing. Where in the past, these particular breaks were disked or dozed the entire width (some as wide as 280 feet) causing sedimentation into Pilgrim Creek and other tributaries. They are now being treated in the following pattern from the center line out: 0–40 feet disked; 40–80 feet seeded with low growing native forbs and grasses and maintained by mowing at a 2” to 4” height; and 80–120 feet seeded with native forbs and grasses (low fuel content species) and left undisturbed. Approximate costs were \$225,000.

Work was finalized for the soil stabilization designs of two widening canyons engulfing training roads in Oscar One and cost estimates were determined. Additional work was completed for understanding post-fire erosion dynamics within the Roblar 2 fire perimeter zone. Table 4-9 displays erosion control projects and their current status. Staff has been hired (i.e., erosion control specialist) to administer to current and ongoing projects.

Erosion of the sea cliffs, bluffs, and canyon heads along Camp Pendleton’s shoreline is catastrophic, episodic, site-specific, and directly related to prevailing meteorological conditions and in recent years, to anthropogenic alterations of natural drainage patterns (Kuhn 1999). To address the problem of erosion on Camp Pendleton along the San Onofre State Beach, Kuhn (1999) documented the landslide movement between old Highway 101

and the shoreline since 1980 and the storm water runoff effects as a result of natural and anthropogenic diversions such as roads, railroad installations, agricultural, military operations, fires, seismic activity, and high rainfall. This study provided confirmation of the natural aspect of the problem, and that it does not require human intervention.

TABLE 4-10. EROSION CONTROL PROJECTS SINCE 1997 CONDUCTED OR PROPOSED ON BASE

Date	Project	Location	Contractor	Ac	Status
2011	Emergency Erosion Control	Basewide	ACCI	TBD	Ongoing
2008	Emergency Hydroseed and Erosion Control	Basewide	ACCI	14	Completed
2008	Firebreak and Roads Erosion Control	LZ 53	ACCI	1.5	Completed
2008	Horno Fire: Firebreak BMPs	Romeo One/ Echo	ACCI	1.5	Completed
2008	Horno Fire: Aerial Hydroseeding/ Check Dams	Papa One	ACCI	120	Completed
2008	Training Lands Reclamation	Juliette	ACCI	8	Completed
2008	Emergency Erosion Control	Golf Course	ACCI	6	Completed
2008	Erosion Control for Coastal Canyons	Edson Range West Canyon	ACCI	1	Completed
2007	Emergency Hydroseeding and Erosion Control	Basewide	Innovative Enclosures	65	Completed
2006	Training Land Reclamation	White Beach	Habitat West/EDAW	5	Completed
2005	Erosion Control for Coastal Canyons	Beach Section F	Habitat West/EDAW	3	Completed
2005	Firebreak and Roads Erosion Control	Housing Firebreaks	Foothills Associates	45	Completed
2005	Training Lands Reclamation	Red Beach	Habitat West/EDAW	3	Completed
2004	Post Fire Stabilization and Monitoring	Gulf, Hotel Training	Jones and Stokes	5,756	Completed

Date	Project	Location	Contractor	Ac	Status
2004	Erosion Control for Coastal Canyons	Edson Ranges	EDAW	3	Completed
2004	Firebreak and Roads Erosion Control	India Training	Habitat West/EDAW	4	Completed
2003	San Onofre Firebreak	San Onofre Housing	EDAW	3.3	Completed
2002	Gavial Fire Project	Hotel Training	AMEC	8	Completed
1999	Training Lands Reclamation	SIAC	Innovative Enclosures		Completed
1999	Erosion Control for Coastal Canyons	Victor/ Red Beach/ Uniform	Resource Conservation District (RCD)		Completed
1998	Erosion Control Plan	Basewide	Tierra Data	N/A	Completed
1998	Erosion Control for Coastal Canyons	Coastal Canyons	RCD		Completed
1998	DZ Tank Park	DZ Tank Park	RCD		Completed
1998	Bluff Erosion Study	North of White Beach	Gerry Kuhn	N/A	Completed
1997	DZ Tank Park	DZ Tank Park	RCD		Completed

The new geodatabase will be used to compile available historical and current data for erosion mapping, project tracking and future management actions. The geodatabase and restoration projects of the Erosion and Sediment Control Program is expected to directly benefit natural resources through: 1) the reduction of soil erosion and subsequent sedimentation at adjacent habitats, streams, and drainages; 2) enhanced vegetative recovery on-site; 3) potential expansion of habitats for natives species; 4) exotic pest plant reduction and control; and 5) military training by returning training lands to useable conditions and reducing safety hazards. Part of the Erosion and Sediment Control Program emphasizes avoiding the creation of erosion problems through review of project plans (including prescribed burns) during the NEPA review process. This review determines if a project has the potential to create erosion problems during or after the project and provides direction to help prevent erosion problems (e.g., BMPs during construction and recommended prebuilt design changes to prevent post-project erosion).

Actions that support soil resources, ecosystems and military training aboard Camp Pendleton are listed below (see Appendix M for details on these actions).

- Training land reclamation.
- Erosion control for coastal canyons.
- Emergency erosion control.
- Firebreak and roads erosion control.

- Emergency hydroseeding and erosion control.

4.4.1.5. Fire Management

Goal: Maintain USMC mission-driven training needs while reducing ignitions/catastrophic wildfire and preventing CSS type conversions (aka Reduce Ignitions to Optimize Training [RIOT] – Wildland Fire Management).

Objective: Per Department of Defense Instruction 6055.06, Marine Corps Order P5090.2A, Base Order P111320.13, and the Sikes Act; the Base Fire Management Program is focused on achieving the USMC Mission while becoming a premier wildland fire management unit. The RIOT – Wildland Fire Management is driven by the Base Wildland Fire Management Plan, which was created, implemented and studied by the certified Base Wildland Fire Program Manager/Fire Ecologist.

Through the Base Fire Ecologist establishing RIOT precedence, warfare training will thrive and improve on fire safety, environmental security objectives will be met under federal compliance, and the longevity of military training will be secured by way of sustainable management practices. The overriding goal of fire management on Base is to: “protect life, property, and natural ecosystem functioning and diversity, while maximizing training opportunities and minimizing total cost (MCBCP 1998).” The Land Management Branch’s Fire Management program supports that goal. MCBCP has had an average of 300 fires per year since 1968, one of the highest ignition rates in the country (Tierra Data 2005). The high fire ignition frequency on Camp Pendleton (Munich 1983) likely represents the single greatest influence on natural resources on Base (MCBCP 1998). The frequency is influenced by three factors: 1) frequent ignition sources from weapons firing, explosions, and pyrotechnic devices; 2) biological and climatic conditions conducive to fire in the late summer and fall; and 3) large areas of open space with abundant vegetation.



FIGURE 4-9. BASE WILDFIRE
(PHOTO SOURCE: CAMP PENDLETON)

To address fire management issues, Base Order P11320.13D (*Fire Protection Regulations and Instructions*) was implemented in 1992. Subsequently, a Fire Management Plan was developed jointly with the USFWS (entitled *Wildland Fire Management Plan Update*, MCBCP 1998). The Fire Management Plan is based on the development, implementation, and oversight of a proactive strategy focused on valuation and prioritization of Base resources. The 1998 Fire Management Plan strategy seeks to balance military training

requirements, with protection of natural resources in combination with fiscal considerations; all of which optimizes military training for the short and long term. Marine Corps Order P5090.2A, c11, s2-04, ss3 drives Program Authority of the certified Base Fire Ecologist whose responsibilities include, but are not limited to, fireline resource advising, firebreak and prescription burn plans, fire ecology, and wildland fire contract management. All of which are job functions required to maintain a sustainable and fire safe military training base.

Ecological effects of a fire can vary greatly with vegetation type, topography, and weather, as these and other factors will determine the severity of the fire. Grass and forbs-dominated vegetation types will generally have the lowest fire severities, while open scrublands may have intermediate severity fires, and dense coastal sage scrub and chaparral will often have the highest severity fires (Tierra Data 2005).

A mission-driven Wildland Fire Mapping Project was established in 1997 to map the perimeter, acreage and burn severity for wildland fires on Base. Fires over 5 ac are mapped, recorded in GIS and added to the Base's fire geodatabase. Once completed, the Base Fire Ecologist analyzes the data and shapes the Base prescription burn (RXB) and firebreaks (FBX) plans using sound scientific assessment. Fire mapping is primarily conducted by contracted aerial photo flights. The digitized aerial photos are used to determine the perimeter of a fire in conjunction with fireline data collected by the Base Fire Ecologist. Fires occurring inside a restricted impact area are mapped using this same technique; GIS and high-resolution digital photos of the fire taken from low-flying aircraft within 21 days of the fire. Fire severity was based on the National Park Service (1992) definitions until mid-2005 when the estimates switched to the more-detailed severity matrix found in the National Park Service's Fire Monitoring Handbook 2003 (National Park Service 2003). The geodatabase and revised fire severity mapping methodology is used with upland vegetation maps to determine if type conversion is taking place as a result of repeat fires and invasive annual grass invasion. Periodic vegetation mapping every five years allows the LMB to look at changes in habitat/vegetation cover. In FY07, the LMB began funding a GIS analysis to determine if any CSS, chaparral, CSS/chaparral, and/or perennial grassland have been type converted to another community. This analysis will also provide valuable information concerning the California gnatcatcher which is closely associated with CSS habitat (Bieber pers. comm. 2007).



FIGURE 4-10. FIREFIGHTER HELICOPTER
(PHOTO SOURCE: USFS)

In 2006, 8,068 ac burned on Base: 3,702 ac were burned in wildfires, 2,074 ac were burned as prescribed fires, and 2,292 ac were burned within the central impact areas. All fires caused by accident were classified as “wildfires”, or as burns occurring entirely within the borders of central impact areas Whiskey, Zulu, and Quebec. Annual or perennial grassland accounted for 66% of the ac burned by wildfire, shrublands accounted for 19%, Oak woodlands 11% and all other vegetation 4% (ITS 2007). Ninety-six percent (96%) of the wildfires in 2006 were classified as lightly or moderately burned. Such a high fire frequency precludes the buildup of heavy, woody fuels. Most fires burned over large grassy areas, where fuels were relatively light and often stopped at the interface between grassland and shrubland. Comparison of the 2005 data with previous years’ data (other than total ac burned) is difficult due to change in methodologies. Also, in contrast to 2005, the main method of data collection in 2006 was via aerial photography. Currently, an improved LTETM is being developed to establish which attributes to track in each vegetation community, and determine a health indicator. The LMB is also developing a “trigger” or threshold for when management action is required. At present, the Base is committed to maintaining its “regional commitment” of baseline occupied habitats (Bieber pers. comm. 2007). However, management considerations will be modified as necessary to reduce conversion where it is possible (outside of impact areas) and protect vegetation types in high fire-incidence areas. This will entail closer monitoring and greater communication with personnel responsible for operations and training activities and the Base Fire Department.

Table 4-11 summarizes the known fire history of the Base. An analysis of ignition sources was also compiled from fire department incident records between the years 1986-1988. These data revealed that fires can occur throughout the year on Base and that the large majority of fires are caused by training activities. Table 4-12 summarizes Wildfires, Wildland Fire Implementations (WFI), and Prescribed Burns (RXB) for each year. From

2009 on, the fires that occurred within impact areas are included within the Wildland Fire/WFI/RXB analysis, and all fires (not just greater than 5 ac) are captured in the records. However, the number of fires alone can be misleading because the Base has actually seen a drop in the number of fires and size of fires over the past 40 years due to increased fire management support; the number of fires reported is only rising due to advanced fire data collection methods recently implemented (Goodman pers. comm. 2011).

TABLE 4-11. DOCUMENTED FIRE HISTORY ON CAMP PENDLETON, 1968 – 2010

Year	Total Acreage^c	Total Number of Fires
1968	26,545	348
1969	15,364	445
1970	11,106	419
1971	15,662	342
1972	4,524	270
1973	4,562	322
1974	13,358	Not Recorded
1975	41,422	Not Recorded
1976	11,053	Not Recorded
1977	7,592	308
1978	11,637	312
1979	29,670	382
1980	8,503	Not Recorded
1981	21,439	Not Recorded
1982	9,661	Not Recorded
1983	10,769	Not Recorded
1984	8,231	325
1985	14,067	Not Recorded
1986	8,260	300
1987	4,973	316
1988	12,438	371
1989	20,621	440
1990	23,582	312
1991 ^a	6,387	287
1992	15,871	211
1993 ^b	4,515	159
1994	7,051	241
1995	6,062	247
1996	9,020	199
1997	9,534	84
1998	8,670	47
1999	10,448	69

Year	Total Acreage ^c	Total Number of Fires
2000	4,712	30
2001	6,764	41
2002	5,934	25
2003	16,984	51
2004	8,163	39
2005	16,357	61
2006	8,068	30
2007	21,926	57
2008	13,653	30
2009	12,879	85
2010 ^d	10,771	126

^a Most of Camp Pendleton's Marines deployed to Gulf War.

^b Commencement of Fire Danger Rating System.

^c Control burns not included except where they may have been interpreted as wildfires in cases where satellite imagery was used and burns under 5 ac not included.
Sources for fire history data at Camp Pendleton: 1968-1996 (MCBC 1998a), 1997-1999 (MCBCP 2002a), 2000 (Tierra Data Systems 2001a), 2001 (Tierra Data Systems 2002), 2002 (Tierra Data Systems 2003a), 2003 (Tierra Data Systems 2004), 2004 (Tierra Data Systems 2005), 2005 (ITS 2006) 2006 (ITS 2007), 2007 (ITS 2007), 2008 (Apex Consulting 2009a), and 2009 (Apex Consulting 2010a).

