

7.0 NATURAL RESOURCES MANAGEMENT GOALS AND OBJECTIVES

A Comprehensive Natural Resources Management Plan (Kellogg 1994) was developed for the U.S. Navy to provide guidance for natural resources management on NAS Miramar. A number of specific management plans were incorporated and appended into that 1994 Natural Resources Management Plan, including the Fish and Wildlife Management Plan (USFWS 1993a), Outdoor Recreation Management Plan (NAS Miramar 1991), and Vernal Pool Management Plan (Bauder and Wier 1991). MCAS Miramar incorporated information that remained relevant into the 2000 and 2005 INRMPs (MCAS Miramar 2000, 2006). All relevant information from these previous plans is updated and incorporated into this INRMP for implementation.

7.1 Natural Resources Management Goals

Marine Corps' natural resource management goals, as set forth in MCO 5090.2 in support of Station military readiness requirements, are as follows:

- preserve access to air, land, and sea spaces to meet military readiness requirements;
- comply with applicable natural resources protection requirements (*e.g.*, laws, executive orders, and regulations);
- provide public access to installation lands, where practicable, provided such access does not conflict with military readiness and does not harm sensitive installation natural resources;
- participate in regional ecosystem partnerships, provided such participation does not conflict with military readiness and does not harm installation natural resources; and
- participate in wetland mitigation banks and threatened and endangered species conservation banks.

Natural resource management goals specifically adopted by MCAS Miramar are as follows:

- support the MCAS Miramar military mission by ensuring compliance with applicable environmental laws and regulations;
- include natural resource management as a component of planning for execution of Marine Corps operational requirements;
- identify and select opportunities for maintaining biodiversity, including conservation of important plants and animals; and
- secure regulatory agency and public recognition of Marine Corps environmental stewardship efforts.

DoD policy directs that each INRMP must address resource management on all lands for which the installation has real property accountability, including lands occupied by tenants or lessees or being used by others pursuant to a permit, license, right of way, or any other form of permission. Additionally, DoD policy authorizes installation commanders to require tenants, lessees, permittees, and other parties to accept responsibility for performing appropriate natural resource management actions as a condition of their occupancy or use¹⁴.

¹⁴ Assistant Deputy Under Secretary of Defense (Environment, Safety, and Occupational Health) Memorandum for the Deputy Assistant Secretary of the Army (Environment, Safety, and Occupational Health), Deputy Assistant Secretary of the Navy (Environment), Deputy Assistant Secretary of the Air Force (Environment, Safety, and Occupational Health), and Director, Defense Logistics Agency of 17 May 2005 on the subject of Implementation of Sikes Act Improvement Amendments: Supplemental Guidance concerning Leased Lands.

As such, all MCAS Miramar actions will consider natural resource management policies and objectives of this INRMP for all lands of MCAS Miramar. As new real estate and permission documents are developed and as modifications to existing permissions are prepared, the clear applicability of this guidance in the context of the entire INRMP will be reinforced. DoDI 4715.03, Enclosure 3, states that prior to acquiring, disposing, or realigning DoD properties, (1) all significant natural resources should be identified and determined whether they may be affected by the action and (2) permitted, significant, or museum-housed natural resources-related objects and documents are identified and conserved.

Natural resource management actions outlined in this INRMP will be planned and executed on all applicable lands of MCAS Miramar by Station resource management actions, others using Station lands, or both. Where applicable, this will include lands occupied by tenants or lessees or being used by others pursuant to a permit, license, right of way, or any other form of permission following necessary coordination. Existing land use agreements already subject to environmental planning and resources agency authorizations are expected to be operating already in a way that complements the philosophies and objectives of this INRMP.

NAVFAC SW provides some project management support to the Natural Resources Division for contracting, natural resource cooperative agreements, and project oversight. Department of the Navy procedures strongly encourage that NAVFAC SW be used for all contracted actions and cooperative agreements. Costs of this support are in addition to anticipated contracting costs.

This chapter's purpose is to describe the integration of the management and conservation of natural resources to support military operational requirements of the Station. To that end, clear objectives are presented below to meet each natural resource management goal. Projects were then developed and prioritized to accomplish each objective, and are presented in Appendix E.

