

CHAPTER 4

NATURAL RESOURCES MANAGEMENT

This chapter presents the natural resource management courses of action and goals for the various natural resources components that support the military operational and support requirements of MCB and MCAS Camp Pendleton. These courses of action are presented for each management and conservation program as specific objectives and projects/tasks (planned actions). The program policies, goals, objectives, and “High Priority Planned Actions” presented in this chapter were developed and prioritized to: (1) achieve Camp Pendleton’s natural resource management goals, (2) incorporate the principles of ecosystem management in all programs, and (3) support the military operational and support requirements of the Base. Camp Pendleton will seek appropriate funding and will set priorities based on the amount of funds actually received. In all cases, the year the planned action is to be accomplished refers to the calendar year. “Other Planned Actions” are identified for implementation as funding and resources permit and their delay is unlikely to cause management problems or failure to meet goals or mission support requirements. Where planned actions support more than one management program objective they are repeated under different subsections within the chapter.

The MCB Camp Pendleton AC/S Environmental Security provides the majority of program management for natural and cultural resource compliance and management on MCB Camp Pendleton. AC/S Environmental Security coordinates the integration of the other Assistant Chiefs of Staff natural resource actions within Camp Pendleton’s natural resource program and this plan. This includes planning for and accomplishing established goals, objectives, and planned actions to support the ongoing military mission of the Base. The AC/S Environmental Security routinely provides technical guidance regarding vegetation management, soil conservation, and management of federal threatened and endangered species, wetland conservation, fish and wildlife management, outdoor recreation, cultural resource protection, and GIS data management.

The MCAS Environmental Officer provides program management for natural and cultural resource compliance and management on the Air Station. Although the Air Station is under a separate command structure and has its own staff, Marine Corps Base and Marine Corps Air Station staff regularly collaborate to ensure that management and planning efforts are appropriately coordinated. Goals, objectives, and planned actions within this chapter include Air Station natural resource management programs.

The record of environmental stewardship and ecosystem management demonstrated by both Camp Pendleton and the United States Marine Corps, has yielded and will continue to yield, natural resources above and beyond the Base’s regional commitment. In doing this, the Base has been able to maintain a degree of flexibility in the implementation of the military mission and natural resource management. Camp Pendleton’s natural resources management program emphasis is on the inclusion of practical, economical, and effective management and control practices that incorporate ecosystem management principles as the basis for land use

planning and management. This approach takes a long term view of human activities, integrating military uses and requirements with biological resources. The goals are to sustain biological diversity and maintain continued availability of Camp Pendleton resources for military and other human uses. Ecosystem management practices require a shift from single to multiple species management, consistent with the requirements of Section 1531 *et seq.* of 42 USC (DoDI 4715.3). Camp Pendleton must be a link in the region's "matrix of biodiversity" but not an "island of biodiversity." Camp Pendleton is working to define and understand its regional relevance and commits to fulfill its responsibility to regional conservation efforts. Ecosystem management is innovative, requiring 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.

Camp Pendleton's natural resource management philosophy is that management programs should achieve the objectives of regulatory requirements and foster stewardship of the resources entrusted to Marine Corps while not constraining the ability to accomplish established and future military training requirements.

Camp Pendleton's determines the effectiveness of its natural resource management program through periodic measuring and monitoring of species population, habitat quantity and habitat values and comparing those values against goals and commitments established (in consultation with the USFWS) in the Estuarine and Beach Ecosystem Conservation Plan (Appendix H), the Riparian Ecosystem Conservation Plan (Appendix I) and the Upland Ecosystem Conservation Plan (Appendix J).

4.1 ECOSYSTEM MANAGEMENT

The distribution and abundance of species and communities and the ecological and physical processes that govern distribution and abundance occur irrespective of land ownership or management boundaries. Therefore, the long term success of conservation efforts in an ecoregion necessarily depends on coordination of land use decisions across and throughout the range of the species and communities of interest. A cohesive and seamless conservation strategy provides the best potential for conservation planning that supports sustainable land use.

Successful regional conservation strategies will require innovative and new approaches to land use decisions. Land management agencies and land use jurisdictions need to direct their assessment, conservation, and management efforts beyond current endangered, threatened, and candidate species and their associated habitats to all natural communities within the ecoregion. The underlying premise of this strategy is to plan for biodiversity in a coordinated and integrated fashion, across ownership and management boundaries.

It is Camp Pendleton's intent to preclude long term damage and degradation by managing natural resources through processes and programs that incorporate ecosystem requirements. Ecosystem management is not prescriptive and revolutionary, but predictive and evolutionary. It is flexible, adaptive, interactive, holistic, broadly inclusive of people, and

large scale. Natural resources management programs will continue to be directed toward achieving Camp Pendleton's natural resource goals. Camp Pendleton's ecosystem approach seeks to:

- 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 sensitive species. Native plant communities shall be maintained by natural processes and not be artificially manipulated, except as needed to restore depleted natural resources, or where areas are isolated from natural dynamics of the ecosystem;
- 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 occurrence of wildfires caused by Base activities through the Fire Danger Rating system and controlled/prescribed burns in coordination with adjacent land managers;
- Achieve greater biological diversity and distribution of native species, especially federal threatened and endangered species populations, throughout the region/ecosystem;
- Establish self-sustaining populations of listed species that require little human intervention for maintenance; and
- Develop effective partnerships among private and government agencies.

Ecosystem management is a process that considers the environment as a whole, not as a collection of parts, and recognizes that people and their social and economic needs are an integral part of the whole. Ecosystems are complex and dynamic by nature, with components that are interrelated and operating at different rates. An ecosystem functions as a whole, not as a collection of parts; its integrity may be disrupted by excessive "interference" of any single component. The listing of programs and planned actions as separate stand alone components in the following sections does not reflect the Base's method of management or organization and are organized for the purpose of establishing a framework to integrate similar functions towards achieving established goals and objectives.

GOAL: To manage Camp Pendleton's natural resources using an ecosystem management approach.

OBJECTIVE: Develop a collaborative vision of desired future conditions that integrates ecological, socioeconomic, and institutional perspectives, applied with a geographic framework defined primary by natural ecological boundaries.

High Priority Planned Actions:

- In collaboration with Camp Pendleton land users, federal, state, tribal, local governments, nongovernmental organizations, private organizations, and the public, develop a shared vision of what constitutes desirable future ecosystem conditions. 2003.
- In collaboration with Camp Pendleton land users, federal, state, tribal, local governments, nongovernmental organizations, private organizations, and the public, develop a shared vision of what constitutes desirable future watershed conditions for the Santa Margarita River and the San Mateo Creek. 2003.

OBJECTIVE: Develop a framework for performing adaptive management.

High Priority Planned Actions:

- Develop and implement a formal lessons learned protocol to facilitate adaptive management. 2002.

OBJECTIVE: Develop an understanding and involvement in other regional ecosystem based conservation plans.

High Priority Planned Actions:

- Obtain available vegetation data for areas that are surrounding and adjacent to Camp Pendleton and enter it into a GIS database. 2002.
- Assess the feasibility and desirability to conduct off-Base surveys of selected species and habitat types, water quality monitoring, and hydrographical surveys to contribute to the understanding of Camp Pendleton's regional contribution to their conservation and recovery. 2003.
- Sponsor/support scientific research in support of regional understanding and Base management goals by qualified personnel. Ongoing.
- Develop a decision support framework for performing ecosystem management. 2002.

- Maintain a regional planning database and perspective on regional plans, habitat conservation plans, and other initiatives in the Riverside, Orange and San Diego County Area. Ongoing.

4.2 NATURAL RESOURCES INVENTORY

Maintaining a natural resources inventory helps guide land use, land management, and restoration decisions that facilitate the sustainability of military activity over time. 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 taxa and habitat types 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.

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 Biological Opinion terms and conditions, NEPA procedures, etc.). As funding becomes available, additional surveys may be 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 annual status of golden eagle (*Aquila chrysaetos*) and other raptor nests.

The establishment and maintenance of a natural resources inventory is an essential component of conservation and adaptive management (DoDI 4715.3). 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 efficient and effective accomplishment of management program goals and objectives.

GOAL: Develop and maintain an inventory of natural resources to support management programs and the ability to conserve and enhance native fauna and flora and the functional value of natural systems.

GOAL: Categorize natural processes and impacts to natural resources through monitoring, investigative research, and data analysis in order to make informed decisions necessary for maintaining training lands.

GOAL: Continue to develop and maintain comprehensive data collection and processing systems to facilitate informed management decisions.

GOAL: Ensure that scientifically sound and commonly accepted data collection methods and sampling techniques are used to update natural resource inventories.

4.2.1 Vegetation and Habitat Mapping

Fundamental to the understanding of land use and land management capabilities, and the assessment of community and ecosystem health, is the identification of vegetation types and their distribution on Base (along with climate, available moisture, and other physical features of a landscape). Vegetation largely determines the type and distribution of animals that can be supported by a system. Compared to animal populations, vegetation is relatively stable over time. Therefore, the required frequency for vegetation mapping is less than that for animals. Nonetheless, the description, classification, and mapping of vegetation on Base are not without complexities. For example, there is no universally agreed upon method for describing or classifying vegetation. The assemblage of species within vegetation types varies continuously. No two hillsides have exactly the same vegetation. On Southern Californian shrub lands, it is common to have a “patchwork” or mosaic of small blocks of different community types with indistinct transition zones between them.

The GIS vegetation coverage currently in use by Camp Pendleton’s natural resource managers and planners was originated by the San Diego Association of Governments (SANDAG) in the early 1990s, and updated in 1995. SANDAG’s vegetation mapping was part of a countywide 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 in the mapping efforts.

Due to its limited size, the MCAS has collected vegetation data at a higher resolution than the rest of the Base (with the exception of site specific surveys for projects). A vegetation survey of the Air Station was recently completed and is expected to serve as the primary planning data set over the next five years. Moreover, floodplain and wetlands delineations have been completed for the entire Air Station.

OBJECTIVE: Develop and maintain an inventory of vegetation and selected habitat types on Camp Pendleton and in surrounding communities (e.g., distributions, occurrences, incidental take, photographic archive, etc.), using high quality and up-to-date GIS maps where appropriate and desirable.

High Priority Planned Actions:

- Ensure that all GIS layers from surveys conducted on Camp Pendleton are in a format that meets specified in-house criteria (Appendix N). Ongoing.

- Conduct high resolution aerial photography of the riparian and estuarine areas on Camp Pendleton every two years. 2002, 2004.
- Conduct high resolution ortho rectified photography of the entire Base every five years. 2003.
- Conduct high resolution aerial photography of upland habitats on Camp Pendleton at the frequency required under the Upland Biological Opinion. TBD.
- Obtain available vegetation data for areas that are surrounding and adjacent to Camp Pendleton and enter it into a GIS database. 2002.
- Track plant community distribution, habitat function and value, and vegetation age classes. Ongoing.
- Continue to develop a GIS wetlands mapping coverage for Camp Pendleton that supports proactive planning and impact avoidance. Ongoing.
- Maintain high quality and up-to-date GIS mapping of vernal pools on Camp Pendleton that supports proactive planning and avoidance of impacts. Ongoing.
- Assess the feasibility and desirability to conduct off-Base surveys of selected species and habitat types, water quality monitoring, and hydrographical surveys to contribute to the understanding of Camp Pendleton's regional contribution to their conservation and recovery. 2003.

Other Planned Actions:

- Initiate floodplain delineations and watershed analyses basewide. Through appropriate hydrographic modeling, determine the various flood event levels for selected areas on Base.
- Establish a photographic archive of each vernal pool group to help monitor changes over time.
- Update basewide vegetation mapping of Camp Pendleton every four to five years. As needed, perform minor updates.
- Coordinate the acquisition of aerial photographs of watersheds.

4.2.2 Species Specific Surveys/Monitoring

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 (e.g., size, density, and distribution) and habitat type and quality over time. The Base conducts surveys and monitoring for selected species for a variety of reasons. A high priority for natural resources management is the monitoring of federal threatened and endangered species on Base to ensure compliance with regulatory requirements and to assist in the recovery efforts for those species. Selected candidate, rare, sensitive (e.g., state listed), and other (e.g., game and exotic) species may also be surveyed or monitored. This will help prepare the Base for potential future listings, assist with the management of consumptive recreational programs, evaluate the efficacy of management techniques, and provide additional indices of ecosystem health.

OBJECTIVE: Develop and maintain an inventory of *federal threatened and endangered species* on Camp Pendleton (e.g., distributions, occurrences, breeding success, predation rates, incidental take, etc.), using high quality and up-to-date GIS maps where appropriate and desirable.

High Priority Planned Actions:

- Ensure that all federal threatened and endangered species known to occur on Base are monitored in accordance with USFWS Biological Opinions. (See Threatened and Endangered Species Management, High Priority Planned Actions)
- Use the Environmental Incident Reporting System to collect, maintain, and report information about environmental incidents that occur on Camp Pendleton. Ongoing.
- Survey for the southern steelhead as determined in consultation with NMFS. As needed conduct genetic tests on a representative sample. TBD.
- Continue to implement the monitoring program that tracks compliance with the levels of take, and the measures and terms and conditions of the Incidental Take Section of the Riparian Biological Opinion. Ongoing.
- Establish an Incidental Take Database that will catalog incidental takes on the Air Station. 2001.
- Assess the feasibility and desirability to conduct off-Base surveys of selected species and habitat types, water quality monitoring, and hydrographical surveys to contribute to the understanding of Camp Pendleton's regional contribution to their conservation and recovery. 2003.
- Collect survey data on isolated ephemeral wetland invertebrates, including the endangered San Diego fairy shrimp and the Riverside fairy shrimp at levels and intervals to be determined in the Uplands Biological Opinion issued by the USFWS. TBD.

Other Planned Actions:

- Survey for California red-legged frog.
- Survey for the quino checkerspot butterfly as required by survey protocol.
- Facilitate annual light-footed clapper rail surveys on Base.

OBJECTIVE: Develop and maintain an inventory of selected *candidate, rare, and sensitive species* on Camp Pendleton. (e.g., distributions, occurrences, breeding success, predation rates, incidental take, etc.), using high quality and up-to-date GIS maps where appropriate and desirable.

High Priority Planned Actions:

- Develop a standardized, regionally coordinated, system for recording and mapping significant resource observations (plants, wildlife, erosion, damage, etc.). 2002.
- Assess the feasibility and desirability to conduct off-Base surveys of selected species and habitat types, water quality monitoring, and hydrographical surveys to contribute to the understanding of Camp Pendleton's regional contribution to their conservation and recovery. 2003.
- Collect survey data on isolated ephemeral wetland invertebrates, including the endangered San Diego fairy shrimp and the Riverside fairy shrimp at levels and intervals to be determined in the Uplands Biological Opinion issued by the USFWS. TBD.

Other Planned Actions:

- Develop an inventory program for wildlife species of regional concern with a specific focus on those species on the Base likely to become proposed for federal listing as threatened or endangered in the near future.
- Survey for rare plant species to facilitate management planning
- Continue to evaluate the status of raptor populations and reproduction on Camp Pendleton.
- Establish a wildlife population trend monitoring program for existing native sensitive and nongame fish and wildlife species as a component of long term ecological trend monitoring.

OBJECTIVE: Develop and maintain an inventory of *other* species on Camp Pendleton (e.g., distributions, occurrences, breeding success, predation rates, incidental take, etc.), using high quality and up-to-date GIS databases where appropriate and desirable.

High Priority Planned Actions:

- Collect survey data on isolated ephemeral wetland invertebrates, other than candidate, rare and threatened and the endangered San Diego fairy shrimp and the Riverside fairy shrimp at levels and intervals to be determined in the Uplands Biological Opinion issued by the USFWS. TBD.
- Sponsor/support scientific research in support of regional understanding and Base management goals by qualified personnel. Ongoing.
- Develop a standardized, regionally coordinated system for recording and mapping significant resource observations (plants, wildlife, erosion, damage, etc.). 2002.
- Participate in Annual Christmas Bird Count on the Air Station levee to compile a census of what birds are winter residents on the Air Station. Ongoing.
- Obtain Audubon Society bird data collected on Camp Pendleton. 2003.
- Conduct Spring Bird Count on the Air Station to provide a comprehensive record on the numbers of birds at the Station during the spring. Ongoing.
- Map the spread of exotic plants and successful removal by control programs, including regional data when possible. Ongoing.

Other Planned Actions:

- Document observations of all exotic competitors/predators found on Base during other survey efforts.
- Continue to evaluate the status of raptor populations and reproduction on Camp Pendleton.
- Establish a wildlife population trend monitoring program for existing native sensitive and nongame fish and wildlife species as a component of long term ecological trend monitoring.