^d Goodman pers. comm. 2011

TABLE 4-12. PRESCRIBED BURNS, WILDFIRES, AND FIRES INSIDE IMPACT AREAS ON MCB CAMP PENDLETON, 1997 – 2010

Year	Fire Type	Number of Fires	Ac
1997	Wildfire (≥5 ac)	40	3,477
	Prescribed (RXB)	17	3,226
	Impact Area	27	2,831
Total		84	9,534
1998	Wildfire (≥5 ac)	23	2,768
	RXB	10	4,029
	Impact Area	14	1,873
Total		47	8,670
1999	Wildfire (≥5 ac)	27	3,049
	RXB	19	4,140
	Impact Area	23	3,259
Total		69	10,448
2000	Wildfire (≥5 ac)	5	355
	RXB	15	3,521
	Impact Area	10	836
Total		30	4,712
2001	Wildfire (≥5 ac)	6	519
	RXB	14	4,682
	Impact Area	21	1,563
Total		41	6,764

Year	Fire Type	Number of Fires	Ac
2002	Wildfire (≥ 5 ac)	11	3,575
	RXB	4	1,380
	Impact Area	5	979
Total		25	5,934
2003	Wildfire (≥ 5 ac)	21	2,717
	RXB	13	2,260
	Impact Area	17	12,007
Total		51	16,984
2004	Wildfire (≥ 5 ac)	4	3,475
	RXB	12	1,173
	Impact Area	23	3,515
Total		39	8,163
2005	Wildfire (≥ 5 ac)	31	8381
	RXB	9	3066
	Impact Area	21	4910
Total		61	16,357
2006	Wildfire (≥ 5 ac)	18	3702
	RXB	5	2074
	Impact Area	7	2292
Total		30	8,068
2007	Wildfire (≥ 5 ac)	39	18,634
	RXB	5	794
	Impact Area	6	2,498
Total		50	21,926
2008	Wildfire (≥ 5 ac)	25	12,600
	RXB	5	1,052
Total		30	13,652
2009	Wildfire/WFI	81	10,554
	RXB	4	2,325
Total		85	12,879
2010	Wildfire/WFI	118	9,284
	RXB	8	1,487
Total		126	10,771

Sources for fire history data at Camp Pendleton: 1997-1999 (MCB Camp Pendleton 2002), 2000 (Tierra Data Systems 2001a), 2001 (Tierra Data Systems 2002), 2002 (Tierra Data Systems 2003a), 2003 (Tierra Data Systems 2004), 2004 (Tierra Data Systems 2005), 2005 (ITS 2006), 2006 (ITS 2007), 2007 (ITS 2007), 2008 (Apex Consulting 2009a), 2009 (Apex Consulting 2010a), and 2010 (Goodman pers. comm. 2011).

Camp Pendleton’s Fire Department and the Base Fire Ecologist are actively engaged in regional planning and partnering to the mutual benefit of the Base and local, regional, and national agencies. In addition to providing personnel and equipment to assist in emergency wildfires throughout the region, fire department staff regularly provides professional expertise in fire management planning and in personnel training. The following examples highlight some of the ways in which the Camp Pendleton Fire Department has contributed to or is involved in local, regional, and national partnering efforts:

- Federal Wildland Fire Policy Review Working Group and the National Wildfire Coordinating Group. Camp Pendleton's Fire Chief acts as the DoD representative to the Federal Wildland Fire Policy Review Working Group and the National Wildfire Coordinating Group, which were established to develop and implement fire management policy for use on all federal lands.
- Wildland Fire Suppression Training Support. Camp Pendleton's Fire Department annually hosts two weeks of wildland fire suppression training for USFS personnel and all other regional cooperating agencies.
- Wildland Fire Suppression Mutual Aid Agreements. Camp Pendleton's Fire Department provides personnel and equipment, as available, as part of mutual aid agreements with local, regional and national with members, as part of Interagency Incident Management Teams. Camp Pendleton's Fire Chief was an Incident Commander in the Los Alamos, New Mexico fire (*Cerro Grande Incident*) during May and June 2000.
- Camp Pendleton's Fire Management Plan. Camp Pendleton's Fire Management Plan was developed in cooperation with the USFWS and is being viewed by several DoD installations and National Forests as a potential regional model.
- Naval Weapons Station Fire Management Plan. Camp Pendleton's Fire Department assisted Naval Weapons Station, Seal Beach Annex personnel (and their contractors) in development of a Fire Management Plan that is complementary to Camp Pendleton's new Fire Management Plan and strategy.
- Santa Ana Mountains Fire Alliance and the San Diego County Fire Safe Council. Camp Pendleton's Fire Department is a member of the Santa Ana Mountains Fire Alliance and the San Diego County Fire Safe Council.
- San Diego County Fire Service Working Groups. Camp Pendleton's Fire Department personnel are active around San Diego County in several fire service working groups to help ensure the availability of, and ready access to, up-to-date information on fire incidents and fire-related land management issues on Base.
- Regional Fuels Management and Fire Resource Allocation Planning. Camp Pendleton's Fire Department is working with the Cleveland National Forest and Orange County Fire Authority on fire management issues that integrate both fuels management and fire resource allocation planning.
- Fire Department Local Mutual Aid Memorandum of Understanding. Camp Pendleton's Fire Department has established an MOU with all fire agencies in San Diego County, the Orange County Fire Authority, the California Department of Forestry & Fire Protection, USFS, SONGS, Caltrans, and California Highway Patrol, for providing mutual aid, when requested.
- Fire Management Equipment Field Testing and Evaluation. Camp Pendleton lands have been instrumental in the testing and development of the utility and applicability of Type-1 Helicopters (large Heli-tankers) as an initial attack resource on wildfires. The first Type-1 initial attack Helicopters were stationed and tested for three years at Camp Pendleton. Ultimately, results of this research led to the placement of initial attack Type-1 helicopters throughout southern California. Also Camp Pendleton's Fire Department, in conjunction with the program sponsor, California's Department of Forestry and Fire Protection, hosted and coordinated

research and development of the “*Operation Fire Stop II*” project. This joint effort was designed and initiated to test and evaluate new, 21st century wildfire fighting equipment.

PRE-SUPPRESSION

Natural conditions that lead to high fire frequencies on Base cannot be eliminated. Therefore, pre-suppression measures are an essential mission support component of the Fire Management Program. Pre-fire measures include the implementation of the Fire Danger Rating System, scientifically determined from the fire behavior triangle (fuels, weather and topography), maintenance of defensible space, firebreaks (FBXs) and access roads, and qualified application of the MCB Camp Pendleton prescription fire burn plans (RXBs).

The Fire Danger Rating System consists of a color-coded notification system that indicates the fire danger level and programmatic instructions that identify restrictions on activities with fire-generating potential (Table 4-13). Fire danger ratings are established daily from a combination of weather data, fuel moisture, fuel load, Base activity level, and fire fighting resource availability (ratings may be further adjusted within a given locality for the added protection of the natural resources present). Fire hazard conditions are monitored throughout the day by the Base’s Fire Department, in cooperation with Environmental Security Fire Management, Range Control, and through intermittent range inspections.

The 2005 Annual Fire Frequency and Mapping Report (ITS 2006) shows that ignitions were most frequent during the dry summer months and the relatively infrequent during periods of extreme fire danger, when the FDR imposes the most stringent restrictions on use of heat or flame producing devices. The threat of wildland Fire Ignition is directly related to the type of military training conducted at any given moment, the threat of Catastrophic Wildfire is linked to the ignition plus natural resource conditions (Goodman pers. comm. 2011).

An essential component of fire prevention on Base is fuels management. The management of fuels can help prevent, as well as assist in, the control of fires that do start. Pre-suppression fuels management involves the maintenance of defensible space, firebreaks and fuel breaks to limit or slow the spread of fire. The Base has established an extensive current network of 76 firebreaks and 22 fuelbreaks, totaling nearly 1,636 ac over approximately 187 linear miles. Firebreak locations and requirements are periodically reviewed and are eliminated from the network if considered unnecessary by the Camp Pendleton Fire Department. The LMB monitors the firebreak system closely and makes recommendations to the fire department concerning firebreak compliance and status. Reference the 2010 Annual Report: Mission Driven Wildland Fire Mapping Project (MCBCP 2011b) which was composed and approved by AC/S Environmental Security Fire Management in support of the Camp Pendleton Fire Department (CPFD) compliance. By 2005, 24 firebreaks had been taken out of the original firebreak network and restored with native vegetation. All requirements for new firebreaks are reviewed through the NEPA process before they can be constructed on Base.

TABLE 4-13. FIRE DANGER RATING SYSTEM

Fire Danger Rating	Caution to be Exercised	Necessary Precautions	Hazard
BLUE 0-30	Use normal caution.	Any type of ammunition may be used with care. Smoking is permitted.	LOW
GREEN 31-40	Use normal caution. Fires will start very easily.	Any type of ammunition may be used with care. Smoking is permitted.	MODERATE
YELLOW 41-60	Use extra caution. Fires will start very easily.	Yellow is the beginning of the high danger period. Any type of ammunition may be used on ranges and within impact areas. Smoking is permitted only in cleared areas or on firebreaks. The use of pyrotechnics, demolitions, and heat/flame producing devices within maneuver areas will be limited as much as possible to cleared areas or areas previously burned for that purpose.	HIGH
ORANGE 61-80	Use extreme caution. Fires are very hard to control.	Firing will be permitted at all times on all ranges and within impact areas, unless restricted by the Impact Area Control Officer. Minimal use of pyrotechnics, demolitions, and heat/flame producing devices, including blanks, is allowed within maneuver areas; however, their use is restricted to cleared or previously burned areas only. Smoking is permitted only in cleared areas and on firebreaks.	VERY HIGH
RED 81-100	Flash condition. This is the highest class of fire danger. Fires started are practically impossible to extinguish and usually continue until danger rating conditions improve or they burn themselves out. The utmost caution must be exercised at all times with fire producing agents and devices.	The firing of high explosives, pyrotechnics, incendiaries, or other ammunition likely to cause fires is prohibited unless specifically authorized by the Base Training Facility Officer. Authorized firing units will be advised as to the status of the range or impact area in question by the Impact Area Control Officer should a change in the fire danger rating occur. The Fire Chief can authorize keeping the lower elevation training areas open because of the cooling effect of fog. If kept open, the Fire Chief will enhance Initial Attack capabilities to the area in the event of a wildland fire. Firing units will exercise maximum attention to the observance of range fans and other pertinent precautions to prevent fires of any nature from starting. Smoking will be permitted only under strictly supervised conditions and in fire-safe areas. The use of any type of training/live ordnance, heat or flame producing devices (heaters, welders, stoves, or open fires) in maneuver areas is strictly	EXTREME ^a

prohibited.

- ^a These ranges are closed during extreme rating: Door Gunner 2, 401 Impact Area. These training areas are closed during extreme rating: Juliett, Lima, Hotel, Golf, Romeo One, Alfa Three, Bravo One, Bravo Two, Yankee, Charlie, Delta, Echo, Foxtrot, India, East of India Firebreak and North of West/East Firebreak.

Another important pre-suppression fuels management measure involves the use of prescription burns. The fire department submits an annual burn plan, in coordination with ES Fire Management (which includes all hazard reduction burns) for review through the NEPA process and by the Natural Resources Department and Air Quality Branch to ensure that these pre-suppression fire management actions are consistent with natural resources management goals and the San Diego County Air Pollution Control District's Smoke Management Program. All prescription fire burns, hazard reduction, environmental, and training burns are coordinated with and permitted by the San Diego County Air Pollution Control District. Table 4-12 lists data on Camp Pendleton prescribed burns (MCBCP 2011b).

FIRE SUPPRESSION

Fire suppression occurs throughout the Base as needed, mostly from the months of May to November. Fire suppression activities include: fire line construction, backfires, direct suppression, and "mop-up" activities. Where possible, fire vehicles use existing roads or firebreaks; however, suppression actions may include driving off road, including over burned areas. Past fire patterns indicate the location of the majority of the fire suppression activity on Base. Due to the frequency of these fires and subsequent suppression activities, it is required that the Base Fire Ecologist, as a qualified Wildland Firefighter and Ecologist actively collaborates with operational firefighting forces on scene to safely and effectively control the fire (concentrating on the Marine Corps mission, natural resource/environmental objectives, and Fire Department Minimum Impact Suppression Tactics) as driven by the Base fire management plan, Base Order, Marine Corps Order, and DoD Instruction previously outlined.

In many cases, existing paved and dirt roadways can be used as firebreak lines to contain a wildland fire. The location of vulnerable habitats or listed species is considered when carrying out all forms of fire suppression actions, especially if an area is to be bulldozed or hand-cut for a fire line. Personnel from the fire department collaborate with the Resources Management Division, Base Fire Ecologist –when regulated natural resources (as shown on the Base Environmental Operations Map) may be affected by suppression activities. The Base Fire Ecologist responds to such calls and provides guidance to the Incident Commander on avoidance and minimization of impacts to identified natural resources. Fires of five ac or larger are mapped for historical reference. As of 2010, all Points of Ignition are also determined and mapped by the Base Fire Ecologist; completing and intricate piece to the RIOT Wildland Fire management Program.

Fire suppression is conducted on Base using in-house resources with additional cooperative support from local and regional firefighting agencies. In-house firefighting resources include 10 standard wildland firefighting vehicles (5-ton, 6-wheel drive), 10 light attack vehicles (High Mobility Multipurpose Wheeled Vehicle [HMMWV] and/or 4-wheel-drive

pickup trucks mounted with water tanks), 2 water tenders (10-ton, 6-wheel drive), and 4 D-8 or equivalent military bulldozers. Cooperative resources include air tankers, helicopters, hand crews, engines, and bulldozers.

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

In addition, the Base utilizes air support firefighting resources when necessary. While very effective, such resources are also very costly. As a result, they are requested only when the resource being protected justifies the cost. Primarily, they are requested when there is a high risk that the wildland fire might burn outside the Base boundary.

POST-FIRE SUPPRESSION

Post-Fire Suppression (rehabilitation) actions may include, but are not limited to: erosion control, restoring temporary firebreaks created while suppressing the fire, exotic vegetation control, and increased protection of the site via revised Programmatic Instructions and/or restrictions on use of the area. Post-suppression fire management actions generally occur where a fire has burned occupied federally listed threatened or endangered species habitat or where erosion may cause mass wasting or sedimentation into Waters of the U.S. These activities are implemented to reduce or eliminate potential long-term negative effects of fire and are intended to reduce the effects of direct and indirect suppression actions.