7.2 Natural Resources Management Objectives

The natural resources management goals of MCAS Miramar can be split into the following management categories based upon the natural resources and management issues present for the Station:

- General Vegetation Management and Soil Conservation
- Wildland Fire Management
- Grounds Maintenance and Landscaping
- Special Status Species Management
- Vernal Pool Habitat Management
- General Wetland Management
- General Wildlife Management
- Migratory Bird Management
- Wildlife Damage Management (including Bird and Animal Air Strike Hazards)
- Integrated Pest Management
- Natural Resources-Related Outdoor Recreation Management
- INRMP Planning & Implementation
- Agricultural Outlease Management

Specific objectives have been developed for each of these categories as discussed in more detail below.

7.2.1 General Vegetation Management and Soil Conservation

Monitoring and maintaining native vegetation, control of invasive species, watershed and floodplain

management, and soil conservation are components of this subsection. Meeting objectives of each of these components requires an integrated approach to vegetation management as well as other natural resources components identified in this chapter. Management of special status plant species are addressed in Section 7.2.4, *Special Status Species Management*.

Objective: Develop and Implement Natural Land and Habitat Restoration or Rehabilitation

Effective vegetation management and associated soil conservation are critical to maintaining, restoring, and rehabilitating native vegetation and its associated wildlife habitats. When vegetation management is focused on habitat improvement for wildlife, it should include maintenance of wildlife corridors and habitat linkages. An example of ongoing habitat maintenance on Station is the informal policy of discouraging the removal of snags (standing dead trees) and logs. Whether left standing or laying on the ground, these materials provide valuable wildlife habitat. The maintenance and restoration of training lands is an equally important aspect.

Quantitative descriptions of vegetative attributes (cover, biomass, or composition) are helpful for habitat condition or trend monitoring, a planned management objective. Monitoring allows for periodic review of ecosystem quality and management success. The Natural Resources Division updated its vegetation/landcover mapping and geospatial information system (GIS) database in 2014 (Tetra Tech 2014). Data updates will be determined by periodic analysis of landscape conditions.

Invasive Plant Management

MCO 5090.2 (para. 11104.1g(2)) states, “*Installations, organizations and military units shall not authorize, fund, or carry out actions likely to cause or promote the introduction or spread of invasive species in the United States or elsewhere. They shall provide for invasive species control and minimize the economic, ecological, and human health impacts that invasive species cause.*”

MCAS Miramar complies with Executive Order 13112, *Invasive Species*. An invasive species is defined as “*an alien species whose introduction does or is likely to cause economic or environmental harm or harm to human health*” (Executive Order 13112). Federal agencies are to prevent the introduction of invasive species, provide for their control, and minimize the economic, ecological, and human health impacts that invasive species cause. Invasive plants can be a serious threat to natural plant communities. These species can change the structure of a plant community and degrade its ecosystem value.

MCAS Miramar has been actively identifying and controlling invasive plant species since before 1999. The priority for species control changes due to variable threats associated with invasive species, effectiveness of ongoing control, cost/benefit factors, and available control resources. There are 22 invasive species under contract for control with additional species to be added as needed. Several additional vernal pool weed species are controlled in specific vernal pool restoration and enhancement projects. MCAS Miramar follows the California Invasive Plant Council (<http://www.cal-ipc.org/>) and the San Diego Weed Management Area working group (http://www.sandiegocounty.gov/content/sdc/awm/ipm_sdwma.html) guidance materials when appropriate during invasive plant treatment and monitoring efforts.

Objective: Continue Long-Term Ecosystem Monitoring (LTEM) of Vegetation and Soil Conditions

MCAS Miramar has implemented Long-Term Ecosystem Monitoring (LTEM) for vegetation and soil conditions. Results of the initial year (1999) field studies for flora were summarized (Varanus Biological Services, Inc., and San Diego Natural History Museum 2003¹⁵) and are available for baseline comparisons. The most recent floral portion of the long-term ecosystem monitoring effort (O’Leary 2009) was completed in 2009.

¹⁵ J.L. O’Leary, San Diego State University, provided the vegetation evaluation.