4.2.3 Long Term Trend Monitoring and Analysis

The long term 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 discussed in the previous section, to monitoring of 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 this section are initiatives such as the Base's Long Term Ecological Trend Monitoring (LTETM) project, the monitoring of abiotic factors (e.g., erosion, fire, and water quality), the monitoring of anthropogenic impacts. Several of the trend monitoring actions included in this section are considered components of other management programs on Base as well (e.g., erosion control and fire management).

The LTETM project is a continuation of and modification to the Land Condition Trend Analysis project that was initiated in 1990. LTETM serves as an annual data gathering tool to monitor ecosystem changes, the potential impacts of land use, and the efficacy of natural resource management practices. The LTETM project consists of nearly two hundred 100-m-long line transect permanent sample sites ("core" plots) and "special use" plots that are established as needed. To date, 38 special use plots have been established to monitor fire, erosion, restoration efforts, the effects of military training on Vasey's button celery (*Eryngium vaseyi*), population dynamics of thread-leaved brodiaea (*Brodiaea filifolia*) and many-stemmed hasseanthus (*Dudleya multicaulis*), and population dynamics and fire ecology of Englemann oak (*Quercus englemanii*) woodlands.

To support erosion control efforts (See General Vegetation Management and Soil Conservation), the Base began identifying and monitoring locations of erosion problems basewide in the early 1990s. In 1997, a database of erosion sites (Soil Erosion Field Inventory) was developed to assist the Base in prioritizing its limited resources to better focus on areas where success was readily achievable.

Effective mapping and consistent knowledge of fire location, frequency, size, and pattern is necessary for long term trend analyses and proactively managing fire (see Section 4.11). Gaps in the fire records and inconsistent and sometimes inaccurate mapping of fires have made management difficult for the Base in the past. A fire history for Camp Pendleton, which was built from a combination of available records and remote sensing interpretation, was compiled as part of the update of the fire management plan in 1998. Since 1997, the Base has mapped the boundaries of all wildland fires greater than five acres in size outside of the impact areas (excluding prescribed burns). The intensity of burning within a fire perimeter had never been well documented on the Base. Yet, burning intensity can have enormous implications on the amount of vegetation removal and subsequent recovery rates for vegetation and habitat values. Development of a practical method for mapping burning intensities was finalized for the 1999 fire season.

OBJECTIVE: Monitor and analyze long term ecological, abiotic, and anthropogenic trends that will contribute to the understanding of ecosystem processes and to the ability to adaptively manage for a sustainable system.

High Priority Planned Actions:

- Map the spread of exotic plants and successful removal by control programs, including regional data when possible. Ongoing.
- Develop GIS layers of comparable datasets that allow for spatial and temporal change detection in populations of selected species and sensitive habitat types. Ongoing.
- Continue to monitor tide levels and water quality in the Santa Margarita River; evaluate potential changes to the estuarine ecosystem as a result of ongoing watershed actions and projects and document the periods when the other coastal lagoons are subject to tidal influence. Ongoing.
- Continue groundwater monitoring in all drainages where groundwater is extracted to determine and manage the potential effect on listed species habitat.] Ongoing.
- Monitor stream water quality, flood regimes, and storm event frequency. Ongoing.
- Use the Environmental Incident Reporting System to collect, maintain, and report information about environmental incidents that occur on Camp Pendleton. Ongoing.
- Evaluate the feasibility of adding portions of tracking systems (Range Facility Management Support System, E-Trax, etc.) that records the level of ongoing programmatic activities and document trends in the frequency, magnitude, and extent of these activities to Natural Resources GIS layers. 2004.
- Develop and implement a Photo Transects Program to document and track changes in targeted areas around the Air Station. 2001.
- Develop and begin implementation of a formal LTETM monitoring plan for the Air Station. 2002.
- Develop and begin implementation of a long term ecological monitoring program on the Air Station. 2002.

Other Planned Actions:

- Conduct annual monitoring of Long Term Ecological Trend Monitoring plots.
- Establish a digital and georeferenced photographic archive in GIS of each vernal pool group to help monitor changes over time.

- Digitize, with high resolution scanning, the historical and ongoing aerial photos of the Base and provide archival storage protection for the original prints.

4.3 WETLANDS, ESTUARY/COASTAL, AND RIPARIAN MANAGEMENT

This section addresses the management of wetlands, estuary/coastal, and riparian areas on Camp Pendleton. Although wetlands include a wide range of habitat types, including swamps, marshes, and bogs, wetlands on Base are primarily riparian systems, estuaries, isolated ephemeral wetlands, and vernal pools. Descriptive statistics for wetlands, estuary/coastal, and riparian areas on Base are presented in Chapter 2. Management and use of these areas requires careful consideration of the CWA, ESA, and the national policy (Executive Order 11990) to prevent an overall net loss of wetlands. Legislation and regulations relevant to wetlands, estuary/coastal, and riparian management are summarized in Appendix A.

Specific goals and commitments for quantities and quality of wetlands, estuary/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 H) and the Riparian Ecosystem Conservation Plan (Appendix I).

Camp Pendleton's Riparian and Estuarine/Beach Conservation Plans are habitat based. Their management strategy focuses on increasing habitat quality by eradicating exotic vegetation and encouraging growth of native vegetation, 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 threatened and endangered species and other species that utilize these habitats on Base.

These conservation programs take an adaptive management approach. 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. In the face of uncertainty, the most prudent strategy is to recognize the possibility of surprise, act to detect it, and correct avoidable error.

The general management approach of these conservation plans can be characterized as the "managing of impacts." As such, they are divided into two components, one for the management of impacts that are *temporary* (e.g., from ongoing activities such as training, maintenance, and recreation) and one for those that are *permanent* (e.g., from infrastructure development projects).

For the management of temporary impacts from ongoing activities a suite of basewide management programs that directly and/or indirectly benefit listed species has been established to compensate for the temporary impacts that do occur. The goal of these compensation measures is to improve habitat value over time, thereby supporting larger populations of listed species.

For activities that would result in a permanent impact (often referred to as “projects”), the Base has established the following management strategy:

- A minimum habitat acreage guarantee has been established 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 Service and the Base for projects/permanent impacts.
- 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.

GOAL: Incorporate principles of ecosystem management into wetlands and coastal management to conserve and enhance native fauna and flora and the functional value of natural systems.

GOAL: Manage wetlands and coastal areas so they remain available and suitable for amphibious, land, and air based training.

GOAL: Monitor, conduct investigative research, and analyze data in order to make informed decisions necessary for maintaining training lands.

4.3.1 General Wetlands, Estuary/Coastal, and Riparian Management

Wetlands are highly productive, complex ecosystems. Wetland management is a challenge nationally and more so in California, which has lost a greater proportion of its original wetlands than any other state. General wetlands 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. Any facility requirement 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 Environmental Protection Agency (EPA) and Army Corps of Engineers (ACOE) guidelines or permit provisions.

OBJECTIVE: Manage wetlands on Camp Pendleton to ensure no net loss of wetland functions and values.

High Priority Planned Actions:

- Ensure that all natural resource staff and/or contractors responsible for wetland conservation have obtained wetlands regulatory and policy training and formal delineation training and that at least one staff member has received this training at all times. 2002.
- Comply with Section 404 Clean Water Act permits issued by the ACOE to (1) ensure compliance with permits issued for DoD actions on the Base; and (2) to monitor the execution of special conditions of permits issued to non-DoD agency proposed actions. Ongoing.
- Conduct high resolution aerial photography of the riparian and estuarine areas on Camp Pendleton every two years. 2002, 2004, 2006.
- Continue Base GIS wetlands mapping for Camp Pendleton in support of proactive planning and impact avoidance. Ongoing.
- Track plant community distribution, habitat function and value, and vegetation age class. Ongoing.
- Continue until 2003 the study of the effects of the absence of effluent release into the Santa Margarita River. 2002, 2003.
- Develop an assessment of and apply for a programmatic general permit for maintenance of diversion facilities, road crossings, culverts, and bridges through wetlands and flood prevention actions. 2004.

Other Planned Actions:

- Document in GIS layers the observations of all exotic competitors/predators found in riparian/estuarine zones on Base during other survey efforts.
- Identify candidate sites for future wetland mitigation to compensate for unavoidable wetland value losses (and include in future master planning documents).
- Enter into agreements to credit the Base for wetlands creation or enhancement in connection with Permit 15,000 development or Base participation in or cooperation with the Murrieta Creek Flood Control Project.

- Enter into agreements to implement a Santa Margarita River watershed wetlands management program, which includes Base credits or banking for beneficial actions upstream of the Base.

OBJECTIVE: Manage floodplains on Camp Pendleton to minimize the impact of floods on human safety, health and welfare, and to restore and preserve the natural and beneficial values served by floodplains.

High Priority Planned Actions:

- During project and NEPA review, ensure that direct or indirect adverse impacts to floodplains are avoided or minimized when possible. Ongoing.

Other Planned Actions:

- Initiate floodplain delineations and watershed analyses basewide. Through appropriate hydrographic modeling, determine the various flood event levels for selected areas on Base.

4.3.2 Isolated Ephemeral Wetlands/Vernal Pool Management

A number of areas at Camp Pendleton contain a wetland habitat known as isolated ephemeral wetlands. These isolated ephemeral wetlands occur naturally on hummocky soils with impervious subsurface layers, in swales between “mima mounds,” or in other depressions that impound water. Water ponds in these depressions in the winter and spring, and dries later in the year. Specialized plant and animal species adapted to the seasonal wet and dry cycle thrive in many isolated ephemeral wetlands, including a number of sensitive plant and wildlife species, four of which are federally listed: spreading navarretia (*Navarretia fossalis*), San Diego button-celery (*Eryngium aristulatum* var. *parishii*), Riverside fairy shrimp (*Streptocephalus woottoni*), and San Diego fairy Shrimp (*Branchinecta sandiegoensis*). Vernal pools are a type of isolated ephemeral wetlands and are differentiated from other isolated ephemeral wetlands by their assemblage of floral species.

Currently, Camp Pendleton has completed an initial and one follow-up basewide inventory of isolated ephemeral wetlands (including vernal pools) and is in consultation with the USFWS for the management the four listed species that are associated with vernal pools (in the Uplands Biological Assessment).

Management initiatives proposed within the Biological Assessment of Upland Habitats (currently under consultation with the USFWS) focus on the listed species and occupied pools. However, isolated ephemeral wetlands and vernal pools in general (including unoccupied pools) are expected to benefit from the proposed management for minimizing or avoiding the potential impacts from programmatic activities on Base. The Biological

Assessment of Upland Habitats has a proposed system of “management levels” that addresses the impacts from training and related activities. Training areas on Base are either designated as Management Level 1 or Management Level 2. Training is permissible in both Management Levels; however, Management Level 2 areas have enhanced programmatic instructions intended to provide a higher level of avoidance and minimization of environmental impacts by personnel training on the Base.

Fifty percent of all known locations of pools (including isolated ephemeral wetlands and vernal pools) occur within the more protective Management Level 2 areas on Base. Moreover, according to the habitat quality classification system developed within the Isolated Ephemeral Wetlands Management Plan, the pools proposed for inclusion within Management Level 2 areas tend to be all of higher quality than the pools within Management Level 1 areas. Habitat quality for the classification system was assessed in terms of level of disturbance, soil profiles, and plant species diversity. The pool class scale ranges between 1 (high quality habitat) and 4 (low quality habitat). All Class 1 pools and 85% of Class 2 pools on Base are proposed for inclusion in the more protected Management Level 2 areas. Of the Class 3 and Class 4 pools, 46% and 42% respectively, are proposed for inclusion in Management Level 2 areas.

Wetlands in general and all pools occupied with listed species (in both Management Levels) receive protection from nontraining activities on Base through the use of programmatic instructions to avoid and minimize adverse impacts. A permanent project impact to occupied pools or jurisdictional wetlands requires mitigation. Projects that have the potential to impact vernal pools are evaluated on a watershed scale. As proposed within the Biological Assessment of Upland Habitats, Camp Pendleton is committed to maintaining free from permanent impact a percentage of the pools currently occupied by listed species as a commitment and contribution to regional recovery efforts. This regional commitment includes 25% of the pools currently occupied with San Diego fairy shrimp, 70% of the pools with Riverside fairy shrimp, 75% of the pools with the San Diego button celery, and 78% of the pools with spreading navarretia.

OBJECTIVE: Protect the natural and beneficial functions of the Camp Pendleton’s isolated ephemeral wetlands, including vernal pools. Take proactive action to prevent damage to vernal pools.

High Priority Planned Actions:

- Maintain high quality and up-to-date GIS layers of vernal pools on Camp Pendleton that support proactive planning and avoidance of impact. Ongoing.
- Continue to develop a GIS wetlands mapping coverage for Camp Pendleton that supports proactive planning and impact avoidance. Ongoing.
- Upon receipt from the USFWS, develop and implement the required elements of the Upland Biological Opinion. TBD.

- Use various media to create and maintain awareness of Base personnel, general public, and lease and easement holders of the sensitivity, values, and obligations regarding the conservation of vernal pools and their watersheds. This may include presentations, briefs, newspaper articles, special messages, informational brochure, and interpretive signs. Ongoing.
- Ensure that the Range and Training Regulations (Base Order P3500.1_), when revised, contains information and programmatic instructions to minimize damage to vernal pools by units training on the Base. 2003, 2005.
- Replace deteriorated field markers, signs, or fencing around vernal pool groups with a higher susceptibility for damage to prevent accidental and/or unintentional damage every other year. 2002, 2004.
- Place new field markers, signs, or fencing around vernal pool groups with a high susceptibility for damage to prevent accidental and/or unintentional damage. Ongoing.
- Work continuously with project and activity planners to avoid or minimize impacts to vernal pools early in the planning process. Ongoing.

Other Planned Actions:

- Design and develop a permanent vernal pool public education and interpretive display for public education on Base.
- Identify potential impacts that lessee and right-of-way holder activities could have to vernal pools and other resources.
- Map other isolated ephemeral wetlands, and fully map watersheds of vernal pools and isolated ephemeral wetlands.

4.3.3 Estuary/Coastal Zone Management

The management of estuary/coastal zone areas on Base is presented in the Estuarine/Beach Ecosystem Conservation Plan (Appendix H) and the Riparian and Estuarine/Beach Biological Opinion [1-6-95-F-02]. The Estuarine/Beach Ecosystem Conservation program is designed to sustain and enhance estuarine and beach ecosystem dynamics 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 Cockleburr, French, Hidden, Aliso, Las Flores, San Onofre, and San

Mateo Creeks. Conservation efforts are being accomplished through active management efforts (e.g., protective fencing, warning signs, predator management, exotic vegetation control, monitoring of estuary salinity and tidal conditions) 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 and Estuarine/Beach Biological Opinion (1-6-95-F-02) are being actively pursued to promote recovery of the appropriate species. Management proscriptions emphasize avoiding locating projects in estuary and beach areas to avoid permanent impacts from construction.

Base operations, activities, projects, and programs that affect the land, water, or natural resources of any coastal zone must be consistent, to the maximum extent practicable, with the policies of California's Coastal Zone management program. The Base supports the development and implementation of state coastal nonpoint pollution control programs on Marine Corps lands by identifying nonpoint sources, specifying corrective measures, and coordinating nonpoint source compliance efforts with state programs (MCO P5090.2A). Camp Pendleton has identified areas of sensitive natural resources of the coastal zone, minimized the loss or degradation of coastal wetlands, enhanced the natural value of wetlands, and protected water quality.

The effectiveness of Camp Pendleton's estuary/coastal zone management program will be determined through periodic measuring and monitoring of species population, habitat quantity and habitat values and comparing those values against goals and commitments established (in consultation with the USFWS) in the Estuarine and Beach Ecosystem Conservation Plan (Appendix H).

OBJECTIVE: Protect and rehabilitate the natural and beneficial functions of the Base's estuaries and coastal zones. Continue to implement the Estuarine/Beach Ecosystem Conservation Plan, as specified in the Riparian and Estuarine/Beach Habitats Biological Opinion issued by the USFWS.

High Priority Planned Actions:

- Continue to monitor tide levels and water quality in the Santa Margarita River; evaluate potential changes to the estuarine ecosystem as a result of ongoing watershed actions and projects and document the periods when the other coastal lagoons are subject to tidal influence. Ongoing.
- Monitor the effects of sedimentation in the Santa Margarita River Estuary and coastal lagoons that are subject to upstream disturbance from programmatic, construction activities and off Base activities. Ongoing.
- Continue to implement programmatic instructions for activities in and adjacent to riparian and estuarine/beach habitats. Ongoing.

- Obtain concurrence from the USFWS that impacts are adequately offset by the Estuarine/Beach Ecosystem Conservation Plan for any activity not specifically addressed in the programmatic instructions of the plan or otherwise covered in the Riparian and Estuarine/Beach Biological Opinion. Ongoing.
- Rehabilitate estuarine/beach areas temporarily disturbed due to nonroutine maintenance and construction activities to original or better condition. Ongoing.
- Develop a habitat enhancement plan for the San Onofre estuary. 2003.