Post-fire activities (e.g., reseeded) occur under limited conditions, as determined by the Land Management Branch. For example, seeding takes place only at sites where erosion or loss of vegetation cover is caused by human activities or where exotic/weedy vegetation existed before. Examples of post-fire reseeded with native seed stock include locations known as Chappo and Gavilan. Chappo included an area of approximately 4.2 ac hand-seeded with a mix of native shrubs, grasses and forbs. Monitoring for the re-establishment of native species was carried out, and it was apparent that the exotic annual grasses were out-competing the natives. In the Gavilan area, there were 9 eroded sites where re-vegetation measures were applied (totaling approximately 3 ac). Some of the species used for erosion control in these areas (depending on site characteristics) included: California sagebrush, deerweed, purple needlegrass, white sage, California buckwheat, California poppy, etc. (Note: Roblar 2 was an additional post-fire area designated for native re-seeding; however, it was later determined unnecessary).

Actions that support the Fire Management Program aboard Camp Pendleton are listed below (see Appendix M for details on these actions).

1. Post Fire Restoration.
2. Wildfire Sediment Monitoring per CWA.
3. Wildfire Fuel Loading Evaluation.
4. Post Wildfire Erosion Monitoring.
5. Post Wildfire Erosion Control per CWA.

6. Mission Driven Wildland Fire Mapping.
7. Wildland Fire Management Plan (WFMP).
8. Wildland Fire Management Plan Implementation.
9. Post Wildland Fire Endangered Species Habitat Recovery.
10. Prescription Burns Enhancing Endangered Species Habitat.
11. Catastrophic Wildfire Stabilization.
12. Post Wildfire Exotic Plant Control.
13. Wildland Fire Management Decision Support Tool.
14. Fire Danger Fuel Moisture Analysis.
15. Environmental/Wildland Fire Crew.
16. Wildfire Informational Brochures.

4.4.2. Mission and Project Support

The LMB provides Mission Support for training and the training mission of the Base. The LMB supports the military mission of the Base by assisting Base operators' understanding and compliance with applicable laws and regulations. It provides input and assistance in the NEPA process to assist Base actions in minimizing impacts to natural resources. It also ensures scientifically sound species and ecosystem data is on-hand to support activities and consultations. The Mission and Project Support Program is organized into three elements. These Elements are: 1) Regulatory Compliance and NEPA Review; 2) Mitigation Tracking; and 3) Personnel. These elements are detailed in the following sections and identify Element Objectives and Actions planned to meet the Goals and Objectives of this Program.

4.4.2.1. Regulatory Compliance and NEPA Review

Goal: Timely processing and support of mission-driven requirements that integrate essential requirements of applicable laws, regulations and EOs.

Objective: Provide thorough review and prompt staffing/turnaround of CX, EA and EIS documents that guide all projects to comply with all laws, regulations and management programs, and will apply sound resource management.

Similar to the Wildlife Management Branch NEPA Support Element (Section 4.3.1.3), the LMB reviews all proposed projects via the NEPA process to determine if those projects are in compliance with laws, regulations and Base management programs for which the LMB provides oversight. The function of the Regulatory Compliance and NEPA Review element of the Mission Support program is to engage land management specialists where appropriate, and provide technical assistance to project proponents, throughout the NEPA process. During the review of proposed projects, land management specialists: 1) identify potential effects of the proposed action; 2) identify less-damaging alternatives; 3) ensure that BMPs and adequate mitigation is planned; 4) assess the level of regulatory interface required; 5) assess consistency with natural resources management goals, objectives, BOs and conservation programs; and 6) obtain required permits (primarily CWA Sections 401 and 404 permits).

As part of this element, the LMB also reviews projects for applicability and conformance with their other management programs identified in Sections 4.4.1 and 4.4.3. The LMB reviews projects for, provides oversight and/or coordinates compliance with the following laws, regulations and EOs:

- ESA (plants and two vernal pool fairy shrimp species).
- CWA, Sections 401 and 404.
- Rivers and Clean Harbors Act.
- EO 11988 Floodplain Management.
- Soil and Water Conservation Act (16 U.S.C. 2001-2009).
- Watershed Protection and Floodplain Prevention Act (16 U.S.C. 1001-1009).
- EO 11987 Exotic Organisms.
- EO 13112 Invasive Species.

As regulated by the CWA of 1972, the LMB staff follows the 404 permitting process through the USACE for all projects that have the potential to discharge fill or dredge materials into Waters of the U.S., including jurisdictional wetlands. In addition, the LMB staff applies for the 401 certification from the local RWQCB to validate the 404 permit.

The LMB also reviews all wetland and jurisdictional delineations performed on Base before submission to the USACE, and is the lead for any communication with the USACE regarding CWA 404 issues.

ESA compliance and management is accomplished through implementation of the Base's three Ecosystem Conservation Plans (Appendices B, C and D) and their BOs. These Plans are designed to maintain and enhance the biological diversity of their ecosystems on Camp Pendleton. The conceptual approach behind these conservation plans is to sustain and restore ecosystem dynamics, so that natural plant and animal communities on the Base are sufficiently resilient to coexist with current and future military training activities. The success of these plans is measured primarily by the species richness and an increase in ecosystem health and value.

Actions that support the LMB's Regulatory Compliance and NEPA Review aboard Camp Pendleton are listed below (see Appendix M for details on these actions).

- Red Beach wetlands delineation.
- Wetlands restoration/mitigation project.
- Survey wetland restoration/mitigation potential.
- SMR/SMC groundwater drawdown analysis.

4.4.2.2. Mitigation Implementation/Tracking

Goal: Follow through with permit requirements (ACOE & USFWS) as scheduled and required.

Objective: Improve successful completion of restoration projects.

This element oversees and tracks habitat restoration, mitigation and compensation efforts for projects where permit requirements, mitigation, and compensation are initially funded by a project proponent for specific projects such as MILCON projects, local construction projects, infrastructure maintenance and training projects or exercises. Habitat restoration efforts performed as part of the Base's stewardship are conducted as part of the Land Management Branch's Sustainable Ecosystem Management Program's (Section 4.4.1.). Habitat restoration may be required as a condition of obtaining a permit, or as mitigation or compensation to offset temporary or permanent impacts or loss of habitat from an USACE Permit, BO or NEPA document.

Specific habitat restoration requirements and success criteria are identified from Permits, BOs and/or NEPA documents. These habitat restoration efforts are tracked to ensure annual success criteria are being met and meetings are held with project sponsors to develop corrective action, if monitoring indicates annual or final success criteria are not being or may not be met. At the end of the project funding (normally five years for MILCON), conditions are compared to desired results. If restoration results identified in the Permit, BO and/or NEPA document have not been achieved, the responsibility for the restoration effort (and funding requirement) is assumed by, and continued by the LMB until the success criteria are met. Habitat restoration, mitigation and compensation requirements for non-Camp Pendleton projects remain the responsibility of the project proponent until successfully completed. Projects are cross-tracked by project and vegetation community (Riparian, Wetland, and Upland), for further control and integration with stewardship projects and programs identified in Sections 4.4.1. and 4.4.3.

The LMB manages the two forms of required mitigation tracking for riparian areas. First, mitigation ratios are determined by an accounting of acres for specific riparian vegetation series documented every two years (see also Section 4.4.1.2. Ecosystem Mapping and Monitoring). Second, mitigation needs determined by the Wildlife Management Branch Formal and/or Informal Consultations or USACE permits are deducted from an established riparian invasive weed bank (see Section 4.4.1.3.).

To determine mitigation ratios, the LMB develops an orthorectified infrared aerial photograph at a 1:12,000 scale and maps the riparian vegetation series as outlined in the Riparian BO. Mapping methodologies have been standardized to reduce false habitat changes attributed to mapping errors. Every two years the process is repeated and a habitat change analysis is conducted. The resulting acreages are then added to the formula that determines mitigation ratios.

The riparian invasive weed bank is developed primarily through intensive exotic vegetation removal and used as compensation for permanent and temporary impacts to riparian vegetation. The habitat bank balance is divided into assigned and unassigned acreages. At present, 407 ac of riparian area have been treated, with 242 assigned to mitigation projects, and 165 unassigned acreages. An additional 110 ac of restored riparian habitat is anticipated to be added to the bank in 2013, and another 120 ac is anticipated to be added in 2015. See Section 4.4.1.3. Invasive Weed Control, for a more complete discussion of the treatment methodologies.

Upland habitat restoration mitigation requirements for project impacts are established on a project-specific basis, in coordination with the USFWS. Active habitat restoration mitigation projects currently underway are shown in Table 4-14.

Listed below are Actions that support Mitigation Tracking and Management aboard Camp Pendleton (see Appendix M for more details on these actions).

- USACE, RWQB, ESA mitigation tracking.
- Riparian BO habitat monitoring.

TABLE 4-14. ACTIVE HABITAT RESTORATION PROJECTS

PROJECT	TYPE OF MITIGATION	AC	START DATE	STATUS
P-527B Santa Margarita Sewage Alignment	CSS Restoration (Permanent)	60	2000	Ongoing
	CSS Temporary Impacts	5		
P-046 Northern Power Distribution System	CSS Restoration	0.22	2001	Ongoing
	SKR Management Area Expansion (1.7Ac=Bank)	28.7	2001	Ongoing
P-010 Levee	CSS Restoration	1.22 / 2.08		
	Riparian Bank Deduction	181.66	1997, 1999	Completed
HOLF	Grassland Restoration	60	2000	Completed/Failed
	Grassland Restoration (New Project)	60	2006	Ongoing
	CSS Restoration	14.92	2002	Ongoing
	CSS Restoration	24	2005	Ongoing
	Wetlands Restoration	5		
	Mulefat Scrub Restoration	4	2006	Ongoing
	Seep Restoration	2		
P-633 Infantry Squad Battle Course	Grassland/CSS Restoration (Combined Area)	53.75/0.5	2003	Ongoing
	River Channel Crossing Restoration		2003	Ongoing
	Riparian Restoration	0.116	2003	Ongoing
P-634 Armor/Anti-Armor Tracking Range	Oak Woodland Restoration	5	2003	Ongoing
	Vernal Pool Restoration			
	Grassland Restoration	25	2002	Ongoing
SEMPRA Pipeline (Kinder Morgan)	Riparian Restoration	2.2	2000	Completed
	Annual Grassland Restoration	33.5	2000	Completed
	Oak Woodland Restoration	0.76	2000	Completed
	Freshwater Marsh Restoration	0.68	2000	Completed
	Sycamore Grassland Restoration	0.7	2000	Completed
	CSS Restoration	11.2	2000	Completed
	Native Grassland Restoration	61.5	2000	Completed
	Brodiaea Filifolia Transplant	1	2000	Ongoing
VERTREP	CSS Restoration	5		

PROJECT	TYPE OF MITIGATION	AC	START DATE	STATUS
P-951 LCAC	(Phase I) Vernal Pool Mesa Conservation Plan	200	2000	Ongoing
	(Phase II) Implementation		2007	Ongoing
Wire Mountain	Vernal Pool Mesa Restoration	8	2000	Completed
	CSS Buffer	2	2000	Completed
P-071 Iron & Manganese Water Treatment Plant	California Sagebrush Series Restoration	0.33	2003	Ongoing
	Black Sage Series Restoration	0.23	2003	Ongoing
	IM plant consisting of Sumac Series Restoration	0.054	2003	Ongoing
	Mulefat Series w/ Black Sage Series Understory Restoration	0.13	2003	Ongoing
	Sumac Series Restoration	0.067	2003	Ongoing
De Luz Housing	CSS Restoration	8		Ongoing
P-218 CAL	CSS Restoration	6.21	2000	Ongoing
P-017 BEQ in San Mateo Area	CSS Restoration	0.5	2003	Ongoing
P-098 BEQ in San Mateo Area (#2)	CSS Restoration	1.89	2006	To be completed June 2008
San Mateo Creek Bridge	Wetland Restoration	1.765	2001	Completed
	CSS Restoration	0.05	2001	Completed
San Mateo Housing	Vernal Pool Mesa Restoration			Completed
San Mateo Creek	Creek Channel Restoration		2006	Ongoing
Talega Creek	Creek Channel Restoration		2006	Ongoing
Pio Pico Bank	CSS Restoration	20		Ongoing
Mass III Area	Vernal Pool Mesa Restoration		2003	Ongoing
Vernal Pool Group 68	Vernal Pool Mesa Restoration		2006	Not Started
BFOP (Vernal Pool Group 43)	Vernal Pool Mesa Restoration (Phase I)		2006	Ongoing
Dune Habitat Restoration #1	Dune Restoration		2004	Ongoing
Dune Habitat Restoration #2	Dune Restoration		2005	Ongoing

4.4.3. Agricultural and Other Multiple Use Lease Management

The LMB is responsible for overseeing seed collection permits. Agricultural leases were managed by the LMB until 2011, when the last remaining agricultural row crop lease on Base was terminated. The seed collection program is consistent with the multiple-use concept adopted by the Marine Corps for its lands. Camp Pendleton is able to benefit from the seed collection permits by way of income generated and by having quick access to native vegetation seed stock of local genotypes for restoration/soil stabilization activities.

Goal: Manage seed collection permits in support of sustained and multiple-use (including military training) of Base lands and to provide funding to support natural resource programs that protect ecosystems and enhance training lands (see Section 2.3.3.1.).

4.4.3.1. Seed Collection

Objective: Permit, oversee, and encourage seed collection procedures and activities that will provide a significant and sustainable source of native plant seed stock for the region, where such plant populations have been lost to urbanization.