O’Leary (2009) summarized results of the vegetation component of LTEM, which included the following:

- the development and implementation of a work plan for the spring 2008 and future vegetation sampling of 82 permanent plots located on the Station;
- the relocation and resampling of 75 vegetation plots last sampled in spring 1999;
- the establishment and sampling of seven additional plots;
- the production of detailed site descriptions, information on disturbance activities and erosion on ‘Land Use Forms,’ plot boundary directions, and maps recorded on standardized ‘Plot Map Forms;’
- the collection, pressing, identification, and mounting onto herbarium sheets of any plants found within plots that were previously not known to occur on the Station;
- creation of individual summaries of the compositional, structural, and site characteristics of the 82 plots sampled in 2008;
- creation of composite summaries of the individual plots that comprise each major vegetation type;
- contrasts between summaries of each major vegetation type sampled in 1999 with those sampled in 2008;
- summary contrasts for average cover for growth forms for 1993-94, 1999, and 2008;
- discussion of vegetation management implications; and
- production of a detailed methods manual to assist in the future relocation and sampling of the 82 vegetation plots.

O’Leary (2009) evaluated changes in vegetation between 1993-94, 1999, and 2008 and concluded, “*With only one exception (plot 80-5), none of the changes detected on individual sample plots appear attributable to U.S. Marine Corps military readiness activities. A significant factor affecting the Station’s vegetation was the Cedar Fire of October 2003 which burned 67 of the 82 vegetation plots. Generally, most vegetation types appear to be recovering fairly well, but exceptions occur.*”

LTEM special purpose plots have been placed in specific sites to provide information on management issues. For example, the Natural Resources Division has established LTEM special purpose plots in areas for controlled burns or wildfire corridors to monitor long-term fire effects to vegetation and soil conservation.

Objective: Maintain Watershed Productivity, Quality, and Function

Non-point source pollution control (including soil erosion control and maintenance of vegetative cover) is critical to the management of watershed health. Maintaining riparian vegetation cover through invasive plant removal contributes to water quality by preventing siltation into streambeds (e.g., minimizing new surface drainage into canyons). Watershed management is performed to conserve soil and water productivity and function. Effective watershed management includes fire management to reduce the loss of native vegetation and the assessment of impacts of surface runoff into watersheds.

Soil Erosion Control

MCO 5090.2 (para. 11104.2d) states, “*The Marine Corps shall manage its lands and waters to control and prevent soil erosion, soil loss, and aquatic sedimentation and to preserve natural resources by conducting surveys and implementing soil conservation measures. Construction projects shall be designed to eliminate post construction soil erosion, and altered or degraded landscapes and associated habitats shall be restored and rehabilitated whenever practicable.*”

Soil erosion can severely delay the re-establishment of vegetation and habitat conditions needed to sustain plant and wildlife species. This is of particular concern when Special Status Species’ habitat is the focus of

habitat improvements. Soil erosion also affects the maintenance of training lands, which require vegetative cover for training realism.

All Marine Corps installations are required to manage their lands to prevent and control soil erosion and conserve natural resources using surveys and soil conservation measures. Erosion control is meant to conserve the integrity of soil productivity and function. It encompasses water quality concerns and protection of wetland functions.



Slope Restoration - Fish Pond Natural Resources Division

Erosion and sedimentation issues are important at MCAS Miramar due to highly erodible soils and above normal fire risk throughout most of the year. Excess sediment or altered flows can affect watershed hydrologic function, water quality, and wildlife habitat. Watershed malfunction that results in excessive runoff can degrade or even destroy whole ecosystems, individual plant communities, or specialized zones, such as riparian areas. Gullies can lower the water table, potentially affecting vegetative cover and the hydrology of an entire watershed. Roads can alter water flow and potentially divert water from natural streams.

A soil erosion inventory of the Station was completed in 1991 (Kellogg and Kellogg 1991). Of 287 erosion sites described, 51 were classified as active and 32 with minor activity. Almost three-quarters of the sites were natural landslides off eroded ridges in East Miramar. The greatest manmade erosion hazards on the Station were wide, unvegetated fuelbreaks without water diversion devices (Kellogg 1994).

In 2004-05, URS (2005) inventoried undeveloped portions of the Station on a landscape level to assess, document, and prioritize active erosion sites and provide recommendations for restoration of priority erosion sites. Erosion sites were classified into the following categories: sheet, rill, gully, channel, and mass wasting/landslide; sites were further categorized as natural or accelerated by human-induced processes. URS identified 98 sites with erosion problems; 68 contained gullies. Rills were identified at 19 sites; channel erosion at 8 sites; streambank erosion at 6 sites; slumps at 5 sites; and mass wasting was recorded at 12 sites.