Other Planned Actions:

- Restore and enhance coastal dunes.
- Reduce encroaching bluff erosion. Submit specific projects through normal Base staffing procedures and the Base NEPA process for decision and approval.
- Develop specific habitat enhancement plans for estuaries other than the San Onofre Estuary.
- Monitor sediment load and model sediment transport in the Santa Margarita River mainstem and the estuary.

4.3.4 Riparian Habitat Management

Riparian habitat management is accomplished through implementation of the Riparian Ecosystem Conservation Plan (Appendix I) and the Riparian and Estuarine/Beach Biological Opinion [1-6-95-F-02]. The Riparian Ecosystem Conservation Plan is designed to maintain and enhance the biological diversity of the riparian ecosystem on Camp Pendleton. The conceptual approach behind this conservation plan is to sustain and restore riparian ecosystem dynamics so that natural plant and animal communities on the Base are sufficiently resilient to coexist with current and future military training activities. The success of this plan is primarily measured by the species richness and an increase in ecosystem health and value.

The plan identifies the major riparian habitats and quantifies the baseline (as present in 1994) acreage for each. The plan also assigns values to habitat types based on their suitability for current threatened and endangered species. These values were qualitatively developed based on information related to the distribution and abundance of threatened and endangered species and what was then known about their life history requirements. The riparian plan is a commitment to promote an increase in the quantity of riparian woodland and riparian scrub habitat throughout all the Base's watersheds, beyond the baseline established in the Santa Margarita River Memorandum of Understanding. Further, it promotes the maintenance of the open water/gravel areas and marsh areas within the baseline. Conservation efforts are

focused on the eradication of exotics for various habitat categories and conversion of this acreage to riparian woodland riparian scrub or open gravel areas in pursuit of the goal of promoting growth in threatened and endangered species (primarily least Bell's vireo [*Vireo bellii pusillus*], southwestern willow flycatcher [*Empidonax traillii extimus*], and arroyo toad [*Bufo californicus*]) populations.

The effectiveness of Camp Pendleton's riparian habitat management will be determined through periodic measuring and monitoring of species population, habitat quantity and habitat values and comparing those values against goals and commitments established (in consultation with the USFWS) in the Riparian Ecosystem Conservation Plan (Appendix I).

OBJECTIVE: Continue to implement the Riparian Habitat Conservation Plan, as specified in the Riparian and Estuarine/Beach Habitats Biological Opinion issued by the USFWS.

High Priority Planned Actions:

- Continue to implement programmatic instructions for activities in and adjacent to riparian and estuarine/beach habitats. Ongoing.
- Obtain concurrence from the USFWS that impacts are adequately offset by the Estuarine/Beach Ecosystem Conservation Plan for any activity not specifically addressed in the programmatic instructions of the plan or otherwise covered in the Riparian and Estuarine/Beach Biological Opinion. Ongoing.
- Develop and implement mitigation measures for future proposed training and maintenance actions (that are not addressed in the Riparian and Estuarine/Beach BO) that may affect listed species or riparian habitat. Ongoing.
- Rehabilitate riparian areas temporarily disturbed due to nonroutine maintenance and construction activities to original or better condition. Ongoing.
- Conduct high resolution aerial photography of the riparian and estuarine areas on Camp Pendleton every two years. 2002, 2004.
- Track plant community distribution, habitat function, value and vegetation age classes. Ongoing.

Other Planned Actions:

- Implement an effective dust control program to help minimize fugitive dust and sedimentation problems.

- Reduce or eradicate exotic vegetation from riparian areas and temporarily disturbed sites on Camp Pendleton in accordance with the Riparian Ecosystem Conservation Plan and the Riparian and Estuarine/Beach Biological Opinion. Ongoing.

4.4 WILDLIFE MANAGEMENT

Fish and wildlife management is defined by the Marine Corps as "A coordinated program of actions designed to preserve, enhance, and regulate indigenous wildlife and its habitats, including the conservation of protected species and nongame species, management and harvest of game species, reduction in bird aircraft strike hazard (BASH), and animal damage control" (MCO P5090.2A). It is the Marine Corps policy that installations must comply with laws for the protection and management of wildlife resources and must develop, where compatible with military requirements, programs for the development, enhancement, and use of wildlife resources.

Topics included in this section are general wildlife management, migratory bird management, wildlife damage management (including BASH), integrated pest management, and game species and sport fisheries management. Pest management is included as it has potential effects on fish and wildlife, particularly with the application of pesticides. Federally listed species management and the exotics control program are addressed separately in following sections. Legislation and regulations relevant to fish and wildlife management are summarized in Appendix A.

GOAL: Incorporate ecosystem and adaptive management into management programs to conserve and enhance native fauna and the functional value of natural systems.

GOAL: To better understand natural processes and impacts use monitoring, investigative research, and data analysis to make informed decisions necessary for maintaining training lands.

4.4.1 General Wildlife Management

All species of wildlife benefit from Camp Pendleton's basic strategy to maintain training areas in a natural state in support of training, reduce adverse impacts from activities, minimize development, and perform mitigation actions where impacts occur to threatened or endangered species, vernal pools, and other wetlands. The protection (via enhanced programmatic instructions) of riparian and estuarine/beach habitats and Management Level 2 areas (as proposed within the Biological Assessment of Upland Habitats) is ostensibly for federally listed species; however, numerous non listed, native species also benefit from these areas of reduced impacts. The basis of good management is understanding the diversity, abundance, distribution, population dynamics, and habitat requirements of species. While not feasible to survey and monitor all wildlife populations on Base, some species, such as federally listed species, help to provide indicators of ecosystem health in general. Moreover, the Base continues to conduct, or support others in conducting, studies that help managers to better understand the diversity and distribution of wildlife resources on Base. These studies

include monitoring neotropical migrant birds, arthropod surveys, lepidoptera surveys, bat surveys, herpetological surveys, and mule deer surveys. Indirectly, other proactive resource management initiatives, such as vegetation enhancement, will help protect the viability of wildlife populations on Camp Pendleton.

OBJECTIVE: Manage existing native sensitive and nongame fish and wildlife species in order to support and maintain self-sustaining populations.

High Priority Planned Actions:

- In collaboration with Camp Pendleton land users, federal, state, tribal, local governments, nongovernmental organizations, private organizations, and the public, develop a shared vision of what constitutes desirable future ecosystem conditions. 2003.
- Provide focused training to the natural resources staff members responsible for wildlife management. Ongoing.
- Identify controlled burn or other brush management areas that will be valuable for maintaining or enhancing mosaic and diversity of vegetative age classes and enhance wildlife diversity. This will compliment the Camp Pendleton Wildland Fire Management Plans and Uplands Ecosystem Conservation Plan. 2004.

Other Planned Actions:

- Establish a wildlife population trend monitoring program for existing native sensitive and nongame fish and wildlife species as a component of long term ecological trend monitoring.

4.4.2 Migratory Bird Management

The primary consideration with regard to migratory birds is compliance with the Migratory Bird Treaty Act (MBTA). The MBTA is an international agreement between the United States, Canada, and Mexico that protects designated species of birds. Virtually all birds that occupy Camp Pendleton throughout the year are protected under the act. The MBTA controls the taking of these birds, their nests, eggs, parts, or products. It states that it is unlawful at any time, by any means or in any manner, to pursue, hunt, take, capture, kill, attempt to take, attempt to capture, or attempt to kill, purchase, offer to purchase, deliver for shipment, ship, export, import, cause to be shipped, deliver for transport, transport or cause to be transported, carry or cause to be carried, or receive for shipment, transportation, carriage, or export, possess, offer for sale, sell, offer to sell, barter, offer to barter, any migratory bird, any part, nest, or egg of any such bird, or any part, nest, or egg thereof; unless and except as permitted by regulations in the MBTA.

All persons, organizations, and agencies, are liable for prosecution for violations and must follow permitting requirements for taking migratory birds. Special purpose permits may be requested and issued that allow for the relocation or transport of migratory birds for management purposes.

On 10 January 2001 Executive Order 13186 was issued requiring each federal agency taking actions that have, or are likely to have, a measurable negative effect on migratory bird populations to develop and implement, within 2 years, a Memorandum of Understanding (MOU) with the USFWS that promotes the conservation of migratory bird populations to provide guidance and responsibilities of federal agencies regarding protection of migratory birds. This Executive Order requires federal agencies to the extent permitted by law and subject to the availability of appropriations and within administration budgetary limits, and in harmony with agency missions, to:

- Support the conservation intent of the migratory bird conventions by integrating bird conservation principles, measures, and practices into agency activities and by avoiding or minimizing, to the extent practicable, adverse impacts on migratory bird resources when conducting agency actions;
- Restore and enhance the habitat of migratory birds, as practicable;
- Prevent or abate the pollution or detrimental alteration of the environment for the benefit of migratory birds, as practicable;
- Design migratory bird habitat and population conservation principles, measures, and practices, into agency plans and planning processes (natural resource, land management, and environmental quality planning, including, but not limited to, forest and rangeland planning, coastal management planning, watershed planning, etc.) as practicable, and coordinate with other agencies and nonfederal partners in planning efforts;
- Within established authorities and in conjunction with the adoption, amendment, or revision of agency management plans and guidance, ensure that agency plans and actions promote programs and recommendations of comprehensive migratory bird planning efforts such as Partners-in-Flight, U.S. National Shorebird Plan, North American Waterfowl Management Plan, North American Colonial Waterbird Plan, and other planning efforts, as well as guidance from other sources, including the Food and Agricultural Organization's International Plan of Action for Reducing Incidental Catch of Seabirds in Longline Fisheries;
- Ensure that environmental analyses of Federal actions required by the NEPA or other established environmental review processes evaluate the effects of actions and agency plans on migratory birds, with emphasis on species of concern;
- Provide notice to the USFWS in advance of conducting an action that is intended to take migratory birds, or annually report to the USFWS on the number of individuals

- of each species of migratory birds intentionally taken during the conduct of any agency action, including but not limited to banding or marking, scientific collecting, taxidermy, and depredation control;
- Minimize the intentional take of species of concern by: (i) delineating standards and procedures for such take; and (ii) developing procedures for the review and evaluation of take actions. With respect to intentional take, the MOU shall be consistent with the appropriate sections of 50 C.F.R. parts 10, 21, and 22;
 - Identify where unintentional take reasonably attributable to agency actions is having, or is likely to have, a measurable negative effect on migratory bird populations, focusing first on species of concern, priority habitats, and key risk factors. With respect to those actions so identified, the agency shall develop and use principles, standards, and practices that will lessen the amount of unintentional take, developing any such conservation efforts in cooperation with the USFWS. These principles, standards, and practices shall be regularly evaluated and revised to ensure that they are effective in lessening the detrimental effect of agency actions on migratory bird populations. The agency also shall inventory and monitor bird habitat and populations within the agency's capabilities and authorities to the extent feasible to facilitate decisions about the need for, and effectiveness of, conservation efforts;
 - Within the scope of its statutorily-designated authorities, control the import, export, and establishment in the wild of live exotic animals and plants that may be harmful to migratory bird resources;
 - Promote research and information exchange related to the conservation of migratory bird resources, including coordinated inventorying and monitoring and the collection and assessment of information on environmental contaminants and other physical or biological stressors having potential relevance to migratory bird conservation. Where such information is collected in the course of agency actions or supported through Federal financial assistance, reasonable efforts shall be made to share such information with the Service, the Biological Resources Division of the U.S. Geological Survey, and other appropriate repositories of such data (e.g., the Cornell Laboratory of Ornithology);
 - Provide training and information to appropriate employees on methods and means of avoiding or minimizing the take of migratory birds and conserving and restoring migratory bird habitat;
 - Promote migratory bird conservation in international activities and with other countries and international partners, in consultation with the Department of State, as appropriate or relevant to the agency's authorities;
 - Recognize and promote economic and recreational values of birds, as appropriate; and

- Develop partnerships with non-Federal entities to further bird conservation.

The protocols developed in the MOU between DoD and USFWS to achieve the requirements of this Executive Order and the following considerations relative to migratory bird management will be addressed in greater detail in revisions to this INRMP:

- Nuisance bird problems: Exclusion of nuisance birds is the preferred method; the AC/S Environmental Security can provide technical support to those needing assistance.
- The potential beneficial effects of owls inhabiting aircraft hangars will be researched by literature review. Since owls are nocturnal, they are much less of a BASH concern than other species, and they may prevent or reduce the presence of other birds and rodents from inhabiting hangars. Most other birds, since they are active during daylight hours, are a greater BASH concern. A study conducted at Naval Air Station Lemoore will be reviewed for its relevance. Any applicable remedies may be applied.
- Injured and nuisance birds (refer to Section 4.6.3).

Wording in all contracts and work orders for construction and maintenance will explain the law, and that it applies to all persons (not just federal agencies). It will be emphasized that a contract or work order does not authorize, encourage, or condone violation of the law and workers are expected to comply.

Camp Pendleton participates in the international Partners in Flight (PIF) program, establishing and maintaining Monitoring Avian Productivity and Survivorship (MAPS) stations. The Base also supports DoD's policy for integrating neotropical migratory bird management into existing natural resource and land management programs consistent with the military mission. The PIF program is the larger network of federal, state, and nongovernmental organizations of which DoD is an important participant. The objective of the MAPS program is to contribute to an integrated bird monitoring system for North America. A wide variety of biological data are collected on neotropical birds at these stations.

OBJECTIVE: Implement MBTA conservation requirements in a manner consistent with military mission requirements.

High Priority Planned Actions:

- Maintain the Base's Special Purpose Migratory Bird Permit to move and relocate birds for the purposes of transporting to a wildlife care facility, accommodate mission critical requirements, or otherwise care for the safety of migratory birds, their young, eggs, or nests. Ongoing.

- Develop contractual and work order language for contracts and work orders relating to construction, reconstruction, and maintenance projects on the Base to minimize loss of bird nests and costly delays due to MBTA prohibitions. 2002.
- Develop protocols, including tracking and reporting, for responding to injured or nuisance birds including active bird nests (with or without eggs or chicks). 2002.
- Establish guidelines for installation of exclusion devices in areas where bird access or nesting cause problems. 2003.
- Sponsor/support scientific research in support of regional understanding and management goals by qualified personnel. Ongoing.
- Participate in Annual Christmas Bird Counts on the levee to provide data on what birds are resident during the winter period on the Air Station.

Other Planned Actions:

- Protect habitat in accordance with DoD and Partners in Flight program by monitoring.
- Continue MAPS stations. Study the use of certain habitats by neotropical migratory birds in conjunction with the DoD Partners in Flight program.

4.4.3 Wildlife Damage Management (Including Bird Aircraft Strike Hazard)

Camp Pendleton's boundaries interface with both urban and natural environments. Conflicts can arise with nuisance animals (coyotes, ground squirrels, skunks, and rats), which occasionally pose a health or safety hazard. Further, federal threatened and endangered species, and other native wildlife can become prey for domestic animals, including pets and feral animals. Camp Pendleton's pest control is through the Facilities Maintenance Division, and if necessary, other local vector/animal control agencies. Wildlife problems previously identified at Camp Pendleton include coyotes around housing areas, bats roosting in buildings, gulls and crows at the landfill, and interference from bird flocks on the runway. Assistance with nuisance animal problems is obtained from the U.S. Department of Agriculture, Wildlife Services on a reimbursable basis. All wildlife damage management and control measures on Base are conducted in a humane and judicious manner. To minimize problems from domestic animals and the potential escape and establishment of exotics, the Base has a policy on the possession of pets (most exotic pets are prohibited basewide and some housing areas adjacent to sensitive resources have restrictions on the possession of normal domestic household pets, such as dogs and cats).

Bird collisions with aircraft are a serious threat to flight safety. At the air station, the problem has been largely with flocking species such as crows, blackbirds, and gulls. Distribution and abundance of bird species that pose a potential hazard can change seasonally and also vary

by altitude, temperature, rainfall patterns, and surrounding land use. Several methods are being researched and considered for usage in the MCAS BASH Plan including, but not limited to, the following:

- Bioacoustics is taped distress or alarm calls of birds. The equipment required to adequately project these calls includes a cassette tape deck mounted in a vehicle and a speaker mounted on its roof. Special care must be taken to play the tape in short intervals to prevent habituation by the birds. Play the tape for 20 to 30 seconds and then pause briefly. Repeat the procedure several times if necessary. The birds should respond by taking flight or becoming alert/wary. These calls are effective for gulls, blackbirds, starlings, cowbirds, grackles, ravens, crows and some shorebirds. Pyrotechnics could be used in conjunction with bioacoustics to enhance dispersal.
- Pyrotechnics are 12-gauge scare cartridges that produce a secondary explosion to scare the birds from the area. The scare cartridges are launched from either a shotgun or pyrotechnic pistol (M-8 Very Pistol) with a steel sleeve insert to modify the gun to the 12-gauge size. Pyrotechnics have proven effective in dispersing most bird species.
- Propane Gas Cannons may also be used. These devices should be operated, especially at dawn and dusk, as birds come into feed and roost. Cannons must be relocated frequently to avoid habituation problems. These devices have been quite effective on gulls, blackbirds and waterfowl.
- Depredation. Birds must be killed occasionally as a reinforcement of other methods. Domestic pigeons and rock doves, European starlings, and house sparrows may be killed without a permit. However, A federal depredation permit, available from the USFWS, is required before killing any birds protected under the MBTA.
- Falconry. Falcons trained for airfield bird dispersal may be effective when used in combination with other frightening techniques and has been quite successful with blackbirds, pigeons and gulls.
- Model Airplane Method. The model airplane method uses a radio remote controlled model airplane to disperse birds. The wingspan is approximately 42 inches and is equipped with a wind-powered, noise generator, attached to a wing surface. It has proven effective with large shore birds, waterfowl and wintering vultures.
- Border Collie. The use of Border Collie dogs to disperse birds has proven effective under certain circumstances.
- Fogging. A technique that utilizes a device that resembles types of smoke that effects birds.