The LMB provides oversight of the contractors who have been issued permits to harvest seeds from native plants on Base for commercial purposes. The permits are issued and maintained by the Real Estate Contracting Officer at the NAVFAC San Diego. The wide variety of plant communities and native plant species on Base provide stock for local native vegetation restoration programs and for ornamental landscaping. The seed collection permits provide a means for Base access to free seed on a large scale that can, in turn, be used to re-vegetate and enhance disturbed land on Camp Pendleton. The seed collection lessee provides field labor and storage services for the Base and is allowed to sell collected seed on a retail basis. The use of seeds collected on Base helps ensure a genetic stock that is adapted to the environmental conditions of the area and saves money spent on site restoration/soil stabilization.

Over 200 species on 76,550 ac are approved for harvest, but no more than 30% of the annual seed crop of a tree, brush, forb, or grass species in any individual location may be harvested each year. All seed harvesting is done by hand and/or with specialized hand-carried vacuum type devices. Mechanical harvesting is not allowed, nor is mechanical injury to plants. The harvesting of endangered, threatened, or proposed endangered and proposed threatened species is regulated by the USFWS by permit. Some native plant species are harvested from October to December, while other species are harvested between April and July. Because seed-collecting activity is conducted on foot, most locations on Base (excluding impact areas) are available for seed collection.

The LMB coordinates requests for seeds for Base restoration efforts. Additionally, the LMB coordinates access to training areas for seed collection. Improvements in oversight of the seed collection permit are planned for when additional branch personnel are obtained. These improvements will include tracking availability and quantity of seeds being held by the permit holder for Camp Pendleton's use and collected seed species amounts.

4.4.4. Outreach

In cooperation with the Wildlife Management Branch's Natural Resources Awareness Element (Section 4.3.8), the LMB staff conducts community education and outreach programs when feasible (for on-Base and off-Base residents) to ensure proper public environmental awareness and recognition of DoD stewardship. Educating Base residents, visitors, and the surrounding communities about Camp Pendleton's unique natural resources, stewardship initiatives, and contributions to regional conservation goals supports Camp Pendleton's commitment to environmental protection and preservation of its natural resources. The Education Program consists of two elements: 1) Internal Education and 2) External Education. These elements are detailed in the following sections and identify Element Goals, Objectives and Actions to be conducted in support of this program.

4.4.4.1. Internal Education

Goal: Improve natural resource awareness, compliance, and working relationships with other AC/Ss.

Objective: Use contract support to attend regular meetings with all AC/S environmental briefings.

LMB staff conducts frequent presentations on natural resources and Base management programs to a variety of on-Base personnel. LMB staff updates Base personnel during S-3/S-4 meetings, leads fieldtrips to observe wildlife, and discusses Base management programs. Awareness is also accomplished through interpretive signs and programs, nature trails, and viewing areas. Interpretive signs and programs provide an opportunity to communicate natural resource information and value to users and visitors of Camp Pendleton. Listed below are Actions that support Internal Education aboard Camp Pendleton (see Appendix M for more details on these actions).

- Develop interpretive facilities.
- Environmental education.
- Wire Mountain education outreach.
- Transportable exhibit.
- Invasive species posters and pamphlets.

4.4.4.2. External Education

Goal: Raise awareness of Camp Pendleton's natural resources management program successes and contribution to conservation of the resources entrusted to USMC stewardship.

Objective: Present papers, posters, articles, and briefings to appropriate venues, newspapers, and professional periodicals.

LMB staff also conducts frequent presentations on natural resources and Base management programs to a variety of off-Base groups such as conservation organizations, service groups and college classes. Base personnel also lead field trips for these groups to observe Base resources and discuss Base management programs. A series of five interpretive signs are located along I-5 at the north and southbound rest areas. Two of the five include information about plant species and their habitats that occur on Camp Pendleton. These signs were developed in coordination with Caltrans. The LMB requires most contractors to create poster sessions regarding their efforts on Base and present them at professional conferences/seminars as part of their contract for other programs and elements. Special interest areas, such as where military activities are highly visible along I-5 and historic sites, offer a setting for education and orientation of the public. Listed below are Actions that support External Outreach aboard Camp Pendleton (see Appendix M for more details on these actions).

- Highway pullout interpretive signs.
- Rare dune habitat exhibit.

- Reprint plant communities brochure.
- Regional data standards.

4.5. ENVIRONMENTAL PLANNING DIVISION

As previously noted in Section 4.2.1.2. of this chapter, the Environmental Planning Division provides procedural and technical advice, project planning, environmental review, mitigation development, operation and maintenance planning, and project implementation on both military and nonmilitary NEPA documentation for facility planning, construction plans, maintenance activities, military training operations, leases and other proposed actions that may affect natural and/or cultural resources.

Environmental planning and technical support for projects on Camp Pendleton are important for ensuring the sustainability of natural resources to support the military mission. The frequency, intensity, and variety of land uses that must occur on Base to train Marines and members/units of other Services and the number of Base organizations involved in land use decisions, require that environmental planning be comprehensive and integrated into the Base's broader land use planning structure and processes. Moreover, the environmental portion of the planning process requires compliance with multiple interrelated laws and regulations designed to ensure that federal agencies assess, in detail, the potential environmental impacts of their actions that could significantly affect the quality of the human environment. Camp Pendleton programs, plans (e.g., training management plans, master plans, and integrated pest management plans), and projects (e.g., construction of new ranges, roads, and buildings) must be implemented in compliance with natural resource laws and regulations, and integrate Base natural and cultural resources programs, plans and projects. Failure to anticipate environmental planning requirements can cause project delays that can be costly to the government, financially as well as in staff time and missed training opportunities. Environmental site review conducted late in the planning process, particularly due to endangered species and cultural resource mandates, can cause uncertainties and delays in project implementation. A review conducted early in the design and site selection process, on the other hand, can provide a positive and flexible tool rather than a negative one.

Goal: Integrate natural resource management requirements with infrastructure and operational mission master planning to minimize unnecessary and potential adverse impacts on future mission-driven projects and readiness activities.

Goal: Initiate NEPA and environmental planning early enough in the project planning process to avoid or minimize delays in the schedule of proposed actions.

Goal: Fully evaluate and document impacts of proposed actions and integrate mitigation requirements with existing environmental and natural resource programs.

Goal: Streamline EA procedures to provide wise and efficient expenditure of required resources (staff time and funds), timely turnaround of action sponsors' requests, and to enhance the mission-related use and stewardship of the Base's natural resources.

Environmental planning on Camp Pendleton occurs on different levels and scales (e.g., short-term, project-specific versus long-term, region-wide). Program or project-specific planning, which is relatively short-term, is typically integrated with natural and cultural resources management via the NEPA process. Camp Pendleton's NEPA process provides a mechanism to help ensure that adverse impacts from specific projects and actions are avoided or minimized and that planning efforts are consistent with natural resource laws and regulations and Camp Pendleton's ecosystem conservation plans. Camp Pendleton's NEPA process is instrumental to the successful integration of Base activities and programs. Initial planning stages of proposed actions must be integrated with the NEPA process "to ensure that planning and decisions reflect environmental values, to avoid delays later in the process, and to preclude potential conflicts (32 CFR CH 1, Part 188)."

Beyond project-specific planning, long-term/strategic and master planning help to guide natural resource and land use integration through time, ensuring that Base activities (including development projects, recreation programs, natural resources management initiatives, etc.) are consistent with natural resources management requirements, goals, and objectives, and that those goals and objectives are consistent with the military mission and ecosystem conservation plans. Long-range, strategic basewide planning provides an opportunity to evaluate the integration of, and consistency among, planned actions.

The Environmental Planning Division of AC/S ES administers the NEPA process for Camp Pendleton. This office ensures that NEPA compliance has been accomplished and that the appropriate level of documentation has been prepared for new projects or actions, and some continuing actions. The Environmental Planning Division coordinates natural resources management support of Base projects which includes: 1) coordination of and participation in the NEPA process (e.g., review of proposed projects) by staff biologists and planners, assistance in the development of alternatives that may avoid and minimize adverse impacts to natural resources and the environment; 2) verifying that required consultation with environmental regulatory agencies has been accomplished; 3) management and integration of compensation and mitigation actions (e.g., identification of mitigation sites, development of mitigation areas, and monitoring mitigation sites); and 4) post-NEPA review and follow-up.

The Environmental Planning Division: 1) maintains, updates and distributes the INRMP; 2) changes, conducts and coordinates reviews with Base stakeholders; 3) conducts and coordinates reviews with Resource Agencies; and 4) submits annual reports to Resource Agencies through the processes noted in Section 1.2. The INRMP is maintained as a living document under constant review and update. As surveys, projects and consultations are completed and received, INRMP tables and narratives are updated with the new data/information. During the annual review with program managers, action lists for each Program and Element and identification of "must fund" actions are updated. Narrative sections of the INRMP, not associated with a specific program, are updated as new information is received and completely reviewed at least once every five years. Updated/revised sections will be forwarded to Resource Agencies, Base staff and posted on the Base website.

The responsibilities of the Environmental Planning Division are accomplished through its three branches: 1) Project Oversight Branch; 2) NEPA Branch; and 3) Environmental Plans Branch. The Project Oversight Branch facilitates near-term project planning, NEPA EA and EIS level environmental review, mitigation development, and project implementation for military and nonmilitary construction projects, as well as training actions and new equipment fielding. The Project Oversight Branch provides technical environmental project planning guidance to Base personnel regarding natural and cultural resources management and oversight of compliance issues/requirements. The NEPA Branch provides procedural and technical advice on both military and nonmilitary NEPA documentation for facility planning, construction plans, maintenance activities, military training operations, and other proposed actions that may affect natural and/or cultural resources. Primary responsibilities of this branch include developing and reviewing initial environmental and planning submittals, facilitating a coordinated project approach for application of the NEPA planning process, and determining the level of NEPA review required by a given activity, project or action. If a CX is the proper level of NEPA documentation, the NEPA Branch prepares and issues the CX via a Decision Memorandum. If not, the Project Oversight Branch supports the action sponsor in the development of an EA or EIS. The Environmental Plans Branch provides long-range and strategic environmental, technical advice to both military and nonmilitary land users regarding facility and construction planning, maintenance activities, military training operations, and other proposed actions that may affect natural and/or cultural resources. This branch of the AC/S ES serves as the lead for coordination and integration of on-Base land use and natural resources planning with local and regional off-Base planning concepts, initiatives, and programs. The Environmental Plans Branch has also been assigned the responsibility to coordinate reviews and provide continuous updates to the INRMP (see Chapter 1). The following list of Actions support the Environmental Planning Division in achieving its goals (see Appendix M for more details on these actions).

- Continuously maintain and update the INRMP.
- Buffer lands acquisition and management.
- Biodiversity and landscape planning update.
- Encroachment Management Plan (ECP).
- Encroachment and planning GIS data support.
- Encroachment quantification of offshore and nearshore areas.

4.5.1. NEPA Review

The primary planning tool for the evaluation of projects and actions potentially affecting the environment and for the coordination of these projects and actions with Camp Pendleton's environmental management programs is NEPA. NEPA is the basic national charter for the protection of the environment (HQMC 1998) and requires federal agencies to assess and document, in detail, the potential environmental impacts of their actions that could significantly affect the quality of the human environment. NEPA is intended to help decision makers make environmentally informed decisions and take actions that protect, restore, and enhance the environment. In brief, the NEPA process requires that the Base: 1) consider the environment in decisions concerning potential individual and cumulative impacts; 2) make diligent efforts to inform and involve the public at appropriate stages in

the decision-making process; 3) develop and evaluate a reasonable range of feasible alternatives to proposed actions; and 4) support informed decisions with quality documents.

NEPA requires a detailed statement of significant environmental impacts of major federal actions. For example, an action may be considered significant if it has a long-term impact or potential risk because of its effect on a species protected under the Federal ESA. The process identifies reasonable alternatives to proposed actions that might have less or no environmental effect. Individual and cumulative impacts must be considered. The following three-tiered approach is used to document impacts:

- CXs are used for actions that do not individually or cumulatively have a significant effect on the environment, and therefore do not require preparation of an EA or EIS.
- An EA is the analysis to be completed when the government is uncertain as to whether an action will significantly affect the environment or whether the action is controversial; the result of an EA is either a Finding of No Significant Impact or a requirement to complete an EIS.
- An EIS is a full-disclosure document that presents a full and complete discussion of significant impacts, informing the public and decision makers of reasonable alternatives to the proposed action.

Camp Pendleton has established Base-specific regulations to guide NEPA procedures (Base Order 5090.2A) that lay out roles and responsibilities and the procedures to be followed to ensure potential impacts to the environment are assessed, documented, and considered before the decision is made to proceed with an action or project. This Base NEPA Order established a comprehensive program, with varying levels of decisional authority to Base entities, to ensure that all federal actions are conducted in compliance with NEPA. The Base Order identifies data needs and level of required NEPA documentation, clearly delineating responsibilities for environmental review. Camp Pendleton's NEPA documents incorporate natural and cultural resources programmatic and specific instructions as conditions for the conduct of projects and actions.

During the NEPA review process, natural resources managers help to: 1) identify potential adverse impacts from the project; 2) identify less damaging alternatives (e.g., avoidance); 3) ensure that adequate mitigation is planned and funded; 4) provide compliance with natural resources laws and regulations; 5) maintain consistency with natural resources management goals and objectives; and 6) provide technical assistance to other Base offices before, during and after a proposed action is submitted for NEPA review.

The Environmental Planning and Resources Management Divisions utilize a database called the Process Automation Management and Support Module (PAMS) to document and track NEPA project and mitigation activities. NEPA projects and mitigation are also tracked using GIS systems within AC/S ES and AC/S Facilities. The ultimate objective for NEPA project and mitigation tracking is to have a single, consistent interface for maintaining and tracking data. The first phase of development of this new, integrated PAMS system was completed in 2010, the second phase was completed in 2011, and is being utilized by Base staff. Completion of the second phase, which integrates the

mitigation tracking element known as the PAMS Compliance Tracker, is currently in progress.

4.5.2. Consultations

It is Marine Corps policy that installations must comply with laws for the protection and management of natural resources. To ensure compliance, Base projects and actions that may affect regulated resources require consultation with and/or acquisition of required permitting documentation from appropriate regulatory agencies. Natural resources managers at Camp Pendleton are routinely in communication with agencies such as the USFWS, USACE, State of California RWQCB, California Coastal Commission, National Marine Fisheries Service, State Historic Preservation Officer and San Diego Air Pollution and Control District.