Site prioritization was based on the following: 1) sites that potentially affect Station training needs, 2) sites that potentially affect Station facilities, 3) sites that potentially affect Station cultural/ biological resources, and 4) sites that affect Station maintenance projects. URS (2005) completed detailed erosion restoration recommendations for 18 priority erosion sites. These recommendations are adaptable to other erosion sites

with the same erosion classification. Current efforts involve establishing restoration project programming and implementation efforts for these recommendations.

Vegetation restoration is a second area of watershed and ecosystem protection achieved by MCAS Miramar, which provides soil stability in addition to reducing reflected sunlight. During 1999-2001, field work was conducted for a Public Works Division project to locate restoration sites for coastal scrub, grasslands, and wetlands. This study (Johnson *et al.* 2003) identified 102 restoration sites encompassing 598 acres.

MCAS Miramar has instituted several revegetation and restoration projects that have stabilized soils with vegetative cover.

- In 1993, revegetation (restoration) of 25 acres of land was conducted in the Eastgate Mall portions of the Station in order to obtain 20 acres of coastal sage scrub vegetation to compensate for the loss of 20 acres off-station in Lakeside, CA.
- In 1999, the restoration of 87.5 acres was begun to compensate for impacts from construction associated with BRAC realignment. Methods involved burning, irrigation, ripping and tilling, mulching, and local seed to grow seedlings for transplanting (Heffernan 2002).
- In 1999, the restoration of 3.16 acres was begun to repair on-site damage caused by fuelbreak maintenance operations. Methods involved straw flake erosion control dams and seedling plantings from local stocks, follow-up weed control, and irrigation (Johnson 2003a).
- In 1999, restoration of 0.6 acres was done to compensate for impacts associated with repair and improvements to the Ammunition Road leading to the Flightline. Methods involved seedling plantings from local stocks, follow-up weed control, and irrigation. This project also included a study of the effects of soil compaction on seedling survival (Johnson 2003b).
- Beginning in 2001, three eroded sites associated with the Fish Pond were restored to reduce sediment flow into the pond (Green *et al.* 2001). This project is complete (see above photo), and the pond is open for patron use.
- In 2002, MCAS Miramar stabilized and revegetated an eroded chaparral slope at Homestead Dam (Tierra Data 2003).
- In 2006, soil erosion was stabilized on 0.09 acres on slopes in east Miramar along the San Clemente riparian corridor and Training Area 4.
- In 2007, soil erosion stabilization was conducted on 1.19 acres of slope at the Ordnance Complex (Environmental Engineering Division lead).
- In 2008, restoration of 7.2 acres was conducted to compensate for habitat loss from development and enhancement of 2.5 acres of habitat in Rose Canyon associated with the construction of a new Jet Fuel Farm (P-125).
- In 2009, soil erosion stabilization was conducted on 1.8 acres at the Fish Pond outfall on Rose Canyon tributary slope (Environmental Engineering Division lead) (different from 2001 project above).
- In 2010, 7.19 acres of Training Area 4 was reseeded with a variety of native grass species to reduce slope erosion (see below photo).
- In 2016, restoration of severe rill and gully erosion began on more than an acre bordering the VA Cemetery along Nobel Drive in northwestern MCAS Miramar and this area was filled, re-contoured, and planted to native species.



Marines provide manpower to reseed a training area with native plant seed
Photo courtesy of GySgt Christopher Long, January 14, 2010, H & HS Marines

Watershed and Floodplain Management

MCAS Miramar avoids direct or indirect development of floodplains and restores and conserves natural and beneficial values served by floodplains as it implements land management, construction, and land-use actions, as required by Executive Order 11988, *Floodplain Management* and outlined by MCO 5090.2. This approach serves to prevent flood damage to facilities.

Watershed management conserves soil and water productivity and function. Erosion and water quality management employ BMPs approved by the State of California under the Non-Point Source Pollution Control Plan.

Smith and Lichvar (2001) conducted a Station-wide planning-level delineation of aquatic resources, mapping of floodplains, and a functional assessment of riparian ecosystems at MCAS Miramar. The study accomplished the following:

- identified waters of the United States (U.S.) to help address jurisdictional requirement(s) of the CWA, and identified aquatic resources;
- mapped the 100-year return period floodplain; and
- provided a baseline assessment of riparian integrity for the 116 riparian “reaches” on the Station.