Ineffective Methods of Control:

- Stuffed owls and rubber snakes advertised to rid hangars and buildings of birds are usually a waste of money and effort.
- Rotating lights have brought conflicting results; but are generally considered ineffective. Birds quickly habituate to these devices, and the problem remains unsolved.
- Eyespots on aircraft components are being studied in the U.S. and abroad. However, early results suggest the addition of eyespots does not significantly reduce the BASH potential.
- Ultrasonic devices.

OBJECTIVE: Protect the Base, its inhabitants, and native species from damage or loss due to wild or feral animal predation.

High Priority Planned Actions:

- Maintain the Base's Special Purpose Migratory Bird Permit to move and relocate birds for the purposes of transporting to a wildlife care facility, accommodate mission critical requirements, or otherwise care for the safety of migratory birds, their young, eggs, or nests. Ongoing.
- Develop contractual and work order language for contracts and work orders relating to construction, reconstruction, and maintenance projects on the Base to minimize loss of bird nests and costly delays due to MBTA prohibitions. 2002.
- Develop protocols, including tracking and reporting, for responding to injured or nuisance birds including active bird nests (with or without eggs or chicks). 2002.
- Annually conduct and track animal damage control, predator management, and cowbird control activities on Base. Ongoing.
- Maintain a contract with wildlife rehabilitation centers for placement of injured or abandoned wildlife. Ongoing.
- Re-publish Standard Operating Procedures for responding to and handling injured, dead, nuisance, or otherwise encountered wildlife. 2004.
- Publicize the problems with feeding wild animals and actively discourage this activity. 2004.

Other Planned Actions:

- Re-publish procedures for handling road killed/injured deer and other larger animals.
- Establish informational/warning signs in areas with a history of human/animal conflicts.

OBJECTIVE: Reduce the potential for bird collisions with aircraft.

High Priority Planned Actions:

- Complete development of MCAS Bird Aircraft Strike Hazard (BASH) program. 2001. [MCAS]
- Complete assessment of bird roosting sites on and adjacent to the Air Station. 2002.
- Complete “bird-proofing” of the Air Station hangars. 2003.
- Collect data on the seasonality (e.g., flocking behavior) and observations of corvids, passerines, and other potential BASH species; coordinate observation efforts with Air Traffic Control personnel, pilots, safety personnel and ground crew. 2002.

Other Planned Actions:

- Evaluate the advantages and disadvantages of owls inhabiting hangers.
- Evaluate methods of species control for BASH program (e.g., use of falconry, trained dogs, etc.).

4.4.4 Integrated Pest Management

The AC/S Facilities, Facilities Maintenance Division is responsible for pest (e.g., insects, rodents, weedy plants, and disease) management. The Camp Pendleton Pest Management Plan facilitates annual planning and approval of pest control measures. The Pest Management Plan stresses prevention, education. Toxic chemicals are used only as a last resort. Pesticide use in support of Base natural resources management activities complies with applicable requirements, including those of the Federal Insecticide, Fungicide, and Rodenticide Act. Integrated pest management also encompasses exotic plant/weed control (refer to Exotics Species Control).

An integrated Pest Management Plan is updated annually by AC/S Facilities FMD and reviewed by AC/S ES to ensure proposed pest management actions will not detrimentally impact natural resource programs and species recovery efforts.

OBJECTIVE: Comply with the Federal Insecticide, Fungicide, and Rodenticide Act keeping pesticide use to a minimum.

High Priority Planned Actions:

- Submit Pest Management Plan to AC/S Environmental Security natural resource managers for review by hazardous waste and natural resource managers. Ongoing.
- Review Pest Management Plan annually to ensure that proposed pest management actions will not detrimentally impact natural resource management and species recovery programs. Ongoing.

OBJECTIVE: Maintain capability to respond to potential incidences of Africanized honeybee infestations.

High Priority Planned Actions:

- Ensure that at least one member of the Resource Management Division staff is current on behavior, current distribution and control techniques for managing Africanized honey bees. Ongoing
- Maintain informational materials regarding Africanized honeybees. Ongoing
- Maintain an Africanized Honeybee Response Plan. Ongoing

4.4.5 Game and Sport Fisheries Management

In support of the recreational hunting and fishing programs on Camp Pendleton (Chapter 5), the Wildlife Management Branch of the Resources Management Division within AC/S Environmental Security is responsible for the management of game species on Base. The Base hunting and fishing programs are subject to applicable federal and state regulations and are managed cooperatively with the California Department of Fish and Game (CDFG). Under Sections 3450 – 3453 of the California Fish and Game Code, Camp Pendleton annually submits for approval the number of deer tags for distribution by both the Base and the State Fish and Game Commission.

While no native freshwater game fish species occur on Camp Pendleton, a few ponds and lakes have been historically managed for game fish as part of a recreational fishery program.

Inland fishing may be authorized at Horseshoe Lake, Case Spring ponds, Santa Margarita River (above Stewart Mesa Road and in winter months only), 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) (see Chapter 5). Fishing is permitted at Pulgas Lake for catch and release only.

The Resources Enforcement/Compliance Branch stocks Lake O'Neill occasionally with exotic game fish, including largemouth bass (*Micropterus salmoides*), bluegill (*Lepomis macrochirus*), black crappie (*Pomoxis nigromaculatus*), and channel catfish (*Ictalurus punctatus*). Rainbow trout (*Salmo gairdnerii*) and red-eared sunfish (*Lepomis microlophus*) have previously been recorded as having been stocked on Camp Pendleton.

Wildlife game species at Camp Pendleton include California quail (*Callipepla californica*), mourning dove (*Zenaida macroura*), desert cottontail (*Sylvilagus audubonii*), black-tailed jackrabbit (*Lepus californicus bennetti*), brush rabbit (*Sylvilagus bachmani*), southern mule deer (*Odocoileus hemionus fuliginatus*), and several waterfowl species. Management practices benefiting game species on Base include providing additional water sources, controlled burns, brush management, food plantings, and population inventories.

OBJECTIVE: Provide quality and sustainable hunting and fishing by protecting and enhancing habitat for game species and managing populations near the optimal carrying capacity.

High Priority Planned Actions:

- Develop a Fisheries Management Plan to address the adverse impacts to Camp Pendleton's fresh water lakes and ponds from siltation, stagnation, exotic species and aquatic plants. 2005.
- Conduct an annual fish and game survey to evaluate sustainable hunting and fishing levels. Ongoing.
- Develop a Game Management Plan for nongame, small game, and upland game species (incorporating fisheries and deer management plans). 2003.
- Continue to collect and analyze data from harvested animals to support informed fish and game management decisions. Ongoing.
- Annually review the Base hunting program to ensure that it remains sustainable and compatible with wildlife management goals. Ongoing.

Other Planned Actions:

- Evaluate the efficacy of maintaining artificial sources of water availability for wildlife (via use of guzzlers and small earthen dams).
- Assess the feasibility and desirability of expanding the hunting program to include additional or introduced species. If desirable and feasible, coordinate changes through normal Base staffing procedures and the Base NEPA processes.

4.5 THREATENED AND ENDANGERED SPECIES MANAGEMENT

While the Base's natural resource management philosophy is that program initiatives should be ecosystem based, special attention is provided to 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 management and conservation of natural resources as an integral component of the long term viability of the military training mission itself. To balance training mission with the protection of listed species and their habitats, the following guiding principles are key to Camp Pendleton's Listed Species Management Programs

- The primary focus of avoidance and minimization of impacts to listed species will be on occupied habitat. Without a thorough understanding of the necessary components defining suitable habitat for a species, it is difficult to accurately predict locations of potential habitat.
- Should populations of threatened or endangered species increase in size and geographic area across the Base, there will not be a concomitant increase in restrictions to training or support activities. (Camp Pendleton's mission will not be penalized by good management practices that lead to an increase in listed upland species populations.)
- Habitat enhancement, restoration, and other efforts conducted as compensation for permanent and temporary impacts from ongoing Base activities will not further reduce the overall land available to training. (All compensation measures should be compatible with training in the long term.)
- Programmatic instructions (PIs) will be the primary tool for facilitating avoidance and minimization of potentially adverse impacts to the environment in general and listed upland species in particular.
- PIs should be unambiguous and simple, while being neither undesirably restrictive nor lenient. Complex management rules foster greater difficulty in enforcement and achieving compliance.

- Management programs 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 resource and military training and mission support needs.

The primary legislation regulating actions that may directly or indirectly impact federally listed species is the Endangered Species Act of 1973 (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 necessary, Camp Pendleton prepares a biological assessment of the effects of a proposed action on listed species, as required by Section 7 of the ESA, which serves to conserve endangered and threatened 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.

Camp Pendleton's management approach to federally listed threatened and endangered species is to implement measures to avoid and minimize adverse impacts; proactively collect information on presence or absence, location, habitat availability and suitability, and life history requirements; and compensate/mitigate for 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 management and recovery goals.

To ensure that ongoing and future military mission requirements (including training, support activities, maintenance, fire management, natural resource 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 Biological Opinion from the USFWS covering the Estuarine and Beach Ecosystem Conservation Plan (Appendix H), and the Riparian Ecosystem Conservation Plan (Appendix I) (Riparian and Estuarine/Beach Biological Opinion [1-6-95-F-02]). Appendix O contains the reasonable and prudent measures, terms and conditions, and conservation recommendations from the Riparian and Estuarine/Beach Biological Opinion. This Biological Opinion serves 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. Included in these conservation plans and concurred with by the Biological Opinion (1-6-95-F-02) are goals for species population size

or habitat acreage that identify Camp Pendleton’s conservation responsibility within ecoregion species recovery efforts (Table 4-1) and a habitat value system for riparian ecosystems on Camp Pendleton.

TABLE 4-1. Federally listed riparian and estuarine/beach species population goals.

Species	Goal
Least Bells Vireo	200 (territorial males)
Southwest Willow Flycatcher	20 (territorial males)
California Least Tern	[BO #1-6-95-F-02: Maintain the current population and promote its growth]
Western Snowy Plover	40 (breeding pairs)
Arroyo Southwestern Toad	Maintain Existing Habitat
Tidewater Goby	Maintain Existing Habitat

Currently, the Base is in consultation with the USFWS on the Biological Assessment of Upland Habitats on Camp Pendleton and the associated Uplands Ecosystem Conservation Plan. The USFWS is expected to issue a Biological Opinion by the end of 2001. The Uplands Ecosystem Conservation Plan will be added as Appendix (J) and Upland Terms and Conditions will be added as Appendix P once the Biological Opinion is issued.

As part of each conservation plan an Activity Consultation Class System has been established that provides a programmatic approach for directing future consultations on permanent impact projects. The purpose of this programmatic approach is to: (1) satisfy section 7(e)20 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 which require formal consultation with the USFWS; and (5) reduce staff time.

The Consultation Class System does not negate requirements for consultation in the future. On the contrary, it is intended to clarify which projects require consultation and which are “programmatically” covered by programmatic management programs (and their respective Biological Opinions) and receive expedited implementation. The Consultation Class System has been established for riparian, estuarine and beach ecosystem and proposed (pending completion of formal section 7 consultation) for uplands. The Consultation Class System establishes annual reporting procedure for newly initiated Base activities, the effects of which are relatively minor and easily covered under the conservation plan. Further, the system defines types of activities for which an expedited consultation process can be implemented.

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 4-2. 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 4-2. 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. Concurrence letter from USFWS required for specific project.
III	Impacts completely offset by management plan. USFWS notified annually of Class III projects occurring during previous year.
IV	No impacts to listed species. No reporting required.

GOAL: Incorporate principles of ecosystem management into threatened and endangered species management.

GOAL: Maintain existing populations of federally listed species and survey for new populations and existing populations.

GOAL: Conserve and manage threatened and endangered species in accordance with all environmental laws and their implementing regulations.

GOAL: Conduct research on the population dynamics of threatened and endangered species in order to make recommendations that assist in their survival and recovery.

4.5.1 Avoidance/Minimization and Awareness

Central to the management of listed species on Base and key to each conservation plan is the avoidance and minimization of adverse impacts to those species and their habitats. While the Base cannot control natural population fluctuations, it can and does manage anthropogenic disturbance to listed species and their habitats. Thus, the general management approach on Base can be characterized as the “managing of impacts.” As such, management programs are generally divided into two components, one for the management of impacts that are

temporary (e.g., from ongoing activities such as training, maintenance, and recreation) and one for those that are *permanent* (e.g., from infrastructure development projects).

Ongoing military training and mission support activities create impacts that are generally temporary in nature and avoidance and minimization of these impacts are accomplished via programmatic instructions. Further discussion of the implementation and enforcement of these programmatic instructions is provided in Chapter 7 under the respective topics of Programmatic Instructions, Training and Education and Enforcement. In addition to programmatic instructions, physical measures may be enacted to facilitate avoidance or minimization of impacts to sensitive resources, including fencing and relocation. For permanent projects, the NEPA process and Public Works Department site selection and approval process facilitate avoidance and minimization of adverse impacts (see NEPA/Project Support). Additionally, the Activity Consultation Class System, programmatic instructions and pre established mitigation, included in each ecosystem conservation plan, encourages avoidance and minimization through reduced project costs and efforts when listed species and their habitat are avoided.

OBJECTIVE: Implement avoidance and minimization measures in accordance with ESA Section 7 consultations.

High Priority Planned Actions:

- Continue to publish in Base/Station Orders and other relevant documents measures necessary for compliance with the Riparian and Estuarine/Beach Biological Opinion. Ongoing.
- Publish in Base Orders and other relevant documents measures necessary for compliance with the Upland Biological Opinion when completed by the USFWS. Ongoing.
- Every six months, update the Base's Environmental Operations Maps to include the most current species and natural resource data. Ongoing.
- Facilitate distribution of updated Environmental Operations Maps to Base users. Ongoing.
- Upon receipt from the USFWS, develop and implement the commitments and required elements contained within the Upland Biological Opinion. TBD.
- Execute commitments, terms and conditions of all formal and informal consultation documents that apply on the Base to which the Marine Corps or another DoD agency agreed. Ongoing.
- Where possible and reasonable, adopt the least damaging alternative of proposed activities that has potential to result in the permanent loss of listed species habitats.

Use the Activity/Consultation Class System to determine the required level of consultation with the USFWS for new projects. Ongoing.

- Continue to fence around the endangered least tern and snowy plover nesting areas in accordance with the Estuarine Ecosystem Conservation Plan. Ongoing.
- Use various media to create and maintain awareness of Base personnel, general public, and lease and easement holders of the sensitivity, values, and obligations regarding the conservation of federal threatened and endangered species and their habitat. This includes presentations, briefs, newspaper articles, special messages, and informational brochures. Ongoing.
- Train natural resources staff responsible for listed species management regarding species under their primary areas of responsibility on a regular basis. Ongoing.
- Where feasible, salvage federally listed and sensitive native plant species from new project construction sites for transplantation to suitable and more protected locations. Ongoing.
- Review and modify avoidance and minimization measures as additional information or specific results are obtained. Ongoing.
- Erect signage on the Air Station to discourage unauthorized usage of sensitive habitats. 2002.

4.5.2 Surveys and Monitoring

Federally 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 H), the Riparian Ecosystem Conservation Plan (Appendix I) and their Biological Opinion (1-6-95-F-02). Listed upland species are also currently 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 selected 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.

Surveys and monitoring are used to determine species population, habitat levels and habitat values that are used to determine the effectiveness of Camp Pendleton's management and conservation programs.

OBJECTIVE: Maintain up-to-date, distribution, population dynamic and habitat data for all federal threatened and endangered species and species proposed to be listed as threatened or endangered that are *known to occur on Base*.