To facilitate effective and efficient management of Base resources while ensuring regulatory compliance for ongoing programs and actions, programmatic consultations have been conducted with appropriate regulatory agencies. For example, the Base has consulted under Section 7 of the Federal ESA with the USFWS on ongoing activities and ecosystem conservation programs within riparian and estuarine/beach habitats on Base. This consultation resulted in the Riparian BO (USFWS 1995a). The Base is currently in consultation with the USFWS for the corresponding Upland Habitat BO and Listed Upland Species Management Program. Within all of these plans/documents are Consultation Class Systems (Table 4-1) for directing future consultations on Base projects. The purpose of this programmatic Class System approach is to: 1) satisfy Section 7 of the ESA requirements for future consultations; 2) provide a systematic method for dealing with future proposed projects in a consistent, predictable manner; 3) increase the Base's mission flexibility; 4) identify activities that require formal consultation with the USFWS; and 5) reduce staff time (for both the Base and the USFWS).

While formal consultations are required under many circumstances, natural resource managers often engage in informal consultations with regulatory agencies, as well. Such informal consultations are integral to the continued assurance of compliance under varying circumstances, to facilitation of management planning and project support, and to building of positive working relationships with regulating agencies.

The AC/S ES serves as the lead organization for planning and addressing natural resource compliance issues such as wetlands, endangered species, and air and water quality regulatory requirements. OWR acts as the Base liaison with federal, State, and local conservation, public health officials and community interests regarding ensuring sustainable water resources management and protection.

4.5.3. Mitigation and Compensation

Natural resources managers provide project and mission support throughout the planning process to include the following: implementation, integration, and monitoring of mitigation and compensation measures. Mitigation is compensation for the adverse effects actions may cause relative to natural resources. Mitigation can include: 1) avoiding the proposed

effect altogether; 2) limiting the magnitude of the action; 3) repairing, rehabilitating, or restoring the affected resource; 4) reducing or eliminating the effect over time by conservation and maintenance operations during the life of the action; and/or 5) ameliorating the effect by providing substitute resources or environments in suitable alternate locations (U.S. DoD 1996). In general, regulatory agencies' preferred order of performing mitigation is avoidance, minimization, compensation in kind, and lastly compensation out of kind.

To separately address the potential adverse effects caused by ongoing land use activities (e.g., training, maintenance, fire management, and recreation) in the proposed management plan for federally listed species in upland habitats on Base (Uplands BA), Camp Pendleton refined the definition of mitigation. The refined definition of mitigation refers to measures taken to offset potential adverse biological effects from actions that may have direct or indirect impacts to federally listed species, critical habitat, or other regulated resources. Compensation refers to measures taken to offset potential biological effects from actions that may have direct or indirect impacts to federally listed species, critical habitat, or other regulated resources. Temporary impacts from ongoing Base activities are inevitable. These impacts, in addition to being temporary, are impossible to quantify due to the almost infinite variations of personnel, equipment, transportation, and time/duration of training events. To minimize and compensate for such unavoidable, unquantifiable temporary impacts in upland habitats, the Base has proposed several basewide management initiatives, management plans and conservation plans. While some of these initiatives/plans may not be specific to a listed species, all resources on Base are expected to benefit either directly or indirectly from successful implementation of these programs.

As part of mitigation planning, careful consideration must be given to the siting of proposed actions and potential mitigation relative to existing land uses and natural resources early in the planning process. As part of Camp Pendleton's ongoing efforts to avoid and/or minimize impacts to threatened or endangered species, vernal pools, other wetlands and constrained regional habitat linkages, first consideration is given to use of marginal or nonnative vegetation areas. This will, in turn, enable planners to reduce costs (in terms of funding, manpower, and time) to plan, obtain regulatory approvals, and implement proposed actions. Locating suitable mitigation sites on Camp Pendleton that will not conflict with military operation requirements is becoming increasingly difficult. Thus in 2010, the Mitigation Technical Advisory Group (MTAG) was established to guide Marine Corps Base Camp Pendleton (MCBCP) mitigation activities, and to identify and submit proposed mitigation locations via the Environmental Impact Working Group (EIWG) and Environmental Impact Review Board (EIRB) to the Base CO/CG for approval. The MTAG will provide recommendations for on-Base mitigation sites and submit approved mitigation locations into the Site Approval and National Environmental Policy Act (NEPA) processes. The MTAG will oversee progress of mitigation activities to assure that all mitigation is complete including receiving documentation of regulatory closure. The MTAG will ensure that the project proponent/action sponsor participates in any required corrective action. Compensation requirements for Base project impacts to nonriparian habitat will be mitigated off Base whenever feasible. If off Base mitigation is unfeasible then appropriate on Base mitigation areas may be utilized. Riparian habitat impacts will be mitigated in accordance with the Riparian BO. Further, Camp Pendleton

cannot be used for mitigating the impacts of actions occurring off Camp Pendleton that affect natural resources (U.S. DoD 1996, paragraph F.1.i [3]). Persons planning and/or preparing mitigation actions need to be aware that military lands cannot be set aside as permanent environmental preserves. The DoD, and the Marine Corps in particular, must maintain the flexibility to adapt its defense mission to political and technological developments (U.S. DoD 1996, paragraph F.1.i [4]). The type of mitigation proposed for a specific impact will be addressed on a case-by-case basis. The action proponent is responsible for ensuring that mitigation requirements for a proposed action are planned, funded, and implemented. As the action proponent typically does not have in-house expertise for conducting the biological elements of mitigation requirements, these actions are often accomplished through contractual agreements. The AC/S ES oversees any mitigation actions that require restoration, enhancement, monitoring, tracking, etc. of resources. Since funding for MILCON projects is congressionally limited to use within a five-year period, it is important to develop mitigation objectives that can be met within this timeframe.

Project-specific requirements and details that are appropriate for a proposed action cannot be provided in this INRMP since such specifics must be tailored to each individual project, and determined through applicable consultation and permitting processes in coordination with regulatory agencies. However, many elements of mitigation actions and planning are common to most situations. The following mitigation measures should be planned for all proposed actions unless a determination can be made and documented, in consultation with Natural Resources Department (AC/S ES) staff, that such measures are not appropriate or feasible:

- Impact Avoidance and Minimization - The first step in mitigation planning should assess the ability to avoid adverse impacts. The primary purpose of mitigation is to lessen the severity of an action. Once avoidance has been implemented to the fullest extent feasible, remaining impacts should be minimized. This must be the first step in the mitigation planning process because numerous regulatory authorizations require demonstration of maximum impact avoidance and minimization before authorization may be given. Avoidance and minimization of adverse impacts may involve modification of building design or orientation, adjustments to the exact siting, and monitoring activities carefully to avoid unnecessary and incidental resource damage. Limitations on the timing of activities are also often required for avoiding and minimizing adverse impacts to natural resources (e.g., to avoid behavioral disruptions during the breeding season for federally listed species). Proposed actions must include requirements for impact avoidance and minimization measures as part of implementation of any proposed action. Measures that should be considered include: worker environmental protection briefings, signs, markers, protective fencing, exclusion fencing, biological monitoring, erosion and sedimentation prevention, noise baffling, and on-site restoration of temporary impacts. These measures should be included as part of an Environmental Protection section in all Standard Operating Procedures, work requests, and contracts effecting natural resource areas. The land use missions of the Base, which require open space and ready-access to support military training activities, are generally incompatible with exclusionary fencing. Although some fencing has been used to protect specific

management areas, fencing and cross-fencing of training areas is generally discouraged.

- Effects Analysis - Potential direct and indirect effects of a proposed action must be addressed when planning mitigation. Direct effects occur immediately upon impact of the action. Indirect effects have an impact at some point later in time. An example of indirect effects includes the case where use and maintenance of a new facility is likely to have an adverse effect beyond the building “footprint” following construction. Fencing may be necessary to prevent landscape maintenance and concentrated human foot traffic from damaging naturally occurring resources that were avoided by the construction of a building. Maintenance and safety considerations associated with new or re-utilized facilities, such as wildfire fuelbreaks, considerations must be treated as part of the initial project, and mitigated accordingly. Some direct effects of a proposed action may be less tangible; a common concern is noise and nighttime lighting associated with construction. As a general rule, noisy construction activities need to be kept far enough away from noise-sensitive, threatened and endangered species such that the level in the occupied habitat varies little from background. Other examples include outdoor lighting that may require shielding, visual harassment by human activities and equipment operation, changes to wetland hydrology, and sedimentation from construction sites to wetlands. Often, the temporary effects that may result from construction are avoided by performing work outside the vulnerable breeding and growing seasons as presented in this planning guidance. Other effects that are likely to have a longer or permanent adverse effect must also be mitigated for and may require compensation.
- ESA and Presence/Absence Determinations - Threatened or endangered species presence or absence determinations must be made using survey guidelines/protocols developed by the USFWS, or other means acceptable to them. Where no such guidelines or protocols exist, surveys must be conducted by qualified persons (see below, minimum criteria for biological monitor) using methods recognized and accepted in the professional consulting field. When making presence/absence determinations relative to a project, areas where indirect effects may adversely impact a species must be considered as well. If a habitat is used by a species for some important part of their life cycle, it is considered occupied regardless of whether the species is temporarily absent. Survey protocols or draft guidelines/protocols have been developed for all federally listed species found on Camp Pendleton.
- MBTA - The MBTA and its implementing regulations and orders generally protect migratory birds. On Camp Pendleton, 96% of all birds are covered under the MBTA. Planners must review proposed actions, with regard to conduct of actions during the active breeding seasons (potentially January through September) and project-caused loss of traditionally used nesting/roosting sites. Habitat clearing activities should be timed to avoid breeding seasons to the maximum extent practicable to avoid damage to active bird nests. Compensation for the loss of traditionally used nesting/roosting sites may be an issue for raptors and colonial nesters, such as herons. All contracts and work orders prepared for Camp Pendleton must include provisions in an Environmental Protection section that prohibit harming, damage, or destruction of active bird nests while requiring “work

around” without incurring additional cost. The Natural Resources Department can provide contractual language for construction contracts.

- Biological Monitor - An on-site biological monitor is typically required for all proposed actions that require active avoidance, are expected to affect threatened or endangered species or wetlands (including vernal pools), and/or require active revegetation or habitat compensation. The role of the biological monitor is to educate workers regarding applicable natural resource related issues, oversee and implement impact avoidance and minimization, document impacts, and/or guide revegetation efforts. At a minimum, this individual must have: 1) a bachelor’s degree with an emphasis in ecology, natural resources management, or related science; 2) demonstrated local experience with the resource(s) involved; and 3) a good understanding of the regulations regarding wetlands and endangered species.
- Mitigation Costs - The cost of mitigating impacts to natural resources should be considered when evaluating proposed action alternative locations and planning for funding. Mitigation must be treated as part of the project that will be fully funded by the action proponent. Some environmental authorizations and permitting require mitigation funding to be secured and assured before causing adverse affects. Resource mitigation costs can be highly variable depending on the specific details of the project (e.g., extent of habitat impacts, type of habitat impacted, duration of impacts, habitat compensation site conditions, and technologies). Provisions of actual cost estimates for mitigation on a “per ac impacted” basis are too variable and project specific to be presented here. Natural resources specialists should be contacted during project planning to assist with estimating the likely mitigation costs associated with a proposed action. Cost considerations for impact prevention during action implementation need to be accounted for, as well as habitat restoration and/or compensation (e.g., biological/archeological monitoring, placing protective signs/fencing, sedimentation controls, etc.).
- Mission and Management Compatibility - Beyond the financial costs of mitigation actions, the effects on future land use must also be considered. These “costs” can seriously affect the flexibility of the military mission. Mitigation actions that involve habitat compensation or enhancement on Camp Pendleton must be planned to support or be compatible with training requirements, long-term natural resources management programs, and the Base Master Plan where possible. Site evaluations and approvals for habitat compensation and enhancement must be initiated concurrently with proposed action planning whenever possible. The ideal situation would be for the actual habitat work to start concurrently or before the action causing an impact. The Base may seek opportunities to mitigate at off-Base locations to contribute to the regional recovery efforts for the species and to maintain mission flexibility on Base. Off-Base mitigation sites should be selected in cooperation with regional planning and conservation agencies, and approved by the USFWS or USACE. Agreements with the USFWS or USACE, made in advance of proposed actions, may provide flexibility in mitigation requirements and post-mitigation land use restrictions. Such agreements may include mitigation banking (see below), a return to pre-mitigation training restrictions following successful mitigation, mitigation initiatives that do not directly involve habitat restoration/enhancement, and off-Base mitigation.

- Mitigation Plan - All actions that require active habitat restoration, enhancement, and/or compensation must have an appropriate plan developed before implementation. Such plans must discuss the site conditions, methods to be implemented, monitoring and maintenance (usually 3 to 5 years), success criteria, remedial actions if expected success is not being achieved, and reporting requirements. The plans must ensure that all applicable requirements of regulatory approvals are incorporated. Review and approval of plans must be accomplished through the AC/S ES. In addition, regulatory agencies often require that they have an opportunity to review and approve plans where their authorization is needed for resource impacts.

To facilitate mission requirements and reduce costs, long-term mitigation planning at Camp Pendleton seeks opportunities to develop mitigation banks and conservation agreements. Mitigation banking is defined as “actions taken to compensate for future adverse effects of undertakings by providing resources or environments in advance of any specific undertaking (U.S. DoD 1996).” The primary objective of mitigation banking is to receive credit for habitat improvement or conservation towards mitigation for future projects. Mitigation banking typically reduces the mitigation ratios required for planned actions.

A conservation agreement is a formal document agreed to by the USFWS and other cooperators that identifies specific actions and responsibilities for which each party agrees to be accountable. The objective of a conservation agreement is usually to reduce threats to a candidate or proposed species or its habitat, possibly lowering the listing priority or eliminating the need to list the species. Conservation agreements are usually less restrictive than mitigation banks and do not require transfer of ownership. Whenever appropriate, Camp Pendleton will consider the option of a conservation agreement. MCAS Yuma, for example, entered a conservation agreement to help conserve the flat-tailed horned lizards (*Phrynosoma mcallii*) on the Barry M. Goldwater Range in Arizona (6 June 1997). This species was proposed for federal listing as threatened, but the proposal was withdrawn as a result of the signing of the conservation agreement.

If mitigation banking and/or conservation agreements are considered, early involvement of the USFWS, the USACE, and other agencies is essential. Such agreements include mechanisms by which future Section 7 consultations and accompanying BOs will direct mitigation requirements. For example, terms and conditions of future BOs that involve the set-aside or special management of habitat would draw on a mitigation bank or conservation agreement. This would allow comprehensive long-term mitigation planning, rather than project specific or activity specific mitigation.

4.5.4. Post-NEPA Follow-Up

Upon receipt of permits, BOs, and other consultation documents, it is the Base’s responsibility to ensure that the terms and conditions, mitigation, and other nondiscretionary requirements are implemented. The Environmental Planning Division serves as the lead organization for conducting post-NEPA follow-up. The aforementioned PAMS database is expected to facilitate post-NEPA follow-up. Contractor support is used

to visit project sites to verify compliance with Programmatic Instructions, mitigation and compensation requirements identified in NEPA documents.

4.5.5. Long-Range and Master Planning

Long-range environmental planning is key to successful natural resources management, integration, compliance, and mission support at Camp Pendleton. Long-range planning helps to ensure that Base activities are consistent with natural resources management goals and objectives, and that those goals and objectives are consistent with the military mission. Long-range planning helps to ensure the integration of and consistency among planned actions.

The INRMP itself is an important long-range planning document for developing environmental baseline information to support activity and operational planning, formalizing natural resources goals and objectives, establishing planned actions to help meet those goals and objectives, and integrating actions and responsibilities basewide. The INRMP review and revision process (Chapter 1) is as important as the document itself, providing a venue for self-evaluation, communication, adaptive management, and further refinement of long-range planning and integration.

It is important that the INRMP be fully-integrated with other planning documents on Base, especially the Base Master Plan. The installation master planners, who are usually within the Public Works Department, should be very familiar with the INRMP because they designate land use. Master plans typically attempt to anticipate a 20- to 30-year period. While the INRMP provides a planning focus of five years, the overarching Department and Division missions and subordinate Branch program goals and objectives have a long-term horizon, which should evolve, rather than change dramatically, over the years. The INRMP identifies federally threatened and endangered species and other potentially vulnerable natural resources with land use restrictions. It is imperative that natural resources managers coordinate such restricted areas with the master planners so that, at a minimum, they can be incorporated into the master planners' maps and GIS. Although historically the MCB Master Plan has focused primarily on the development of facilities, it now has been updated and integrated with other Base long-term planning documents (including those for training, fire management, and natural resources management). The INRMP is expected to complement and be fully compatible with the Master Plan and support strategic planning.

4.5.6. Encroachment

The Environmental Planning Division coordinates the environmental aspects of encroachment planning on Camp Pendleton at different levels and timescales (e.g., short-term and project-specific, as well as long-term and region-wide). Working closely with the AC/S O&T, CPLO, WREC and WACO, programs have been established and are conducted to identify, quantify, monitor and deter mission encroachment, both internally and externally (see also Section 2.6.5).

A key cause of encroachment is urban growth which has exacerbated the depletion and degradation of biodiversity by converting the natural landscape to developed hardscape

(SRS 2003). To define the extent and potential effects of this issue, Camp Pendleton supported a study in 1995 by the Biodiversity Research Consortium, a team of investigators from the Harvard University Graduate School of Design, Utah State University, the National Biological Service, the USFS, TNC, and MCB Camp Pendleton, with the cooperation of the two relevant regional planning agencies, SANDAG and Southern California Association of Governments. This “Alternative Futures Study” (*Biodiversity and Landscape Planning: Alternative Futures for the Region of Camp Pendleton, California* [Steinitz 1996]) examined how urban growth and change in a 50-by-80-mile region situated between San Diego and Los Angeles (area surrounding Camp Pendleton) might influence or be influenced by the region’s existing biodiversity.

The study sought to investigate some basic questions on the possible relationships between development and biodiversity—that is, on the variety and variability of life. These questions included: 1) how might biodiversity be measured; 2) what are the costs and benefits of a computer-simulated modeling approach to landscape planning for biodiversity; 3) can such an approach serve as the basis for regional planning; and 4) what are potentially effective strategies for the conservation of biodiversity? The 1996 study aimed to identify issues that could be addressed through the collaboration of area stakeholders. The basis of the study assumed that all were in agreement about the need to conserve biodiversity, and provided a set of futures that could achieve *that* strategic goal through different sets of land use policies. The study and subsequent publication were primary for educational purposes for the many stakeholders and jurisdictions in the region, providing valuable information regarding issues, strategic planning options, and possible consequences related to regional development and associated impacts to biodiversity. As a follow-on to the study results, Camp Pendleton provided DoD, SERDP, and EPA sponsors both a “lessons learned” assessment from the original effort, and further direction on how to undertake an expanded version of the study within the entire County of San Diego, including all military bases in the region.

Camp Pendleton realized a direct benefit of the Alternative Futures Study through the assurance that regional land use maps in the future include “military” as an official (land use) category. Up until that point, local jurisdictions and regional planning agencies had assigned all military lands in the region as “unused”. Further, tenets of the study are being used in planning biodiversity preserves off-Base to protect critical nodes which will support linkages to the Base’s resources, supporting the most viable matrix of biologically diverse elements in the region. Camp Pendleton, in cooperation with the USFWS as the regional ecosystem manager, continues to use the Alternative Futures Study to influence off-Base regional planning efforts to help achieve species recovery plans and goals.

During 2000, Camp Pendleton initiated a follow-on study to review and evaluate the Alternative Futures Study (Steinitz 1996). Existing conditions were used to validate the results of the predictive models and to refine the regional biodiversity picture, including development of additional alternative futures projections in light of changes in growth and preserve patterns and current conservation planning in San Diego, Orange, and Riverside Counties. This study looked at issues which were perceived as not readily controllable, or which are beyond the influence of regional action. To do so, the scenarios construction process was organized to examine *critical uncertainties*. Critical uncertainties are those

issues that are both difficult to predict and likely to impact social, economic, political, technological, and environmental trends. Most importantly, they are issues that will significantly determine the ultimate success of any local actions taken in the near future.

Furthermore, the scope of study was expanded to include: 1) MCAS Miramar and coastal San Diego County south to the San Diego River; 2) an evaluation of the sufficiency of regional HCPs to achieve conservation goals and biodiversity requirements within the parameters of alternative futures; 3) an assessment of the recovery potential of select threatened and endangered species within the context of the alternative futures scenarios; and 4) an assessment of Camp Pendleton's and MCAS Miramar's role and contributions to regional biodiversity in view of the alternative futures scenarios. The results of this study provides the Marine Corps and regional planners with an enhanced ability to understand and project the expected impacts of alternative futures scenarios on their ability to manage both land use and biodiversity. This additional study, *Environmental Decisions and Uncertain Futures, Scenarios for the Region of MCB Camp Pendleton & MCAS Miramar, California* was finalized on 22 July 2004.

4.5.6.1. Quantification

Over the years the effects of encroachment have been felt and reported by operating units utilizing the Base. The greatest concern reported was the inability of military trainers to develop their tactical decisions by the application of sound military doctrine due to restrictions and prescriptions to avoid impacts to protected areas and resources. Consequently, required tasks could not be conducted at Camp Pendleton and resulted in "work-arounds" at other locations at a significant cost in time and money. To provide analytical quantification to these reports, several programs/projects have been established to help identify and quantify encroachment for the mission on Base, as well as in off-shore and near-shore areas.

In October 2001, Camp Pendleton contracted for the development of the Training and Range Encroachment Information System (TREIS), a tool to quantify the impacts of encroachment on the ability to accomplish combat training on Camp Pendleton. The initial tasks were to develop that quantitative tool, and assess and quantify impacts on the Base's mission capability from various categories of encroachment. The focus of the assessment was solely on the capability or "readiness" of Camp Pendleton, as a Base, to provide a realistic training environment. The scope of the initial analysis concentrated on several components of a MEU (Special Operations Capable). The assessment of Camp Pendleton's capability to support training was conducted at the training task level with tasks taken from existing MCOs for individual and several different unit levels. Face-to-face interviews with Marine Corps subject matter experts were used for the data collection method. They included Marines with significant operational expertise, including training knowledge and experience at Camp Pendleton in the area being assessed. In fact, the Marines' professional military judgment about the ability of individuals and/or units to complete specific training tasks to Marine Corps standards at Camp Pendleton was the basis for the data collected and subsequent analysis.

Two training scenarios were selected for the first quantitative analysis, a notional exercise, intended to reflect the Base's requirement to provide a context for realistic, exercise-based

training and a training scenario to determine the capability of the Base to support the training task anywhere on Base. An assessment of 739 training tasks determined that encroachment has a measurable negative impact on field training at Camp Pendleton. The data indicated that all field training assessed at Camp Pendleton is affected to some degree by encroachment with ground training tasks being impacted the most. For instance, the quantitative assessment determined that a Battalion Landing Team training on Camp Pendleton in a notional training scenario is able to complete its required non-firing tasks to less than 68 percent of the Marine Corps standard.

Further supporting the observations of users of the Base, the study determined that the effects of encroachment on training increase according to the relative complexity and size of the training event. In general, the larger the unit involved and the more complex the training, the more the impacts of encroachment drive down the task completion percentage. Advanced, integrated combat training involving multiple combat elements, maneuver, and tactical operations is generally more restricted by encroachment than intermediate unit level training. Intermediate unit training, in turn, is generally more restricted than individual training.

Also as expected, the basewide analysis reflects that many of the tasks that were degraded in an operational scenario could be “completed” elsewhere on Camp Pendleton. The basewide assessment did not consider the diminished training value of a training task, which when accomplished outside of a tactical context yields segmented and less effective results.

The analysis indicated that restrictions relating to threatened and endangered species and their associated habitat(s) have the biggest impact on training. The presence of wetlands and cultural resource sites are also significant encroachment factors. Certain types of Marine activities in the field are consistently impacted by encroachment. The most common include digging (e.g., fighting positions, vehicle defensive positions, artillery, and MPs), earth moving (e.g., berms and revetments), off-road foot and vehicular movement, noise (e.g., artillery firing, bombing, and helicopter flying), and airspace use (e.g., aircraft, artillery, and mortars).

However, this assessment only looked at a small fraction of the training tasks that are performed at Camp Pendleton. It was designed to serve as an initial survey to begin to understand and quantify the impacts of encroachment. It was not comprehensive in terms of evaluating the full spectrum of training that occurs on the Base. On the other hand, it did assess in detail, the impacts of encroachment on a representative range of training tasks and concluded that all field training assessed at Camp Pendleton is affected to some degree by encroachment. Ground activities and tasks are impacted the most. Camp Pendleton’s ability to provide the best possible training environment for Marines preparing to deploy overseas is significantly hindered due to the impacts of encroachment. Additionally, the assessment provided data to help focus efforts to reduce encroachments at certain locations and on media that would provide the best opportunity to improve training.

An important part of the encroachment quantification study was the development of a database tool, named Training and Range Encroachment Information System (TREIS) in

2003. The purpose of the TREIS was to build upon the data collection and analysis methods from the encroachment quantification study and provide an easy-to-maintain tool to collect additional and ongoing data, perform analysis, generate reports and allow for change/analysis over time. The TREIS also represents a prototype solution for collecting and quantifying encroachment impacts which has the potential to be applied to other USMC ranges and bases.

TREIS performs three primary functions:

- 1) Managing Information - The TREIS manages information collected during encroachment quantification studies.
- 2) Reporting - The TREIS provides reports that quantify encroachment impacts to training and ranges/training areas.
- 3) Data Collection - The TREIS provides an expandable architecture that supports future data collection and analysis allowing comparison of similar training tasks and scenarios over time, to support the goal of “no net loss of training capability” and provides feedback on the effectiveness of encroachment reduction efforts.

The TREIS allows analysis of encroachment impacts on new units, weapon systems, or occupational fields as they are introduced to Camp Pendleton. The ability for user-created operational scenarios allows the user to analyze and compose restrictions throughout the Base. Relationships established in the database allow the Base to summarize encroachment impacts by each encroachment issue and provide a GIS analysis of the restricted training areas.

Additional requirements to quantify competition for airspace, sea space and undersea space in the Camp Pendleton near-shore and offshore areas led to the expansion of TREIS and the development of the Training and Range Information Management System (TRIMS) in 2006. TRIMS is a training capability and capacity toolset supporting sustainable range management. The TRIMS uses relational database and GIS technologies to analyze and visualize the links among Marine Corps training requirements, Camp Pendleton training resources, and factors affecting training capability and capacity including natural resources management programs. TRIMS also provides for 3-D analysis capabilities to support evaluation of the impact of proposed projects, regulations, and activities within Camp Pendleton.

In 2008, the Installation Capability Assessment and Sustainability Support System (ICAS3) was developed to assist in assessing and managing the Base’s capability to support both current and future mission requirements and sustainment of Base resources to support long term military use. ICAS3 is a web-based application that provides customized tools and interfaces to assist in data collection, analysis, and management of installation resources. ICAS3 has retained the Training Range Encroachment Information System (TREIS) module, which enables users to generate reports on quantitative impacts of encroachment on training activities. The system is a standalone website managed by the installation; ICAS3 resides within the Navy Marine Corps Intranet (NMCI) and is available to installation resource managers. The TREIS module was developed subsequent to the Base’s encroachment quantification study titled “Encroachment Impacts to Training and

Readiness at Marine Corps Base Camp Pendleton,” and is based upon the methodology developed in the study. A component of ICAS3 enables environmental and range managers to collect, and analyze encroachments. In addition, the information contained within the application can be updated and maintained over the long term. ICAS3 also directly links with the GEOFidelis West spatial repository. Future enhancements include interactive links with the Range Facility Management Support System (RFMSS) database to display information on range and training area usage and capacity.