High Priority Planned Actions:

- Monitor annually the threatened western snowy plover population and locations, providing estimates of the number of breeding individuals, the reproductive success, distribution, abundance and habitat. Ongoing.
- Monitor annually the endangered California least tern population, providing estimates of the number of breeding individuals and the reproductive success. Ongoing.
- Monitor and document changes in the population and distribution of the threatened California gnatcatcher at intervals to be determined in the Uplands Biological Opinion issued by the USFWS. TBD.
- Monitor and document changes in the population and distribution of the endangered Stephens' kangaroo rat at intervals to be determined in the Uplands Biological Opinion issued by the USFWS. TBD.
- Annually monitor the population and distribution of the endangered arroyo toad. Ongoing.
- Periodically conduct arroyo toad surveys of the Air Station. Ongoing.
- Annually monitor the population levels and distributions of the endangered least Bell's vireo. Ongoing.
- Annually monitor the population levels and distributions of the endangered southwestern willow flycatcher. Ongoing.
- Monitor selected plots every other year for the endangered Pacific pocket mouse population. Conduct comprehensive surveys for the endangered Pacific pocket mouse at intervals determined in the Uplands Biological Opinion. 2002, 2004, 2006.
- Annually monitor a portion of Base estuaries for the endangered tidewater goby population ensuring that each estuary is monitored at least every 3 years. Ongoing.
- Collect survey data on isolated ephemeral wetland invertebrates, including the endangered San Diego fairy shrimp and the Riverside fairy shrimp at levels and intervals to be determined in the Uplands Biological Opinion issued by the USFWS. TBD.
- Map the spread of exotic plants and successful removal by control programs, including regional data when possible. Ongoing.
- Conduct surveys for the endangered San Diego button-celery at levels and intervals to be determined in the Uplands Biological Opinion issued by the USFWS. TBD.

- Conduct surveys for the threatened spreading navarretia at levels and intervals to be determined in the Uplands Biological Opinion issued by the USFWS. TBD.
- Conduct surveys for the thread-leaved brodiaea at levels and intervals to be determined in the Uplands Biological Opinion issued by the USFWS. TBD.
- Incorporate project specific survey data for federally listed species into the GIS species distribution database. Ongoing.
- Incorporate U.S. Geological Survey fish survey data into GIS species distribution database. 2003.
- Assess the feasibility and desirability to conduct off-Base surveys of selected species and habitat types, water quality monitoring, and hydrographical surveys to contribute to the understanding of Camp Pendleton's regional contribution to their conservation and recovery. 2003.
- Survey for the southern steelhead as determined in consultation with NMFS. As needed conduct genetic tests on a representative sample. TBD

Other Planned Action:

- Facilitate annual light-footed clapper rail surveys on Base.

OBJECTIVE: Survey for species that are *not currently federally listed* but for which there may be a likelihood of becoming listed in the future.

High Priority Planned Actions:

- Develop and annually maintain a prioritized list of state listed plant species and species identified by the California Native Plant Society as rare or sensitive that occur on Camp Pendleton. Ongoing.
- Develop a monitoring program for wildlife species of regional concern with a specific focus on those species likely to become proposed for listing as threatened or endangered in the near future. 2002.
- Assess the feasibility and desirability to conduct off-Base surveys of selected species and habitat types, water quality monitoring, and hydrographical surveys to contribute to the understanding of Camp Pendleton's regional contribution to their conservation and recovery. 2003.

- Collect survey data on isolated ephemeral wetland invertebrates, including the endangered San Diego fairy shrimp and the Riverside fairy shrimp at levels and intervals to be determined in the Uplands Biological Opinion issued by the USFWS. TBD.

Other Planned Action:

- Survey for species on Base that have been proposed for Endangered Species Act listing by the USFWS.

4.5.3 Research

Essential to adaptive management, and to recovery efforts for listed species, is the knowledge gained from experimental studies and investigative research. It is the Base's intent to conduct, or allow qualified researchers/projects to conduct, research that has the potential to provide information that supports effective avoidance, minimization, mitigation, and both regional recovery efforts. Such research is absolutely necessary if recovery efforts are to advance beyond trial and error for those species about which little is currently 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 will be reviewed by appropriate Base professionals to help ensure the utility of the data collected, the study design and methodologies support the hypothesis, unintended adverse impacts are avoided, and the project supports regional natural resource management goals and objectives.

OBJECTIVE: Conduct and/or support research that has the potential to provide information that supports effective avoidance, minimization, mitigation, local and regional recovery efforts.

High Priority Planned Actions:

- Complete measures to assess threats to the survival and recovery of the tidewater goby and arroyo toad on Base, including the severity of threats posed by green sunfish, bullfrog, steelhead trout and other likely predators/competitors and hydro modification. 2005.
- Establish test plots to understand best management practices for natural resource recovery after wildland fire impacts. Ongoing.
- Conduct assessments of potential mitigation and management techniques for listed species. Ongoing.

- Continue to study the effects of aircraft noise on passerines. [Levy Mitigation] Ongoing until 2006.
- Complete and implement the Bird Aircraft Strike Hazard Plan for the Air Station. 2002.
- Complete measures to assess threats to the survival and recovery of avian species on Base, including the severity of threats posed by likely predators/competitors. 2006.
- Complete measures to assess threats to the survival and recovery of the pacific pocket mouse on Base, including the severity of threats posed by likely predators/competitors. 2006.
- Complete measures to assess threats to the survival and recovery of the Stephens' kangaroo rat Base, including the severity of threats posed by likely predators/competitors. 2006.

Other Planned Actions:

- Evaluate methods of species control for Bird Aircraft Strike Hazard program (e.g., use of falconry, trained dogs, etc.).
- Undertake measures to assess threats to the survival and recovery of the western snowy plover and California least tern, including the severity of threats posed by likely predators/competitors.
- Undertake measures to assess threats to the survival and recovery of the least Bell's vireo and southwestern willow flycatcher, including the severity of threats posed by likely predators/competitors.
- Undertake measures to assess threats to the survival and recovery of the California gnatcatcher including the severity of threats posed by likely predators/competitors.

4.5.4 General Management (Including Compensation and Mitigation)

Management of federally listed species on Camp Pendleton includes proactive conservation initiatives, compensation for the potential temporary impacts from ongoing mission and mission support activities (training, maintenance, recreation, etc.), programmatic instructions and an activity consultation class system to support avoidance and minimization and mitigation for permanent project impacts. General management initiatives for threatened and endangered species include predator control, habitat enhancement (e.g., exotics control), and habitat restoration. Some of these management actions also function as compensation and mitigation measures.

OBJECTIVE: Conduct management initiatives that contribute to the recovery of listed or candidate species' populations and maintains or improves their habitat.

High Priority Planned Actions:

- Where possible and reasonable, adopt the least damaging alternative of proposed activities that has potential to result in the permanent loss of listed species habitats. Use the Activity/Consultation Class System to determine the required level of consultation with the USFWS for new projects. Ongoing.
- Where feasible and practical use native seed stock in restoration and enhancement measures. Ongoing.
- Complete measures to assess threats to the survival and recovery of the tidewater goby and arroyo toad on Base, including the severity of threats posed by green sunfish, bullfrog, steelhead trout and other likely predators/competitors and hydro modification. 2005.
- Enhance and manage dunes within nesting areas. Maintain and improve the endangered least tern breeding habitat and evaluate the design and feasibility of sand augmentation to the island in the Santa Margarita River. Ongoing.
- Mitigate all direct or indirect permanent impacts to federally listed species according to the measures and ratios determined in coordination with the USFWS. Ongoing.
- Conduct control measures on exotic, invasive species that have a potential direct or indirect adverse impact on federally listed species or their habitat (see Exotics Invasive Species Control). Ongoing.
- Continue predator control measures within the vicinity of snowy plover and least tern nesting sites. Ongoing.
- Annually maintain the endangered California least tern and threatened western snowy plover nesting areas. Ongoing.
- Ensure that secondary roads are maintained to the extent practical in order to avoid ponding of water on the road surface in and adjacent to potential arroyo toad habitat. Ongoing.
- Ensure that construction activities are within compliance with the terms and conditions for new construction sites in the Estuarine and Beach Ecosystem Conservation Plan, the Riparian Ecosystem Conservation Plan, the Upland Ecosystem Conservation Plan and their respective Biological Opinion, and other applicable regulations and guidelines. Ongoing.

- Complete and evaluate results of the multi-year study of effects of least tern management on western snowy plovers. Make adjustments to the Estuarine/Beach Ecosystem Conservation Plan if necessary. 2005.
- Publish notices and/or Base newspaper articles to Base personnel regarding sensitive species and restricted areas along the coast. Ongoing.
- Annually fence and post warning signs at the least tern nesting colonies. Ongoing.
- Explore habitat enhancement techniques for Camp Pendleton estuaries and lagoons including: (a) deepening smaller estuarine lagoons and (b) controlling and removing exotic plants and fish. Ongoing.
- Protect the last known nesting location of the light-footed clapper rail (Santa Margarita River). Ongoing.
- Evaluate the feasibility of participating in cooperative watershed restoration programs, including cooperating with local governmental and nongovernmental stakeholders. Ongoing.
- Complete measures to assess threats to the survival and recovery of avian species on Base, including the severity of threats posed by likely predators/competitors. 2006.
- Complete measures to assess threats to the survival and recovery of the pacific pocket mouse on Base, including the severity of threats posed by likely predators/competitors. 2006.
- Complete measures to assess threats to the survival and recovery of the Stephens' kangaroo rat Base, including the severity of threats posed by likely predators/competitors. 2006.

Other Planned Actions

- Undertake measures to assess threats to the survival and recovery of the western snowy plover and California least tern, including the severity of threats posed by likely predators/competitors.
- Undertake measures to assess threats to the survival and recovery of the least Bell's vireo and southwestern willow flycatcher, including the severity of threats posed by likely predators/competitors.
- Undertake measures to assess threats to the survival and recovery of the California gnatcatcher on Base, including the severity of threats posed by likely predators/competitors.

4.6 EXOTIC INVASIVE SPECIES CONTROL

One of the most severe environmental problems facing the Base's natural areas is the explosive spread of exotic invasive species. The term invasive species is defined by the presidential Executive Order 13112 to mean "an alien species whose introduction does or is likely to cause economic or environmental harm or harm to human health." An alien species, in turn, is defined in the Executive Order as any species not native to a particular ecosystem, including the seeds, eggs, spores, or other biological material capable of propagating that species.

Exotic invasive plants and animals have the potential to cause vast ecological and economic damage, and sometimes pose human health impacts in areas they infest. Among the potential adverse impacts caused by exotic, invasive species are:

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

The purpose of the exotic invasive species control program is to develop and implement a strategy for the control of such plant and animal on Base. "Control" means, as appropriate, the eradication, suppression, reduction, or management of invasive species populations; the prevention of invasive species introductions and their spread from already infested areas; and the reduction of potential adverse effects of invasive species through, for example, the restoration of native species (Executive Order 13112).

Subject to the availability of funds this program will endeavor to: (1) prevent the introduction of invasive species; (2) detect and respond rapidly to and control populations of invasive species in a cost effective and environmentally sound manner; (3) monitor invasive species populations accurately and reliably; (4) provide for restoration of native species and habitat conditions in ecosystems that have been invaded; (5) conduct research on invasive species

and develop technologies to prevent introduction and provide for environmentally sound control of invasive species and, (6) promote education on and awareness of invasive species.

All field efforts to conduct exotic species control are performed in an experimental fashion prior to basewide/broadcast treatment to ensure efficacy of techniques under local conditions and avoidance of unintended adverse impacts to native species.

GOAL: Seek to eliminate invasive exotic species from Camp Pendleton to conserve and enhance native flora and fauna and the functional value of natural systems.

GOAL: Seek to understand natural processes and impacts of invasive exotic species through monitoring, investigative research, and data analysis in order to make informed decisions necessary for exotic species management.

4.6.1 Exotic Invasive Plants

Of the more than 818 plant species on Base, approximately 19% are considered exotic (i.e., nonnative to California). The abundance of exotic, weedy plant species poses a special problem for natural resource management at Camp Pendleton. Invasive, exotic plants are often detrimental to native communities in that they may compete with native plant species, reduce the diversity and quantity of native species; render habitat unsuitable for native animals by altering forage and shelter requirements; cause increased rates of erosion and stream sedimentation; create a system that is more susceptible to wildfires; and impair general ecosystem functioning.

To help reduce exotic plant species on Base and to compensate for temporary and permanent impacts from ongoing training activities, Camp Pendleton has conducted removal efforts for several targeted species. These include the giant reed grass (*Arundo donax*), artichoke thistle (*Cynara cardunculus*), and perennial pepperweed (*Lepidium latifolium*). The Base has not formally approved a basewide exotic plant control program, but a conceptual plan has been developed. The riparian portion of this program has been completed and implementation has begun in selected riparian areas of the Base. This exotic plant control plan focuses on high priority sites, targeting weedy, invasive upland species, including artichoke thistle, mustard (*Brassica* spp.) fennel (*Foeniculum vulgare*), iceplant (*Mesembryanthemum crystallinum*), tamarisk (*Tamarix parviflora*), and tree tobacco (*Nicotiana glauca*). Artichoke thistle was nearly eradicated from the Base during previous exotics control efforts. However, new infestations have recently been identified in several locations within the State Parks lease area. Plans are currently underway to identify, map, and eradicate these new infestations and prevent reinfestation of the Base.

OBJECTIVE: Endeavor to control the spread, and prevent the introduction, of exotic, invasive plant species on Base in order to minimize adverse economic, ecological, and human health impacts.

High Priority Planned Actions:

- Develop a research plan for the management and monitoring of exotic plant species. 2003.
- Provide focused training for the natural resources staff member responsible for exotic plant species control. Ongoing.
- Reduce or eradicate exotic vegetation from riparian areas and temporarily disturbed sites on Camp Pendleton in accordance with the Riparian Ecosystem Conservation Plan and the Riparian and Estuarine/Beach Biological Opinion. Ongoing.
- Continue exotic plant site identification, monitoring, and control efforts in upland habitats to ensure a low reintroduction rate. Ongoing.
- Map the spread of exotic plants and successful removal by control programs, including regional data when possible. Ongoing.
- Beginning in 2003, initiate control efforts for fennel per the Upland Ecosystem Conservation Plan and its BO. 2003
- Aggressively control artichoke thistle in all known locations of reinfestation on Base. Ongoing.
- Discourage the use of invasive exotic plants listed by the Exotic Pest Plant Council and California Native Plant Society, for landscaping. Ongoing.
- Annually, review the Base's Exterior Architecture Plan to help ensure that the use of native plant species is maximized in landscaping practices. Ongoing.
- Participate in regional forums and planning initiatives for the removal of invasive, exotic species. Ongoing.
- Develop an Exotic/Invasive Species Management Plan for the Air Station. 2002.
- Educate Base community members and visitors concerning the potential adverse impacts of exotic invasive species, especially where such promotion may help prevent the introduction and spread of these species. Ongoing.
- Develop a Base Exotic/Invasive Species Management Plan for the Base that is consistent with the National Invasive Species Management Plan (Executive Order 13112). 2003.

Other Planned Actions:

- Evaluate alternative tamarisk control methods than those described in the Riparian Ecosystem Conservation Plan and the Riparian and Estuarine/Beach Biological Assessment.

4.6.2 Exotic Animals

As with exotic plants, exotic animals may also pose a threat to native species and communities on Base for similar reasons (e.g., competitively excluding native species, altering the habitat in a manner which favors other exotics, predation, nest parasitism, etc.). Currently, the Base is conducting control efforts on several nonnative invasive animals, including the beaver (*Castor canadensis*), brown-headed cowbird (*Molothrus ater*), bullfrog (*Rana catesbiana*), 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*]). 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.

OBJECTIVE: Endeavor to control the spread, and prevent the introduction, of exotic, invasive animal species on Base in order to minimize adverse economic, ecological, and human health impacts.

High Priority Planned Actions:

- Annually inventory animal damage control, predator management, and cowbird control activities on Base. This inventory will include the species, both native and exotic, affected by these management activities. In addition, the location by drainage, the numbers trapped or dispatched or translocated will be noted. Exotics noted will include brown-headed cowbird, bullfrog, green sunfish, bluegill, mosquito fish, largemouth and small mouth bass, and others as appropriate for purpose of adaptive management of riparian and estuarine/beach ecosystems. Ongoing.
- Provide focused training for the natural resources staff member responsible for exotic animal species control. Ongoing.
- Develop a Base Exotic/Invasive Species Management Plan for the Base that is consistent with the National Invasive Species Management Plan (Executive Order 13112). 2003.
- Per the Riparian Ecosystem Conservation Plan and its Biological Opinion, conduct brown-headed cowbird trapping to reduce nest parasitism from this exotic species and to help increase the reproductive success of three endangered bird species. Ongoing.