The TREIS module of ICAS3 uses a powerful relational database that links training tasks, as defined by the user, with the installation’s operating areas and their associated encroachment factors. ICAS3, in conjunction with the INRMP, assists in assessing and managing the capabilities of Camp Pendleton to support both current and future mission requirements, as well as the sustainment of natural resources to support long-term military land use.

4.5.6.2. Buffer Acquisition

As noted in Section 2.5.4.3., the National Defense Authorization Act for Fiscal Year (FY) 2003 granted the authority to military departments to partner with NGOs and state and local governments to acquire land adjacent or proximate to military installations, to prevent incompatible development and preserve habitat that may eliminate or relieve current or anticipated environmental restrictions that could interfere with military training, testing or operations. The Environmental Plans Branch serves as Camp Pendleton’s lead in the South Coast Conservation Forum (SCCF). The SCCF investigates opportunities to acquire an interest in lands that could assist in the conservation of many of the federally protected species in the region and achieve the maximum potential of the authorization provided in the 2003 National Defense Authorization Act. Participating in the SCCF are representatives of: Orange, Riverside and San Diego Counties, The State of California, SDSU, Trust for Public Land, Sierra Club and Endangered Habitats League, Fallbrook Land Conservancy, Riverside Land Conservancy, Western Rivers Conservancy and non-governmental conservation organizations such as TNC.

One of the common goals of the SCCF and the Base is acquiring land and/or conservation easements that support the Santa Ana–Palomar Mountains Linkage Plan. This linkage is the last remaining habitat connection to inland areas of the South Coast Ecoregion. Preserving this connection would also serve to reduce the need for additional listings of species in the future, conserve watershed values, buffer the Base from incompatible lands uses, etc. Loss of this linkage is predicted to result in the extirpation of mountain lions on Base (Luke et al. 2004) with potential repercussions to other species throughout the ecosystem.

In FY 2006, two projects were funded, Margarita Peak consisting of 1,206 acres, and Twaddle at 50 acres. The Margarita Peak project was a coalition of The Trust for Public Lands (TPL), California Wildlife Conservation Board, Fallbrook Land Conservancy and Camp Pendleton. The TPL coordinated the acquisition of the land from the original owner, transferred a restrictive easement to the DoN and provided the restrictive fee to Fallbrook Land Conservancy, who now owns and manages the property. The California Wildlife Conservation Board provided a grant for half the acquisition cost to TPL. The Twaddle

project was acquired by TPL using DoN and County of San Diego Parks and Recreation funds. DoN received a restrictive easement and the County acquired the fee, adding the property to their Santa Margarita County Preserve.

In FY 2008 Camp Pendleton partnered again with County of San Diego Parks and Recreation to acquire the 40 acre Lauderbaugh property, which was added to San Diego County's Mt. Olympus Preserve.

In FY 2010 Readiness and Environmental Protection Initiative (REPI) funds in the amount of \$1,232,500 were put into escrow for 3 acquisitions with the Riverside Land Conservancy. They are pending HQ NAVFAC approval of acquisitions as the first acquisitions under a new Environmental Protection Agreement (EPA).

On 17 May 2011, Camp Pendleton's multi-party Encroachment Protection Agreement with Riverside Land Conservancy and Fallbrook Land Conservancy was amended to include the addition of The Conservation Fund as another partner to the agreement.

In FY 2011, the Base received \$3,566,000 in REPI and HQMC funds for seven Encroachment Partnering projects: 3 with Riverside Land Conservancy (Vail Custodial, 355 acres; Ecstatic & Sundance, 66 acres; and portion of Canyon Lands, 160 acres); 2 with Fallbrook Land Conservancy (Durling, 184 acres and Davies, 30 acres); one with San Diego County (Oswald, 86 acres); and one with The Conservation Fund (Cielo del Norte, 462 acres). Funds were placed in escrow pending approval of acquisitions under the EPA and completion of real estate due diligence and the purchase agreements. These projects are part of a multi-year phased acquisition process developed with these partners in the Santa Margarita River watershed and a core gnatcatcher habitat area.

MCB Camp Pendleton submitted its FY 2012 REPI request for \$11,910,733 on 28 July 2011. Through partnerships with Riverside Land Conservancy, The Conservation Fund, The Trust for Public Lands, and Western Rivers Conservancy, who will collectively contribute matching funds of \$12,867,000, the Base is planning to acquire easements on portions of five key properties (Gavilian Mountain, 643 acres; Dripping Springs Ranch, 191.56 acres; Eddy, 12.69 acres; Edwards, 81.45 acres and Cielo del Norte, 467 acres) totaling about 1,396 acres.

4.5.6.3. Buffer Acquisition Management System (BAMS)

In support of the Buffer Acquisition program the Environmental Plans Branch maintains and uses BAMS. BAMS supports the evaluation and acquisition of land parcels subject to actual or potential real estate action as part of the Base Buffer Acquisition program. This support includes collecting, tracking, and reporting information about the acquisition of property through three primary processes: 1) parcel prioritization – compare parcels and justify expenditures for buffer acquisition; 2) parcel acquisition – track real estate acquisition progress involving all acquisition partners; and 3) post-acquisition monitoring – record acquisition documents and monitor management of easement conditions.

4.5.7. Regional Aspects of Environmental Planning/Coordination

The Environmental Plans Branch coordinates the Base's environmental involvement and represents AC/S ES in regional forums and planning processes. Coordination with the Base's Community Plans and Liaison Office (CPLO) (who has overall responsibility for the Base's involvement in off-Base issues) and AC/S O&T is conducted to ensure consistency in support of the Base mission.

Regional land use provides a context for understanding the circumstances under which the Base currently operates and a starting point for understanding its conservation role and the potential effects of its management programs. Likewise, conservation efforts (or lack thereof) in the region affect the Base's mission and natural resources management programs. Additionally, understanding regional land uses and conservation efforts can provide a context for predicting future trends.

Camp Pendleton's ecosystem management program requires the stewardship of resources on Base, as well as, involvement at the regional level. While the management and protection of natural resources within the Base's boundaries are important (and contribute to regional conservation efforts), Camp Pendleton recognizes that long-term sustainability of ecosystem processes and watershed functioning requires a regional perspective, and a coordination of efforts with other land managers to achieve common goals. Adequate provision for, and promotion of, biodiversity conservation within the region surrounding Camp Pendleton will help to ensure functioning landscape linkages and wildlife corridors to Base ecosystems, and support the long-term mission of the Base.

Implementation of an ecosystem approach has required decision-making on a host of issues, both local and regional, short- and long-term, and involvement with various groups operating at several organizational levels. Depending upon the issue, the Base's level of involvement ranges from passive vigilance to active participation; however, in all situations of regional involvement, effective communication and the fostering of positive, long-lasting relations with surrounding communities and diverse interest groups greatly improves the success of the natural resources program, and benefits the overall status of the Base.

Camp Pendleton strives to ensure that its land use and regional planning efforts are complementary with surrounding biodiversity conservation efforts such that Base lands help support the region's habitat conservation needs while also providing continued support of the Base's mission. Part of this effort involves actively monitoring and providing input to regional conservation planning and research efforts including: 1) County of San Diego's MSCP; 2) North San Diego County MHCP; 3) North County Wildlife Forum; 4) Multiple Habitat Conservation Plan; 5) South Orange County Subregional Plan; and 6) Riverside County's Multiple Species and Habitats Conservation Plan and the Riverside County Integrated Planning (RCIP) program.

In addition to following the development and implementation of these regional conservation plans to see how these plans establish preserves and corridor links to the Base and other natural lands, the Environmental Plans Branch reviews proposed conservation areas and wildlife corridors to identify potential encroachment partnering opportunities.

Camp Pendleton encourages local, State, and federal involvement and participation in regional biodiversity conservation and management planning to ensure the continued existence of all species and resources of regional importance, consistent with existing land uses and regional economic needs. Examples of the initiatives that Camp Pendleton is currently involved in include:

- Santa Margarita River Watershed Management Program.
- Team Arundo Watershed Exotics Control.
- Santa Margarita and San Luis Rey Weed Management Area Program.
- Santa Margarita Ecological Reserve.
- TNC Cooperative Agreement (signed in 1988) for the maintenance of biological diversity on DoD installations.
- Camp Pendleton Alternative Futures Study.

Another relevant form of stakeholder involvement is the generation and sharing of regionally useful data. For instance, much of the knowledge gained from the data derived on Base can be directly applied to issues of regional concern and has a clear benefit to local and widespread area management and planning efforts. Base-sponsored research, surveys, and monitoring contribute to a broader understanding of species, habitats, and ecosystem dynamics. In fact, several studies on Base have been part of larger, regional projects. For example, survey sites on Base have contributed to the international MAPS Program (Section 4.3.5.) and to a regional study of the diversity and autecology of amphibians and reptiles within the California portion of the California Floristic Province (Fisher 2000; data from these herpetological survey sites have also contributed to Holland & Goodman 1998a, b). Lastly, symposia, such as the arroyo toad symposium sponsored by MCAS in 2000, also contribute to regional conservation and management initiatives in that they may facilitate the interaction of and sharing of information among public and private agency professionals.

Camp Pendleton provides (and routinely makes available to stakeholders) data and copies of completed reports and surveys conducted on Base and is partnering with several groups to improve regional sharing of ecological data. The Base is participating in a regional GIS database information exchange with SANDAG to enhance documentation of regional biodiversity. Camp Pendleton is also working with TNC and SDSU to develop a riparian monitoring program related to its pending water rights settlement-agreement with Rancho California Water District. To that end, the Marine Corps has provided \$100,000 of Legacy funding to SDSU to develop a web-accessible database for hydrology, water quality, sediment, and habitat and biocriteria data. SDSU's work is part of a larger regional effort to develop an online environmental data transfer system to support regional planning and research. At the same time, Camp Pendleton is participating in an effort, funded initially by the U.S. Bureau of Reclamation, to develop a science-based, watershed-scale water quality monitoring program. That effort also includes database design, along with coordination between the Base, U.S. Bureau of Reclamation consultants, and SDSU to avoid duplication or contradiction in their work products.

Another form of regional involvement and partnering by the Base is providing public education and awareness programs (see also Section 5.5). Environmental staff conduct frequent slide show presentations on natural resources and Base management programs to a variety of on-Base and off-Base groups such as conservation organizations, service groups, and college students. Base personnel also lead field trips to observe wildlife and discuss management projects. Group tours have included an annual tour for the Friends of the Santa Margarita River, the Biodiversity Research Consortium, National Research Council, and regulatory agencies. An Earth Day celebration is held on Base annually, which includes live animal displays of various local reptiles, birds, and mammals. News articles are prepared periodically for the Base paper and interviews are given frequently to local newspapers. Environmental staff personnel also participate monthly with local high schools in a School-to-Career program, orienting students to the environmental compliance and natural resource management professions, education requirements, and skills and expertise needed for programs on the Base.

4.6. OTHER BASE PROGRAMS THAT SUPPORT NATURAL RESOURCES MANAGEMENT

4.6.1. Watershed Management

The natural pattern of water flow has been significantly altered on Camp Pendleton over the last century. In some cases, altered flows have led to an increased intensity of soil erosion, especially during large flow events. The impacts that this alteration may have on riparian cover and diversity, nonpoint source pollution, and water supply have yet to be described. Additionally, the flows entering the Base have been altered significantly by human development in the Santa Margarita and San Mateo watersheds. Since the Base sits at the bottom of several watersheds, it has an interest in every activity upstream that affects flow and water quality.

Watershed protection activities on Camp Pendleton primarily involve water quality protection and erosion control. These are achieved through nonpoint source pollution control (including storm water, wastewater, nonpoint source pollution, etc.), fire management, vegetation management, and land use management. Erosion and water quality management on Camp Pendleton is in accordance with the BMPs approved by the State of California under the Nonpoint Source Pollution Control Plan and the Phase II Municipal Storm Water Permit.

Camp Pendleton seeks to implement the “Clean Water Action Plan: Restoring and Protecting America’s Waters” and the Unified Federal Policy for a Watershed Approach to Federal Land and Resource Management (65 Federal Register 62565-62572, 18 October 2000). Furthermore, as required by EO 11988, 24 May 1977 and 2000 (Unified Policy on Watershed Management Initiatives) the Marine Corps, when feasible, avoids direct or indirect development of floodplains and restores and preserves the natural and beneficial values served by floodplains. Marine Corps installations are required to evaluate the potential effects of actions in floodplains to provide an early opportunity for public review of proposals in floodplains according to NEPA procedures. Camp Pendleton also complies

with the Watershed Management Approach chapter of the San Diego RWQCB's Basin Plan.

Many watershed issues cannot be addressed by the Base alone, but require Camp Pendleton to participate in cooperative planning and management efforts. These issues include water supply, water quality, wastewater management, aquatic habitat protection, flood protection, and floodplain management. To address these issues effectively requires the Base to coordinate with surrounding jurisdictions during infrastructure and land use development planning and approval processes. Camp Pendleton has taken a leadership role within the Santa Margarita River watershed in promoting the watershed approach, and intends to take a similar approach in the San Mateo Creek watershed as urbanization increases.

In 1992-1994, Camp Pendleton and Riverside County participated in an effort to improve cooperative land use and water resources planning within the Santa Margarita River watershed. The two Riverside County supervisors whose districts are in the watershed formed a committee with one San Diego County supervisor and representatives of the Cities of Murrieta and Temecula, and Camp Pendleton. Technical sub-committees addressing water supply, water quality, habitat, recreation, flood protection, and land use were formed to advise the committee. The initiative was supported by grants from U.S. EPA and the California Coastal Conservancy. Its intent was to improve the quality of information provided to land use decision makers about the effects of their decisions at the watershed scale. In the aftermath of devastating flooding in the Santa Margarita River watershed in 1993, the initiative became highly politicized and ultimately, bogged down, and the group stopped meeting.