- Complete measures to assess threats to the survival and recovery of the tidewater goby and arroyo toad on Base, including the severity of threats posed by green sunfish, bullfrog, steelhead trout and other likely predators/competitors and hydro modification. 2005.
- Complete measures to assess threats to the survival and recovery of avian species on Base, including the severity of threats posed by likely predators/competitors. 2006.
- Complete measures to assess threats to the survival and recovery of the pacific pocket mouse on Base, including the severity of threats posed by likely predators/competitors. 2006.
- Complete measures to assess threats to the survival and recovery of the Stephens' kangaroo rat Base, including the severity of threats posed by likely predators/competitors. 2006.
- Educate Base community members and visitors concerning the potential adverse impacts of exotic invasive species, to help prevent the introduction and spread of these species. Ongoing.
- Exercise vigilance for the potential introduction of a new invasive, exotic species and, should such an introduction occur, pursue timely and aggressive control measures to prevent establishment on Base. Ongoing.
- Participate in regional forums and planning initiatives for the removal of invasive, exotic species. Ongoing.

Other Planned Actions:

- Establish Camp Pendleton's carrying capacity for bison and develop a bison management plan.
- Assess the feasibility of halting the introduction of mosquito fish into waters on Base for the control of mosquitoes.

4.7 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 increased soil erosion. 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 involves 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 best management practices approved by the State of California under the Nonpoint Source Pollution Control Plan and the Phase II Municipal Storm Water Permit.

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 takes 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.

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, October 18, 2000). Furthermore, as required by Executive Order 11988, May 24, 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 in order 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 Regional Water Quality Control Board’s Basin Plan.

GOAL: Incorporate best management practices into watershed and habitat protection programs to conserve and enhance native fauna and flora and the functional value of natural systems.

GOAL: Conserve and manage natural resources in accordance with environmental laws and their implementing regulations.

GOAL: Manage vegetative cover, erosion, and fire so areas remain usable and available for amphibious, land, and air based training.

GOAL: Provide fully compliant and reliable water supply and wastewater treatment, good stewardship of all water resources, and leadership in watershed management.

4.7.1 Water Resources Management

Water is a scarce and limiting 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 of its water demands through local groundwater sources within four main 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. Marine Corps Base, Camp Pendleton is committed to providing high quality water to Base consumers. The facilities, environmental, and legal staffs 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 Environmental Security, AC/S MCCA, MCAS, and Western Area Counsel Office, meets regularly to effect coordination and strategic planning of Base water resources. Water related issues this group meets to discuss range 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 Base Water Steering Committee 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 (a majority of the objectives and planned actions within this section were derived from the SWP). 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.

OBJECTIVE: Maintain water supply independence by (1) maximizing development of local water sources, (2) preserving/developing alternative water sources, (3) optimizing wastewater recycling, and (4) meeting all mandated water conservation goals.

High Priority Planned Actions:

- Develop Permit 15000 and seek license. 2007.

- Develop plans to optimize development of the San Mateo Basin. Submit specific projects through normal Base staffing procedures and the Base NEPA process for decision and approval. 2003.
- Develop plans to establish operational link between North and South water systems. Submit specific projects through normal Base staffing procedures and the Base NEPA process for decision and approval. 2008.
- Settle litigation with Rancho California Water District to guarantee adequate quantity, quality, and variability of stream flow in Santa Margarita River. 2002.
- Settle litigation with Fallbrook Public Utility District to optimize development of the Base's groundwater basins and supersede 1968 Memorandum of Agreement. 2002.
- Develop an agreement within the Santa Margarita Watershed to account for water conservation regionally. 2002.

Other Planned Actions:

- Develop plans to establish operational connections of the North and South water systems to *off-Base* water with capacity to meet 100% of emergency requirements. Submit specific projects through normal Base staffing procedures and the Base NEPA process for decision and approval.
- Execute renegotiated Four Party Agreement to maximize the benefits of live stream discharge of treated sewage effluent.
- Beneficially reuse 70% of dry weather treated sewage effluent in the South water system. Submit specific projects through normal Base staffing procedures and the Base NEPA process for decision and approval.
- Beneficially reuse 70% of dry weather treated sewage effluent in the North water system. Submit specific projects through normal Base staffing procedures and the Base NEPA process for decision and approval.

OBJECTIVE: Provide leadership in watershed management.

High Priority Planned Actions:

- Lead the Santa Margarita River Watershed Water Quality Monitoring Group to develop and propose a coordinated watershed-wide water quality monitoring plan. 2002.

- In partnership with The Nature Conservancy and San Diego State University, develop and implement a long-term monitoring program to measure and correlate flow, sediment transport, water chemistry, and habitat in the lower Santa Margarita River watershed. 2002.

OBJECTIVE: Manage stormwater to optimize resources and comply fully with laws and regulations.

High Priority Planned Actions:

- Prepare draft Phase II Municipal Stormwater Permit Application and compliance plan. 2003.

Other Planned Actions:

- Participate in the Santa Margarita River watershed stormwater permit-holder committee.

OBJECTIVE: Ensure protection of Base assets.

High Priority Planned Actions:

- Develop plans to ensure 100-year flood protection of all new facilities. Submit specific projects through normal Base staffing procedures and the Base NEPA process for decision and approval. Ongoing.
- Execute agreements to use cooperative management of upstream hydrology to ensure 200-year flood protection of MCAS Camp Pendleton, and the Ranch House. 2004.
- Complete Phase III Early Warning System improvements. 2003.

OBJECTIVE: Ensure that all Base planning programs consider effects on, and limitations of, water resources and infrastructure.

High Priority Planned Actions:

- Make water resources and water infrastructure decisions based on planning that considers all aspects of water resources issues, including current and projected operational and regulatory requirements. Ongoing.

- Improve the data collected and used for and provided by water resources planning. Ongoing.

OBJECTIVE: Ensure the adequate supply and reliable delivery of safe water to support consumptive and environmental requirements of the Base. Use best management practices to minimize nonpoint sources of water pollution. [DoDI 4715.3]

High Priority Planned Actions:

- Continue to monitor tide levels and water quality in the Santa Margarita River; evaluate potential changes to the estuarine ecosystem as a result of ongoing actions and projects and document the periods when the other coastal lagoons are subject to tidal influence. Ongoing.
- Continue groundwater monitoring in all drainages where groundwater is extracted to determine and manage the potential effect on listed species habitat. Ongoing.
- Monitor stream water quality, flood regimes, and storm event frequency. Ongoing.
- Monitor the effects of sedimentation in Santa Margarita River Estuary and coastal lagoons that are subject to upstream disturbance from programmatic, construction activities and off base activities. Ongoing.

4.7.2 General Vegetation Management and Soil Conservation

Watershed, floodplain, fuel break/fire management, prescribed burning, grounds maintenance, landscaping, and soil conservation can all be viewed as components of vegetation management. 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. Legislation and regulations relevant to vegetation management and soil conservation are summarized in Appendix A.

In 1990, in response to anecdotal reports of erosion problems (provided by Marines, Fire Department personnel, FMD, AC/S ES staff, contractors, researchers, etc.), 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 plans to implement a formal erosion control program.

An erosion site database was developed in 1997 to prioritize limited resources and focus on areas where erosion repair was feasible. This field inventory identified approximately 130 locations where potential erosion problems exist. Several of the projects have already been started (Table 4-3). At present, erosion control activities are focused on specific sites. An Erosion Management Plan is being developed as the first phase of programmatic erosion control measures.

TABLE 4-3. Recent (since 1997) erosion control projects conducted or proposed on Base.

Date	Project	Location	Contractor	Status
1999	Training lands reclamation	To be determined	Claude Boehm	Ongoing
1999	DZ tank park	DZ tank park	Resource Conservation District (RCD)	Completed 1999 Draft submitted 11/1999
1998	Erosion control plan	Basewide	Tierra Data	Ongoing
1998	Coastal canyons	Coastal canyons	RCD	Ongoing
1998	DZ tank park	DZ tank park	RCD	Ongoing
1998	Bluff erosion study	North of White Beach	Gerry Kuhn	Completed 1999
1997	DZ tank park	DZ tank park	RCD	Ongoing

Implementation of the Erosion Management Plan 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; and (4) exotic pest plant reduction and control.

OBJECTIVE: Protect and restore soil productivity, watershed functioning, water quality, and wildlife habitat through effective implementation of Best Management Practices to prevent and/or control soil erosion.

High Priority Planned Actions:

- In collaboration with Camp Pendleton land users, federal, state, tribal, local governments, nongovernmental organizations, private organizations, and the public, develop a shared vision of what constitutes desirable future watershed conditions for the Santa Margarita River and the San Mateo Creek. 2003.

- Provide focused training for the natural resources staff member responsible for soil conservation and erosion control. Ongoing.
- Establish a Natural Resource Damage Repair program by 2002. Implement repair actions as needed in a timely manner. 2002.
- Complete development of research based specifications and standards for reseeded/revegetation of disturbed sites. 2002.
- In the preliminary engineering design, and construction of facilities involving ground disturbance, incorporate construction site sediment control, soil and water conservation as appropriate. Ongoing.
- In the preliminary engineering, design, and construction of facilities involving ground disturbance, incorporate soil and water conservation and native vegetation landscaping, as appropriate, per the White House Memorandum for the Heads of Executive Departments and Agencies (26 April 1994) and Executive Order 13112 (3 February 1999). Ongoing.
- Monitor the effects of sedimentation in Santa Margarita River Estuary and coastal lagoons that are subject to upstream disturbance. Ongoing.
- When row crop outgrants come up for renewal, review Soil and Water Conservation plans for compliance with all applicable natural resource requirements. Ongoing.

Other Planned Actions:

- Restore and enhance coastal dunes.
- Reduce encroaching bluff erosion. Submit specific projects through normal Base staffing procedures and the Base NEPA process for decision and approval.
- Monitor the effects of off road vehicle use and provide for the rehabilitation of training lands that have excessive degradation.

OBJECTIVE: Implement an Erosion Control Management Plan.

High Priority Planned Actions:

- Complete the Erosion Control Management Plan. 2002.

- Annually evaluate the prioritization of erosion control sites and apply best management practices to control measures for areas of severe gullyng to decrease hazardous training conditions. Ongoing.
- Apply best management practices to erosion control measures for firebreaks and roads basewide. Ongoing.
- Endeavor to use native seed stock in restoration and enhancement measures as feasible. Ongoing.

Other Planned Actions:

- Restore and enhance coastal dunes.
- Reduce encroaching bluff erosion. Submit specific projects through normal Base staffing procedures and the Base NEPA process for decision and approval.

4.8 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 Endangered Species Act, including areas in the immediate vicinity of developed and landscaped areas. To help ensure compatibility with federally listed species and natural resource management in general, the Base Exterior and Architecture Plan contains a list of approved plants that may be used for landscaping on Base. Changes to this list are reviewed by the Resource Management Division to ensure consistency with the Base's exotic species control program.

Prior to clearing natural vegetation, AC/S ES is consulted with for natural resources impacts. During the breeding season site surveys are required to locate active bird nests that are removed only after obtaining required permits and/or "take" authorization from the USFWS.

Pesticide application must be coordinated with the Base pesticide coordinator and should be part of an integrated pest management approach. Mowing around runways and parking aprons is done in consideration that federally listed and sensitive species are in the immediate vicinity of the runways.

GOAL: Develop and implement a Native Landscaping Plan

GOAL: Ensure that grounds maintenance and landscaping operations are integrated and consistent with natural resource goals and objectives.

OBJECTIVE: Provide a plan for management and expansion of community landscapes on Base. Conserve water, protect water quality, reduce runoff and erosion, and decrease plant nutrient loss by reducing the demand for water in landscaping. Promote use of native species in landscaping practices.

High Priority Planned Actions:

- Map the spread of exotic plants and successful removal by control programs, including regional data when possible. Ongoing.
- Discourage the use for landscaping of invasive exotic plants, such as those listed by the Exotic Pest Plant Council and CNPS. Ongoing.
- Review annually and recommend changes to the Base landscaping plans for compliance with the White House Memorandum for the Heads of Executive Departments and Agencies (26 April 1994) and Executive Order 13112 (3 February 1999). Ongoing.
- In the preliminary engineering, design, and construction of facilities involving ground disturbance, incorporate soil and water conservation and native vegetation landscaping, as appropriate, per the White House Memorandum for the Heads of Executive Departments and Agencies (26 April 1994) and Executive Order 13112 (3 February 1999). Ongoing.
- Use the exotic plant control program to control spread of exotic landscaping plants into natural areas. Ongoing.
- Review and revise the flightline mowing program Standard Operating Procedures to maintain consistency with BASH program and vernal pool endangered species management requirements. 2003.

4.9 COMMERCIAL FORESTRY – N/A at Camp Pendleton

4.10 GRAZING AND AGRICULTURAL OUTLEASES

AC/S Environmental Security is responsible for overseeing agricultural, grazing, and seed collecting outleases. These programs are consistent with the multiple use concept adopted by the Marine Corps for its lands. The leases benefit the Marine Corps by providing sound and appropriate land uses, along with income to the Base. The agricultural outlease program has operated successfully for many years. The success is due partly to deep soils, the mild coastal climate, and access to water. Proximity to urban markets also provides for the economic success of these enterprises.

Each agricultural outlease contains a Soil and Water Conservation Plan specifying practices and projects to be performed by the lessee as part of the contract. It includes specific soil and water conservation practices required to protect and improve the productivity and fertility of the land, a schedule for application of the required practices, and provisions for restoration of the land upon termination of the lease. In addition, each plan includes agricultural and pest management practices that are consistent with state and federal regulatory requirements and the overall goal of the installation. Conservation measures currently include various erosion control projects, irrigation system upgrades, pest management requirements, fire prevention, debris removal, road damage prevention and access policies. Leased parcels are routinely monitored for compliance with the lease documents and erosion specifications.

GOAL: Evaluate the compatibility and fair-market value of the agricultural and grazing leases, in conjunction with the military mission and natural resource management.

4.10.1 Livestock Grazing

The Base leases out approximately 24,000 acres for sheep grazing. The acreage available for grazing is located in active training areas and is used only when grazing will not interfere with military training. The established animal carrying capacity is set at approximately 44,000 sheep-unit months (a sheep-unit month is the amount of forage a single ewe-lamb pair will consume in a month). Grazing is permitted mainly on annual grasslands south of the Santa Margarita River and on perennial grasslands north of the river (Figure 3-5). Grazing is also used for vegetation control within the fenced compound at the Las Pulgas Ammunition Supply Point to maintain vegetation within height limits specified in fire hazard regulations. Sheep have also been used to abate fire hazards on specific ranges).

Associated with the equestrian program on Base are two pastures for horse grazing. The larger pasture is approximately 1,309 acres and covers much of the Lima training area. The small pasture, 123 acres, is adjacent to the stables. These pastures are available for leased grazing. The number of horses and frequency of usage varies from year to year. As the horse grazing is associated with recreational activities, MCCS provides the lead for the management and use of these areas.

OBJECTIVE: Ensure the long term viability, compatibility, and fair-market value of the grazing leases, consistent with the needs of the military mission and natural resource protection.

High Priority Planned Actions:

- Evaluate grazing levels (from both sheep grazing leases and horse pasture usage) to ensure resource sustainability and minimal adverse impacts to training, Base operations and federal threatened and endangered species. Ongoing.
- Develop a Grazing Management Plan. 2003.
- Monitor the number and class of animal permitted to graze under lease agreements on Base. Ongoing.
- Ensure all present and future Base Orders address the activities of outgrantees, including row crop and grazing leases, as appropriate. Ongoing.

4.10.2 Row Crop Production

Approximately 1,400 acres of land on Base are leased out for farming. Agricultural leases are typically for 5 year. In accordance with the Soil and Water Resources Conservation Act of 1977, each agricultural outlease must have a Soil and Water Conservation Plan specifying practices and projects to be performed by the lessee as part of the contract. Conservation measures currently include erosion control projects, irrigation system upgrades, pest management requirements, fire prevention, debris removal, road damage prevention, and access policies. Each lease also specifies soil and water conservation practices required to protect and improve land productivity and fertility, a schedule for application of the required practices, and provisions for restoration of the land upon termination of the lease. Additionally, each plan includes agricultural and pest management practices that are consistent with state and federal regulatory requirements and the overall goals of the Base.

Funds from agricultural leases can only be used for administrative support of agricultural leases and financing multiple land use management programs. These funds are specifically restricted from being utilized for mitigation funding and funding of non-land management staff at Camp Pendleton. These funds are traditionally used for erosion control efforts, the long term trend monitoring program, rare plant surveys, natural resource staff positions, etc.

OBJECTIVE: Ensure the long term viability, compatibility, and fair-market value of the row crop leases, consistent with needs of the military mission and natural resource protection.

High Priority Planned Actions:

- Evaluate row crop activities on Base to ensure they are properly integrated with natural resource management efforts. 2002.
- When row crop outgrants come up for renewal, review Soil and Water Conservation plans for compliance with all applicable natural resource requirements. Ongoing.
- Develop a Standard Operating Procedure addressing specific environmental compliance actions required by all outgrantees, including row crops, issued aboard Camp Pendleton. 2005.
- Provide periodic inspection of all outgrants, including row crops, and implement an effective action plan to address any violations. Ongoing.
- Expand the Base's Environmental Compliance Evaluation process to include all real estate tenants aboard Camp Pendleton. 2003.
- Ensure all present and future Base Orders will address the activities of outgrantees, including row crop and grazing leases, as appropriate. Ongoing.

4.10.3 Native Seed Collection

An undetermined amount of land is available for native seed harvesting. Private contractors have commercially harvested seeds from native plants on Camp Pendleton since 1988. Native seeds have commercial value as stock for native vegetation restoration programs and for ornamental landscaping. In addition to gaining revenue from the commercial sale of the seeds, seeds are reserved for Camp Pendleton to use for restoration purposes. The use of seeds from the Base helps ensure a genetic stock that is adapted to the environmental conditions of the area and reduces site restoration costs.

Over 200 species are approved for harvest with a species list provided to the contractor. No more than 30% of the annual seed crop of any tree, brush, forb, or grass species in any individual location is harvested each year. All seed harvesting is done by hand and/or with hand carried vacuum type devices. Mechanical harvesting is not allowed. No mechanical injury to plants is allowed. The harvesting of threatened, endangered, or proposed threatened/endangered species is regulated by the U.S. Fish and Wildlife Service and by Base policy.

OBJECTIVE: Ensure the long term viability, compatibility, and fair-market value of the seed collection leases, in conjunction with the military mission and natural resource protection.

High Priority Planned Actions:

- Provide appropriate oversight to native seed collection efforts on Base. Ongoing.

Other Planned Actions:

- Conduct study to ensure that current seed collection methodologies do not impact natural resources on Base.

4.11 FIRE MANAGEMENT

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” (MCB Camp Pendleton 1998). The high fire ignition frequency at Camp Pendleton (Minnich 1983) likely represents the single greatest influence on natural resources on Base (MCB Camp Pendleton 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 extremely dry vegetation.

To address fire management issues, in 1992 Base Order P11320.13D, *Fire Protection Regulations and Instructions*, was implemented. Subsequently a Fire Management Plan (FMP) was developed. An update of the FMP (entitled *Wildland Fire Management Plan Update*, MCB Camp Pendleton 1998), developed jointly with the USFWS, was recently completed. The FMP is based on the development, implementation, and oversight of a proactive strategy focused on valuation and prioritization of Base resources. The 1998 FMP strategy balances military training requirements with protection of natural resources, in combination with fiscal considerations.

GOAL: Implement recommendations from the 1992 plan and incorporate information obtained from the Fire Management Plan Risk Assessment conducted by REM & Associates (1994).

GOAL: Manage fire consistent with training needs and safety.

4.11.1 Pre-Suppression

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-suppression measures include the implementation of the Fire Danger Rating System (FDRS), maintenance of fuel/firebreaks and access roads, and application of controlled burning.

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 4-4). Fire danger ratings are established daily from a combination of weather data, fuel load, Base activity level, and fire fighting resource availability. (Ratings may be further adjusted within a given locality for the added protection of sensitive natural resources.) Fire hazard conditions are monitored throughout the day by the Base's Fire Department, in cooperation with Range Control, and through intermittent range inspections.

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 firebreaks and fuel breaks to limit or slow the spread of fire. The Base has established an extensive network fire/fuel breaks, totaling nearly 1,300 acres over approximately 186 linear miles.

Another important pre-suppression fuels management measure involves the use of controlled burns. The Fire Department submits an annual burn plan (which includes all controlled burns) for review by the AC/S ES to ensure that these pre-suppression fire management actions are consistent with natural resource management goals and the San Diego County Air Pollution Control District's Smoke Management Program. All controlled and training burns are coordinated with and permitted by the San Diego County Air Pollution Control District.

OBJECTIVE: Minimize the risk of adverse impacts from wildfires and fire management practices.

High Priority Planned Actions:

- Provide natural and cultural resource technical services to the Camp Pendleton Fire Department to support their fire management planning efforts. Ongoing.
- Develop a set of programmatic instructions/guidelines in coordination with the Fire Department of use during wildfire suppression activities. 2002.
- Conduct pre-suppression measures (e.g., controlled and prescribed burning) to help reduce the fuel load while managing for sensitive natural resources. Ongoing.
- Prepare jointly with the Fire Department, Standard Operating Procedures for annual maintenance of the Base's fuel breaks, firebreaks, and access roads. 2002.
- Validate, and revise where necessary, the current fire model. 2002.
- Provide wildland fire management training to natural resources staff responsible for supporting wildland fire management on the Base. Ongoing.

TABLE 4-4. 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 prohibited.	EXTREME ^a

^a These ranges are closed during extreme rating: Door Gunner 1, Door Gunner 2, 401 Impact Area. These training areas are closed during extreme rating: Juliatt, 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.

- Evaluate present firebreaks needed to support the Wildland Fire Management Plan. 2002.
- Restore, using best management practices, firebreaks and roads, which are no longer needed. Ongoing.
- Develop a fuel loading report that identifies high hazard areas. 2002.
- Develop a GIS based vegetation age class distribution map of the Base that shows levels of fuel loading. 2002.
- Annually update fuel load hazard mapping. Ongoing.
- Schedule and prioritize prescribed burns for resource management and fire suppression. Ongoing.
- Identify controlled burn or other brush management areas that will be valuable for maintaining or enhancing mosaic and diversity of vegetative age classes and enhance wildlife diversity. This will compliment the Camp Pendleton Wildland Fire Management Plans and Uplands Ecosystem Conservation Plan. Ongoing.

4.11.2 Suppression

Fire suppression occurs throughout the Base as needed, mostly between the months of May and November. Fire suppression activities include: fire line construction, firing out, 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 (Figure 4-1) indicate the location of the majority of the fire suppression activity on Base.

In many cases, existing paved and dirt roadways can be used as fire lines to contain a wildfire. The location of sensitive habitats or listed species is considered in 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 contact the AC/S Environmental Security when sensitive natural resources (as identified on the Base Environmental Operations Map) may be affected by suppression activities. A natural and cultural resource representative from the AC/S, Environmental Security Resource Management Division responds to such calls and provides guidance to the Incident Commander on avoidance and minimization of impacts to listed species and occupied habitats. Fires of five acres or larger are mapped.

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 Vehicle [HMMV] and/or four-wheel-drive pickup trucks mounted with water tanks); 2 water tenders (ten-ton, six-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 U.S. Forest Service (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 wildfire might burn off the Base.

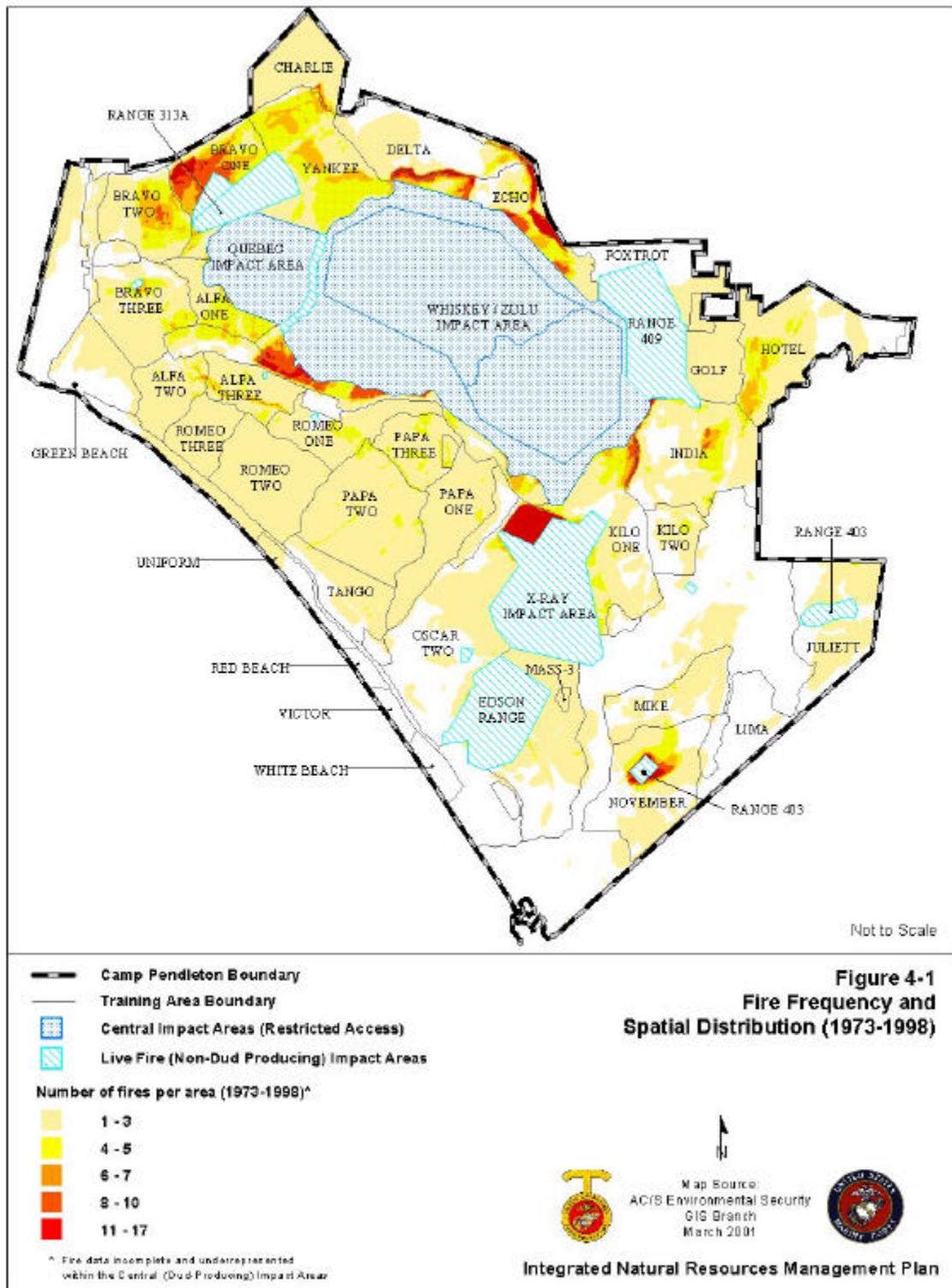
OBJECTIVE: Minimize the risk of adverse impacts from wildfires and fire management practices.

High Priority Planned Actions:

- Have a qualified natural and cultural resource representative respond to all wildfires when called by the Fire Department. Provide on-the-ground natural and cultural resource expertise to help avoid and minimize adverse impacts from fire suppression activities. Ongoing.
- Provide natural and cultural resource technical services to the Camp Pendleton Fire Department to support their fire management planning efforts. Ongoing.
- Develop a set of programmatic instructions/guidelines for coordination with the Fire Department during wildfire suppression activities. 2002.
- Provide wildland fire management training to natural resources staff responsible for supporting wildland fire management on the Base. Ongoing.

4.11.3 Post-Suppression

Post-suppression actions include, but are not limited to: erosion control (reseeding, mulching), exotics control, and increased programmatic protection of site. Post-suppression fire management actions generally occur where a fire has burned occupied habitat or where erosion may become a problem.. 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-suppression activities are done only in unusual situations, usually where there is a direct impact or an immediate threat to federal threatened and endangered species or their habitat. Post-fire seeding may occur under limited conditions, as determined by the AC/S ES.



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OBJECTIVE: Minimize the risk of adverse impacts from wildfires and fire management practices

High Priority Planned Actions:

- Update the GIS database with wildland fire data annually. Map all wildland fires outside of impact areas that are greater than five acres and identify impacts to threatened and endangered species. Ongoing.
- Establish monitoring plots to track natural resource recovery after wildland fire impacts. 2002
- Develop procedures for post-fire and post-fire suppression land restoration measures in selected areas. 2002.
- Where possible use native seed stock if conducting post-fire reseeding. Ongoing.
- Provide wildland fire management training to natural resources staff responsible for supporting wildland fire management on the Base. Ongoing.
- Evaluate present firebreaks needed to support the Wildland Fire Management Plan. 2002.
- Restore, using best management practices, firebreaks and roads, which are no longer needed. Ongoing.

4.12 ENVIRONMENTAL PLANNING

Environmental planning and the provision of technical support for projects on Camp Pendleton are important for ensuring the sustainability of natural resources to support the military mission. Due to the wide variety of land uses occurring on Base and the number of Base organizations involved in land use decisions, Base environmental planning needs to be comprehensive and integrated. Camp Pendleton programs, plans (e.g., training management plans, master plans, pest management plans), and projects (e.g., construction of new ranges, roads, buildings) must be in compliance with natural resource laws and regulations and integrated with natural and cultural resources programs, plans, and projects.

Environmental planning on Camp Pendleton occurs on different levels and scales (e.g., short term, project specific versus long term, regionwide). Program or project specific planning, which is relatively short term, is typically integrated with natural and cultural resource management via the National Environmental Policy Act 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. Camp Pendleton's NEPA process is instrumental to the

successful integration of Base activities and programs and is covered in more detail in Chapter 7.

Natural resource management support of Base projects 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) consultation with environmental regulatory agencies, (3) management and integration of compensation and mitigation actions (e.g., identification of mitigation sites, development of mitigation banks, monitoring past mitigation sites), and (4) post-NEPA review and follow up.

Long range, basewide planning is also an important aspect to natural resource management at Camp Pendleton. Long range planning helps to ensure that Base activities (including development projects, recreation programs, natural resource management initiatives, etc.) are consistent with natural resource management requirements, goals, and objectives, and that those goals and objectives are consistent with the military mission. Long range, basewide planning provides an opportunity to evaluate the integration of, and consistency among, planned actions.

GOAL: Integrate natural resource requirements with master planning and planning of mission activities to minimize unnecessary future impacts to mission.

GOAL: Initiate NEPA and environmental planning early enough in the project planning process to reduce delays in the schedule of proposed actions.

GOAL: Fully evaluate and document impacts of proposed actions and integrate them with environmental and natural resource programs when impacts require mitigation.

GOAL: Streamline environmental assessment procedures to enhance the mission-related use and stewardship of the Base's natural resources.

4.12.1 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 the National Environmental Policy Act. NEPA is the basic national charter for the protection of the environment 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 environment. Individual and cumulative impacts must be considered. NEPA is intended to help decision makers make informed decisions and take actions that protects, restores, and enhances the environment. In brief, the NEPA process requires that the Base: consider the environment in decisions concerning potential impacts; make diligent efforts to inform and involve the public at appropriate stages in the decision making process; develop and evaluate less environmentally damaging alternatives to potential projects; and support informed decisions with quality documents. Camp

Pendleton's NEPA process is an instrumental integration tool on Base and is covered in more detail in Chapter 7.

Initial planning stages of proposed DoD 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).

The Resource Planning Division of AC/S Environmental Security administers the NEPA process for MCB Camp Pendleton and the MCAS Environmental Office administers the NEPA process for MCAS Camp Pendleton. These offices have the duty to ensure 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. During the NEPA review process, the natural resource managers within these offices help to (1) identify potential adverse impacts from the project, (2) identify less damaging alternatives, (3) ensure that adequate mitigation is planned, (4) provide compliance with natural resource laws and regulations, and (5) maintain consistency with natural resource management goals and objectives.

Currently, the Resource Planning and Resource Management Divisions of AC/S ES utilize two databases to document and track NEPA and mitigation project activities. These databases are known as E-Trax and the "Mitigation Database," respectively. 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 tracking data. The first phase of development of this new, integrated E-Trax system has been completed and is beginning to be utilized. Completion of the second phase, which integrates the mitigation tracking element, is contingent upon funding availability.

OBJECTIVE: Fully implement the NEPA review process to facilitate project planning and integrate project specific plans with overall Base land use and natural resource management plans.

High Priority Planned Actions:

- During project and NEPA review, ensure that direct or indirect adverse impacts to federally listed species, critical habitat, floodplains, wetlands, and other sensitive resources are identified and minimized when possible. Ongoing.
- Prepare and regularly update a NEPA Handbook that clearly and simply outlines step-by-step Base procedures for the management and preparation of NEPA documents. Included should be a recommended format for Environmental Assessments and Environmental Impact Statements to facilitate contractor and in-house preparation and consistent documents. 2002.
- Clearly identify the persons accountable for project implementation and mitigation

requirements for each project. Ongoing.

- Contact off-Base interested and affected agencies and parties as soon as possible on projects with potentially significant environmental impacts, particularly if controversial. Ongoing.
- Provide NEPA and impact assessment training for designated NEPA personnel including public works and ROICC. Ongoing.
- Ensure all real estate leases and agreements, including renewals, are evaluated through the NEPA process. Ongoing.
- Ensure that all new activities with potential direct or indirect permanent impacts to federally listed species undergo NEPA review and are subject to the activity/consultation class system (as defined in the Estuarine and Beach Ecosystem Conservation Plan, the Riparian Ecosystem Conservation Plan, and the Upland Ecosystem Conservation Plan). Ongoing.