Camp Pendleton is seeking to establish an alternative forum or mechanism to accomplish the original goals of this initiative, and has facilitated regional discussion groups on water supply and water quality. Camp Pendleton is participating as a member of the Murrieta Creek Advisory Committee, with regard to a major flood control and environmental restoration project being developed by the USACE in the upper watershed. Additionally, Camp Pendleton has become a partner with San Diego County, the U.S. Bureau of Reclamation, SDSU, and other stakeholders in a proposal seeking a State grant for watershed plan development, which the Base hopes to integrate with Riverside County's other comprehensive planning efforts.

4.6.1.1. Water Resources Management

Water is a scarce and limiting essential resource in southern California. While the majority of water districts in southern California are forced to import water from hundreds of miles away from the Sacramento Delta and the Colorado River, Camp Pendleton has managed its water supply to provide for all but approximately 1% of its water demands through four main groundwater basins on Base. Protection of this critical resource is essential to the continued ability of the Base to accomplish its mission.

Water resources issues include water rights, water supply, water quality, wastewater, stormwater, flood prevention, and watershed management. The Base works actively to protect its water resources from quality, quantity, and legal threats. Camp Pendleton protects the adequacy of its water supply by implementing conservation programs, and by

defending its adjudicated water rights through technical, administrative, and legal mechanisms. The Base protects the quality of the water through pollution prevention programs, wellhead protection and treatment, and active involvement in watershed-based pollution control programs. Camp Pendleton is committed to providing safe high-quality water to Base consumers. The facilities, environmental, and legal staff on Base share Camp Pendleton responsibilities for water quality management with the goal to ensure that current and future demands are met in accordance with mission and quality of life requirements.

The Base Water Steering Committee (BWSC), which is composed of designated staff from the AC/S Facilities, AC/S ES, AC/S MCCA, MCAS, and Western Area Counsel Office, meets regularly to effect coordination and strategic planning of Base water resources and water-related issues. This group meets to discuss a range of topics from flood protection requirements and upgrades/repairs to existing water and wastewater facilities. This group also has been instrumental in the development of future infrastructure upgrades and broad scope objectives to ensure competency and compliant program management.

The BWSC is responsible for the implementation of the Strategic Water Plan (SWP). This Plan states the Base's strategic vision for water resources, and identifies and proposes strategies to achieve that vision. The committee members are responsible to the BWSC for adherence to, and implementation of, the SWP by the organizations that they represent on the committee. The BWSC does not have direct authority over the staff sections, offices and departments represented on the BWSC, but the BWSC tracks implementation of the SWP at regular quarterly meetings.

4.6.1.2. General Vegetation Management and Soil Conservation

Watershed, floodplain, fuel break/fire management, prescribed burning, grounds maintenance, landscaping, and erosion control can all be viewed as components of vegetation management and soil conservation. Meeting the objectives of each of these components requires an integrated approach to vegetation management, as well as the other natural resources components identified in this chapter.

4.6.2. Grounds Maintenance and Landscaping

Grounds maintenance and landscaping includes considerations for weed control and urban forestry. It is Marine Corps policy that environmentally and economically beneficial landscaping practices be used. These practices are outlined in a Memorandum for Heads of Executive Departments and Agencies issued by the President (Presidential Memorandum) dated 26 April 1994. The Presidential Memorandum directs federal agencies to use landscaping techniques that enhance the local environment and minimize the adverse effects that landscaping can have on the environment. The Presidential Memorandum stresses use of regionally native plants and practices that conserve water and prevent pollution. Integrated measures include reducing use of fertilizers, pesticides, and water use for both economic and environmental benefits. With regard to the control of noxious weeds, Marine Corps installations will cooperate with state programs for controlling noxious plants. Camp Pendleton allows access for that control, consistent with installation safety and security considerations and when similar control measures have been followed

on privately owned lands. Grounds maintenance activities are integrated with fire management with respect to clearing around buildings.

Many locations at Camp Pendleton have species protected by the ESA, including areas in the immediate vicinity of developed and landscaped areas. To help ensure compatibility with federally listed species and natural resources management in general, the BEAP contains a list of approved plants that may be used for landscaping on Base. Changes to this list are reviewed by the LMB annually to ensure consistency with the Base's exotic species control program.

Before clearing of natural vegetation on Base, AC/S ES is consulted regarding natural resources impacts. During the breeding season, site surveys are required to locate active bird nests that are then either left in place until conclusion of the breeding season, or removed only after obtaining required permits and/or "take" authorization from the USFWS. Pesticide application must be coordinated with the Base pesticide coordinator and is part of an integrated pest management approach. Mowing around parking aprons is done with consideration that federally listed species and other vulnerable natural resources are potentially in the immediate vicinity.

4.6.3. Information Management

Information management (the collection, analysis, storage, maintenance, presentation, and distribution of data) is fundamental to the integration and implementation of natural resources management and the ability to make informed decisions. Comprehensive, well maintained, and accessible GIS-based data enables managers, planners, military trainers, and other users of Camp Pendleton to avoid potential land use conflicts through the spatial representation, analysis, and modeling of activities, planned actions, and natural resources.

Types of data required to support management include (e.g., vegetation types and distributions, plant and animal population sizes and distributions, fire frequency and distribution, floodplain and watershed boundaries, long-term trend monitoring, etc.) those collected in Section 4.3.2. (Federal ESA Compliance), Section 4.3.3.3. (Non-Federally Listed Species Monitoring), and Section 4.4.1.2. (Ecosystem Mapping and Monitoring), as well as topographic, soil, land use (e.g., roads, buildings, ranges and training area designations, agricultural and park leases, etc.), other physical features and administrative boundaries. Although not all natural resources data is linked geospatially to locations on the Base, many management decisions, including effectiveness of management plans and adaptive management decisions, require an understanding of the temporal and spatial relationships (e.g., proximity, fragmentation, distribution, etc.) within and among the data. As many of the training areas and locations of regulated natural resources are not demarcated in the field, GIS-based maps are the primary tool for implementing programmatic instructions and for integrating land use and natural resources management, in general. This geospatial technology has also provided Camp Pendleton with the potential for facilitated and increased accuracy in, communication of changes in land use and natural resources information. In addition to increased efficiency in daily operations, well-maintained and accessible GIS-based data also improves the likelihood of success for long-term master planning.

Several organizations on Base are GIS-capable; however, only a few organizations generate the data for end users and serve as the primary administrators of GIS-based information. Organizations that generate and manage GIS data on Camp Pendleton include: 1) the Public Works Office (AC/S Facilities); 2) Range Operations Division (AC/S O&T); 3) the IS Branch (AC/S ES); 4) Fire Department (AC/S SES); and 5) the Environmental Department at MCAS (see Appendix P for brief descriptions of the role and functions of each organization). It is the Information Systems (IS) Branch's policy to review, update, maintain, manage, and analyze all GIS data layers to ensure that this information is available to biologists, planners, and contractors quickly and readily, in digital or hard copy format.

Natural resources information management is complex because ecosystems and spatial data are complex, and the data necessary to develop composite pictures are inherently cross disciplinary. Ultimately, the utility and efficacy of GIS-based planning and analysis for natural resources management, integration, and implementation requires: 1) skilled and knowledgeable system administrators; 2) assurances of the quality and integrity of the data; and 3) adequate accessibility to the necessary technology by Base users, managers, and planners.

4.6.3.1. System Administrator/User Community

The value and efficacy of information management and GIS data is dependent upon both the knowledge and responsiveness of systems administrators to users' needs and the knowledge and capabilities of the system users. State-of-the-art technology is of little value if no one uses it.

First equipped with GIS capabilities in 1994, the Base has since been expanding and refining the application of this tool basewide. In 1997, efforts were begun to incorporate GIS technology within all areas of the Base's environmental and natural resources program. In 1997-98, a comprehensive GIS/IS User Needs Assessment was completed identifying program requirements for GIS. The assessment identified over 100 potential applications of GIS technology within the Base's environmental program. In addition, the assessment provided an analysis of the data requirements of the entire program in accordance with the existing Spatial Data Standards (SDS) for Facilities, Infrastructure, and Environment (SDSFIE).

4.6.3.2. Data Integrity and Technology Advancements

Equally important as the knowledge and capabilities of system administrators and users is the integrity of the data and the capabilities of the interfacing technology. The utility of data depends upon the quality and quantity of the information generated, as well as the format (e.g., application of universal standards) within which the data is stored.

The USACE Computer-Aided Design and Drafting (CADD)/GIS Technology Center for Facilities, Infrastructure, and Environment has been assigned to manage SDSFIE and develop revisions based on user feedback. The SDSFIE has focused on the development of graphic and non-graphic standards for GIS implementations at Air Force, Army, Navy, and

Marine Corps installations, the USACE Civil Works activities, and other government organizations.

The SDSFIE provides a standardized grouping of geographically referenced (i.e., geospatial) features or objects (i.e., real-world) depicted graphically on a map at their real-world location (i.e., coordinates). Each geospatial feature has an “attached” attribute table containing pertinent data about the geospatial feature.

The SDSFIE is the only “nonproprietary” GIS standard designed for use with the predominant commercially available off-the-shelf GIS and CADD (e.g., Environmental Systems Research Institute ArcInfo and ArcView; Intergraph MGE and GeoMedia; AutoDesk, AutoCAD, Map and World; and Bentley MicroStation and GeoGraphics), and relational database software (e.g., Oracle, Microsoft Access, and Microsoft SQL Server). This nonproprietary design, in conjunction with its universal coverage, has propelled the SDS into the standard for GIS implementations throughout the DoD, as well as the de facto standard for GIS implementations in other federal, state, and local government organizations, public utilities, and private industry throughout the U.S. and the world.

The SDSFIE (along with the Facility Management Standards for Facilities, Infrastructure, and Environment [FMSFIE]) is distributed via CD-ROM and the Internet (<http://www.sdsfie.org/>). A user-friendly, interactive Microsoft Windows-based software application installs the SDSFIE/FMSFIE “Browser” and “Generator” applications on desktop computers and networks. The “Browser” application provides viewing and printing capability. The “Generator” application generates Structured Query Language code for construction of the GIS database.

The CADD/GIS Technology Center annually updates and expands the SDSFIE. Before July 1999, the SDSFIE was known as the Tri-Service Spatial Data Standards and the FMSFIE was known as the Tri-Service Facility Management Standards. The SDS/FMS Release 1.90 and 1.95 were completed in December 1999 and April 2000, respectively. The SDSFIE/FMSFIE Release 2.00 was completed in January 2001. SDSFIE Release 2.50 was completed in October 2005. The currently approved version for the Marine Corps is SDSFIE 3.0 Gold. It has been approved as final by the DoD Real Property and Installation Lifecycle Management Investment Review Board (IRB). The official SDSFIE 3.0 Gold version was released on the SDSFIE website on 5 November 2010.

4.6.3.3. Information Integration: Storage, Access, and Dissemination

Data developed through fieldwork, surveys, and inventories as part of all AC/S ES managed contracts, cooperative agreements, and project specific surveys are incorporated within GIS layers and databases, which allows selection of specific information to be displayed for general basewide, project-specific, or training applications.

Natural resources data is made available to the Base community through the publication of three primary maps: the Camp Pendleton Military Installation Map, the Natural Resources Map, and the Environmental Operations Map. These maps provide training units and organizations on Base with information regarding the locations and distributions of

regulated natural resources on Camp Pendleton. For each environmentally significant area depicted on the maps, constraints, restrictions, and guidance are identified.

The Camp Pendleton Military Installation Map, published by the National Geospatial-Intelligence Agency (formerly known as Defense Mapping Agency and National Imagery and Mapping Agency), illustrates general land use and military operations on Camp Pendleton at a scale of 1:50,000 (1 inch represents 4,167 feet). While this map is useful as a general reference, it is revised only every few years (the most current version was revised in 2002) and the geospatial representation of data is not highly accurate for localized planning. To provide more up-to-date natural resources and land use information for general Base distribution, the AC/S ES IS Branch publishes a Natural Resources Map and an Environmental Operations Map. Revised more frequently than the Camp Pendleton Military Installation Map, the Natural Resources Map is printed at a similar scale and is for general planning purposes only. Alternatively, the Environmental Operations Map is published semiannually, at a larger scale (1:24,000) for use in the field, and in a black-and-white format for mass copying and distribution. The Environmental Operations Map is the primary natural resources reference map for Range Control, military trainers, fire department personnel, and Base managers and planners.

Beginning in 1998, efforts were directed towards implementation of a shared basewide enterprise GIS program. As a cooperative effort, the Base Policy and Technical Workgroups have established a framework for the organized, sustainable implementation of GIS technology throughout the Base that includes establishment of metadata standards in accordance with EO 12906, network connectivity between data partners, and the implementation of geospatial data standards.

The IS Branch of AC/S ES maintains an intranet website to increase access to environmental compliance and natural resources related information. This website will be used to disseminate environmental guidance, policy, natural resources data, GIS maps, and other information to Base managers and land users.

For non GIS-based data, AC/S ES is developing the organizational capacity and policy for the coordinated management of this resource. Tabular data and text information have historically been managed at the individual AC/S ES staff member or branch level through the use of desktop databases and other software programs. The lack of coordination and an absence of formal AC/S ES policy concerning the management of this information have resulted in less than optimal teamwork among branches, decreased efficiencies, a loss of corporate knowledge, and poor project turnover for new or reassigned employees.

One of the projects that AC/S ES has undertaken to improve the storage, maintenance, and accessibility of natural resource management information is the Digital Document Management System. The FileNet Digital Storage repository is used to establish the virtual library resource requirements for the archival and retrieval of data and documents. One objective of the Digital Document Management System program is to provide automated management of all Camp Pendleton environmental documentation for compliance with NEPA and MCO P5090.2A, including EAs, CXs, and EISs. All references cited in this INRMP are stored in and available through this system and have also been compiled on

CDs. These reference CDs are available at the Environmental Planning Office in the Environmental Security Building 22165 at Camp Pendleton.

[This page intentionally left blank.]