OBJECTIVE: Improve the NEPA planning process in order to better facilitate project planning and integrate project specific plans with overall Base land use and natural resource management plans.

High Priority Planned Actions:

- Track the early planning phases of future activities, including major training exercises, and construction projects in order to facilitate early awareness, implementation and compliance with programmatic instructions and early consultation with the Service if appropriate. Ongoing.
- Provide technical assistance to other Base offices before and after a proposed action is submitted for NEPA review. Ongoing.
- Provide NEPA and impact assessment training for designated NEPA personnel including public works and ROICC. Ongoing.
- Clearly identify the person accountable for project implementation and mitigation requirements for each project. Ongoing.
- 297A Reinitiate Quarterly environmental planning meetings between MCB and MCAS. 2002.

Other Planned Actions:

- Seek to expand the use of Programmatic Categorical Exclusions to define categories of actions which experience has indicated will not individually or cumulatively have a significant effect on the human environment.
- Encourage each Base office to annually anticipate their projects or actions and seek yearly “programmatic” Categorical Exclusions for all projects that qualify.
- Complete the second phase of E-Trax development, testing, and implementation.

4.12.2 Consultations

It is Marine Corps policy that installations must comply with laws for the protection and management of natural resources (see legislative and regulatory drivers in Appendix A). 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 resource managers at Camp Pendleton are routinely in communication with agencies such as the U.S. Fish and Wildlife Service, U.S. Army Corps of Engineers, State of California Regional Water Quality Control Board, California Coastal Commission, 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 established in coordination with appropriate regulatory agencies. For example, the Base has consulted under Section 7 of the federal Endangered Species Act with the USFWS on 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 and Estuarine/Beach Biological Opinion. The Base is currently in consultation with the USFWS for the corresponding Upland Habitat Biological Assessment and Programmatic Uplands Endangered Species Management Plan. Within all of these plans/documents are Activity (or Consultation) Class Systems (Table 4-2) for directing future consultations on Base projects. The purpose of this programmatic Class System approach is to: (1) satisfy Section 7(e)20 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 which 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.

Apart from the Air Station, which maintains its own environmental compliance staff, the AC/S Environmental Security serves as the lead organization for planning and addressing natural resource compliance issues such as wetland, endangered species, and air and water quality regulatory requirements. The Office of Water Resources also acts as a Base liaison with federal, state, and local conservation and public health officials and community interests regarding water resource management and protection.

OBJECTIVE: Assess and pursue the development of conservation agreements and/or programmatic consultations with regulatory agencies (e.g. USFWS, ACOE, etc.) to provide compliance with laws and regulations for Base actions.

High Priority Planned Actions:

- Ensure that all potential direct or indirect permanent impacts to federally listed species undergo NEPA review and are subject to the activity/consultation class system (as defined in the Riparian Ecosystem Conservation Plan, the Estuarine/Beach Conservation Plan, the Uplands Conservation Plan and their respective Biological Opinions). Ongoing.

4.12.3 Mitigation and Compensation

Natural resource managers provide project and mission support through the planning, implementation, integration, and monitoring of mitigation and compensation measures. Mitigation refers to measures taken to offset potential adverse biological effects from actions that may have *permanent* direct or indirect impacts to federally listed species, critical habitat, or other regulated resource. Mitigation actions are determined on a site specific basis and can include repairing, rehabilitating, or restoring the affected resource; reducing or eliminating the effect over time by preservation and maintenance operations during the life of the action; and/or providing substitute resources or environments. Because the 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. Compensation refers to measures taken to offset potential biological effects from actions that may have *temporary* direct or indirect impacts to federally listed species, critical habitat, or other regulated resource. 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, the Base has established several basewide management initiatives, management plans and conservation plans. While some of these initiatives/plans may not be specific to a resource affected, resources on Base are expected to benefit either directly or indirectly from successful implementation of these programs.

OBJECTIVE: Provide project and mission support through the planning, implementation, and integration of mitigation and compensation measures.

High Priority Planned Actions:

- Ensure that all direct or indirect permanent impacts to federally listed species are mitigated in accordance with USFWS determined measures and ratios. Ongoing.
- Monitor mitigation sites as determined in the agreement with the regulatory agency following enhancement/restoration efforts to ensure compliance. Ongoing.
- Ensure mitigation projects support or compliment the Base's training area development plan, master plan and goals and objectives for natural resource management. Ongoing.
- Conduct habitat restoration/rehabilitation (including exotics control) for the mitigation of existing projects in accordance with the Riparian Ecosystem Conservation Plan, the Estuarine/Beach Conservation Plan, and the Uplands Conservation Plan. Ongoing.
- Identify areas both on and off Base that may be used as mitigation sites for future projects. Ongoing
- Develop mitigation "banks" in anticipation of future project needs. [DoDI 4715.3] Ongoing.
- Develop an off-Base mitigation bank for future Air Station project needs. 2002.
- Develop a system for tracking mitigation conducted for banking credits and for specific projects. 2002.
- Establish a Mitigation Tracking Database for the Air Station that outlines every action that needs to be carried out and serves as a long term monitoring document. 2002.
- Evaluate the feasibility and desirability to negotiate with regulating agencies reduced mitigation costs for development projects within predetermined cantonment buffers. 2002.
- Clearly identify the person accountable for project implementation and mitigation requirements for each project. Ongoing.
- Evaluate the effectiveness of mitigations applied to various projects in avoiding significant environmental impact, and readjust if necessary. Document the Base's experience and successes to convincingly demonstrate mitigations will reduce impacts to less-than-significant. 2004.

Other Planned Actions:

- Identify candidate sites for future wetland mitigation to compensate for unavoidable wetland value losses (and include in future master planning documents).
- Complete the second phase of E-Trax development, testing, and implementation.

4.12.4 Post NEPA Follow up

Upon receipt of permits, biological opinions, 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 AC/S Environmental Security serves as the lead organization for conducting post NEPA follow up except for actions with no regulatory consultations that take place entirely on the Air Station.

OBJECTIVE: Monitor to ensure mitigation compliance for projects implemented or actions taken as set forth in existing NEPA decision documents, Biological Opinions, 404/401 permits, and Coastal Commission determinations.

High Priority Planned Actions:

- Develop and maintain a comprehensive list of commitments and Terms and Conditions contained within the numerous formal and informal consultation documents and permits issued to or that apply on the Base. 2002.
- Ensure the execution of commitments and Terms and Conditions within consultation documents issued to the Base for DoD and non-DoD agency proposed actions. Ongoing.
- Evaluate the effectiveness of mitigation applied to various projects in avoiding significant environmental impact, and readjust if necessary. Document the Base's experience and successes to convincingly demonstrate mitigations will reduce impacts to less-than-significant levels. 2004.

4.12.5 Long Range Planning

Long range environmental planning is key to successful natural resource management, compliance, and mission support at Camp Pendleton. Long range planning helps to ensure that Base activities (including development projects, recreation programs, natural resource management initiatives, etc.) are consistent with natural resource 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 resource 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 7) 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 and Air Station Master Plans. The installation master planners, who are usually within public works, should be very familiar with the INRMP because they designate land use. Master plans typically extend to a 20- to 30-year period, whereas the INRMP provides a planning period of five years. The INRMP may identify designated sensitive areas with land use restrictions. It is imperative that natural resource 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. Currently, the MCB and MCAS Master Plans primarily focus on the development of facilities and are in the process of being up-dated and integrated with other long term planning documents on Base (including those for training, fire management, and natural resource management). The INRMP is expected to complement and be fully compatible with Master Plans and support strategic planning.

OBJECTIVE: Maintain the integration and relevance of long range planning documents to support the long term sustainability of Base resources and the military mission.

High Priority Planned Actions:

- Complete a programmatic Environmental Assessment for the MCAS master plan. 2003.
- Conduct semiannual INRMP review meetings. Ongoing.
- Conduct annual INRMP review meetings. Ongoing.
- Revise the INRMP every 5 years. 2006.
- Develop and implement an Adaptive Management Plan for the Air Station. 2002.
- Integrate natural resources management objectives with mission activities and facilities development. Ongoing. [AC/S ES]

- Attend Base planning meetings; the Range Working Group meetings and other meetings to maintain currency with long range Base planning topics and land user requirements. Ongoing.

Other Planned Actions:

- Integrate the INRMP into the MCB and MCAS Master Plans.
- Ensure the INRMP is integrated as appropriate into other Base planning documents.

4.13 EMERGENCY RESPONSE

Emergency situations are defined to include acts of God, disasters, casualties, and national defense or security emergencies. Although the timing and extent of such emergencies may not be entirely predictable, it is always possible that such events may occur. In addition to prevention and early detection measures that help reduce the probability of an event occurring or the extent of the damage should an emergency situation arise, the Base recognizes the importance of advance preparation to the fullest extent possible/feasible for handling emergency situations. It is understood that the nature of emergency situations does not always permit avoidance and minimization of impacts to sensitive resources and the environment; however, advance preparation is expected to facilitate avoidance and minimization of impacts where possible and to prevent the exacerbation of adverse environmental impacts during responses to emergency situations.

With respect to potential federal threatened and endangered species take incidents incurred by necessary response actions to such emergency situations, 50 CFR 402.05 allows for after-the-fact review of impacts under such circumstances.

GOAL: Develop and implement an Emergency Response Action Plan to avoid and minimize adverse impacts to environmentally sensitive areas and other natural resources.

OBJECTIVE: Develop and implement an Emergency Response Action Plan to avoid and minimize adverse impacts to environmentally sensitive areas and other natural resources.

High Priority Planned Actions:

- Provide natural and cultural resource technical services to the Camp Pendleton Fire Department to support their fire management planning efforts and hazardous incident plans. Ongoing.

- Maintain a contract with San Diego County Hazardous Incident Response Team or a similar organization to provide hazardous substance identification and incident technical advice. Ongoing.

Other Planned Actions:

- To the extent feasible and consistent with the military mission, ensure integration of natural resources concerns with the Base's emergency mobilization/deployment plans to minimize unnecessary impacts during such emergency situations.

4.14 INFORMATION MANAGEMENT

Fundamental to natural resource management and the ability to make informed decisions is the collection, analysis, storage, maintenance, presentation, and distribution of data. Types of data required to support management include those collected in Section 4.2 (Natural Resources Inventory) of this chapter (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.) as well as topographic, soil, land use (roads, buildings, ranges and training area designations, agricultural and park leases, etc.), and other physical features and administrative boundaries. Although not all natural resource 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.

The Information Systems Branch in Environmental Security currently provides management oversight for GIS based data and the office's inventory of automated data processing equipment. The MCAS Environmental Department also has an evolving GIS capability. It is the IS Branch's policy to create, 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.

For non-GIS based data, the ES office is currently 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 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 Environmental Security has undertaken to improve the storage, maintenance, and accessibility of natural resource management information is the development of a Technical Integrated Information Center (TIIC). This state-of-the-art center is designed to provide virtual library resources for the archiving and retrieval of ES data and documents.

GOAL: Provide current, integrated, and accessible natural resource information to on Base and off Base data consumers for comprehensive and effective natural resource management and integration.

OBJECTIVE: Establish/promote a community of managers/users to project the far-reaching vision for geoinfo systems development.

High Priority Planned Actions:

- Establish an executive level working group (“Geographic Information System Policy Group”) with participants from all Base organizations to promote the forward vision and information sharing. 2002.
- Establish a technical level working group (“Geographic Information System Technical Working Group”) with participants from all organizations to promote information sharing and resolution of common technical issues. 2002.
- Participate in regional GIS working groups. Ongoing.
- Build the understanding and utility of the GIS to Base land use decision makers by developing a demonstration of its successful implementation, such as conducting some what-if scenarios for presentation. 2002.

OBJECTIVE: Establish/maintain Camp Pendleton’s GIS natural resources coverages and databases, ensuring all information is current and meets geoinfo standards and quality controls.

High Priority Planned Actions:

- Continue to develop precise and reliable natural resources datasets. Ongoing.
- Digitize at high resolution historical and ongoing aerial photos of the Base and provide archival storage protection for the original prints. 2002.
- Semiannually review GIS data to advise resource managers of needs to update datasets during budget planning and programming and in preparation of publishing the semiannual Environmental Operations Map. Ongoing.
- Ensure that standards for GIS database dictionaries and associated metadata for all Camp Pendleton GIS coverages are met. Ongoing.

- Ensure that all contracts with the potential for producing spatial data will include specific language with respect to the production of spatial data that are fully compatible with Camp Pendleton's GIS database. Ongoing.
- Update GIS data layers for natural and cultural resources from various internal and external reports and NEPA documents written for the Base. Clear backlog by 2004.
- Ensure that the information system support staff responsible for operating and maintaining the system annually obtain focused training regarding current technologies and uses of GIS technology as related to natural and cultural resource management on a military installation. Ongoing.
- Ensure all reports, maps and data received from contractors and supporting studies and surveys are received in digital versions for addition to GIS and the Document Management System. Ongoing.
- Evaluate the quality, accuracy, and resolution of mapped environmental data for all coverages. Ongoing.
- Identify, in specific terms, the appropriate use of each data layer based on the quality and resolution of the data source, and whether it is current. Ongoing.
- Require field verification of all data for site specific projects; including soil testing, on-site inventories for sensitive species, etc. Ongoing.
- Every six months, update the Base's Environmental Operations Maps to include the most current species and natural resource data. Ongoing.
- Establish a database design for each federally listed species, and selected other species as appropriate, to ensure that survey data and summary statistics are comparable from year to year and fulfill requirements for Biological Opinion Terms and Conditions. 2002.

OBJECTIVE: Establish/maintain a repository of Camp Pendleton's environmental knowledge base and provide accessibility to data and information for biologists, planners, contractors, and others in a quick and timely manner.

High Priority Planned Actions:

- Continue development and maintenance of the Technical Integrated Information Center. Ongoing.

- Ensure all reports, maps and data received from contractors and supporting studies and surveys are received in digital versions for addition to GIS and the Document Management System. Ongoing.
- Maintain hard and soft copy records of reports, studies, reference materials, and periodicals for environmental inventory. Ongoing.
- Develop a Standard Operating Procedure for the release of GIS data and survey/monitoring results. 2002.
- Develop (2002) and maintain a natural resources intranet website for access to natural resource data catalog by Base organizations. Ongoing.
- Facilitate distribution of updated Environmental Operations Maps to Base users. Ongoing.

OBJECTIVE: Maintain operational GPS capability for use with Camp Pendleton's GIS to quickly and accurately map natural resources to provide to biologists, planners, and contractors in an efficient manner.

High Priority Planned Actions:

- Develop a Standard Operating Procedure for using the GPS unit in the field and for data translation with a software interface that is user friendly for Natural Resources Department personnel. 2002.
- Ensure all GPS and GIS hardware, software, and maintenance agreements are current. Also, ensure these are technologically advanced and capable of withstanding extreme mapping conditions. Ongoing.

OBJECTIVE: Develop new information and products that increase the efficiencies of the planners and managers. Ensure the technically sound, practical, and appropriate use of storage and computer technology to manage, analyze, and communicate natural resource information in support of management decisions.

High Priority Planned Actions:

- Seek out and use existing technology and make strategic investments in new technologies and creative, innovative management techniques to address local, regional, or global environmental problems (USMCB 1994a). Ongoing.
- Facilitate better natural resource decisions on Camp Pendleton by improving the

capability to access, organize, analyze, and reproduce maps, inventories, remotely sensed data, and other natural resource planning documents. Ongoing.

- Ensure that all GIS computer hardware, software, peripherals, and maintenance agreements are current. Also ensure that hardware and software are capable of complex computations and manipulations with large data sets, detailed graphics are viewable, and that quality maps and reports can be produced. Ongoing.
- Create a demonstration of data resolution limitations for a range of environmental applications, and the hazards of using multiple map scales. 2002.
- Anticipate the need for and seek compatibility with other Base systems, so that land use decisions are coordinated to the greatest extent possible. Ongoing.

Other Planned Actions:

- Acquire any commercially available GIS products that would enhance Camp Pendleton's GIS database.

OBJECTIVE: Continuously educate managers and users on organizational and technical aspects of GIS.

High Priority Planned Actions:

- Develop GIS education programs for upper level managers and command staff, for technical "power" users, and for basic "casual" users. 2002.
- Provide continuing education in advanced GIS technologies through outside industry sources and/or workshops and conferences. Ongoing.
- Provide training on system software and capabilities to end users. Ongoing.
- Create a demonstration of data resolution limitations for a range of environmental applications, and the hazards of using multiple map scales. 2002.
- Build the understanding and utility of the GIS to Base land use decision makers by developing a demonstration of its successful implementation, such as conducting some what-if scenarios for presentation. 2002.

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