The 2003 Cedar Fire demonstrated the potential for substantial damage to riparian systems. Damage occurred in riparian areas from (1) riparian vegetation loss, (2) siltation from the adjacent slopes during rainfall events, and (3) higher water volumes during post-fire rainfall events that eroded channels and banks more than normal. A project was initiated in 2004 by the Miramar Public Works Division to mitigate some watershed damage caused by the fire and to prevent or minimize downstream flooding and sedimentation. Sedimentation barriers and plantings of riparian vegetation were installed in West Sycamore and San Clemente canyons to compensate for potential permanent loss of native riparian vegetation and accelerate vegetation recovery.

Green Farm earthen dam was repaired in 2003 to reduce risk of dam failure, which could have impacted the new Rifle/Pistol Training Range Complex and federally endangered willowy monardella plants downstream. Similarly, Homestead earthen dam in Training Area 4 was repaired about the same time to

prevent failure and damage to downstream resources and facilities.

7.2.2 Wildland Fire Management

MCO 5090.2 (para. 11104.2h) states, “*Fire is an important component of fire-adapted ecosystems. These ecosystems may require some level of prescribed burning to mimic the temporal frequency and intensity of the natural fire regime. Burning outside the natural fire regime may impact or convert vegetation plant communities to a non-native type. Prescribed burning is an important tool to reduce fuel loading and maintain fire-dependent ecosystems.*”

Objective: Implement a Wildland Fire Management Plan

MCO 5090.2 (para. 11204.2a) requires installations with burnable acreage, or bordered by burnable acreage, to develop and implement a Wildland Fire Management Plan, which will be incorporated into or consistent with the INRMP. An effective Plan will protect high value human and natural resource areas from catastrophic wildfire while also conserving resources and military operational flexibility.

The primary reason for fire management at the Station is the protection of human life, health, and property. Proper land and vegetation management aids in suppressing and reducing damage from wildland fires, which helps maintain watersheds and, thereby, water quality.

Potential ignition sources are both on- and off-Station. Management supports emergency response control efforts to reduce the likelihood of catastrophic wildfires, which can cause significant loss of resources. The MCAS Miramar Fire Department is responsible for fire management on the Station. Fire Department wildland fire managers work with the Public Works Division and Environment Management Department to maintain fuelbreaks and access roads.

The management of vegetation to meet fire control needs and soil/vegetation conservation will be evaluated jointly between wildland fire managers and the Station Natural Resource Division. Ideally, plans and actions should be directed to avoid grading or blading the soil beyond maintenance of an access road width with the remainder maintained by vegetation crushing, mowing, or prescribed burning. Where vegetation is cleared down to mineral soil on steep slopes, water bars or other diversion structures are placed at regular intervals to minimize soil erosion.

The *Wildland Fire Management Plan for Marine Corps Air Station Miramar, San Diego, California* (MCAS Miramar Fire Department 2009a) is referenced, but not incorporated into this INRMP. This Plan and its accompanying Environmental Assessment were prepared to guide wildland fire management and action decisions on MCAS Miramar. Fire prevention and suppression measures described in the Plan serve to reduce and/or control the frequency, size, distribution, and intensity of wildfires. Furthermore, these measures are intended to protect high-value areas (*e.g.*, military assets and sensitive natural or cultural resources) on- and off-Station (*e.g.*, residential and commercial areas that border MCAS Miramar). The plan is compatible with this INRMP. It emphasizes the protection of listed species from wildfire and identifies required conservation measures (termed MIST for Minimum Impact Suppression Tactics) associated with firefighting actions.



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The *Fireroad/Fuelbreak Maintenance Plan and Standard Operating Procedures* (MCAS Miramar Fire Department 2009b) is also referenced, but not incorporated into this INRMP. Implementation of

this plan is included in the environmental assessment for the Wildlife Fire Management Plan. The Fireroad/Fuelbreak Plan is reviewed annually and includes details on the maintenance of fuelbreaks and fireroads on the Station. This plan emphasizes treating vegetation to maintain fuelbreaks, instead of using heavy equipment blades to expose bare ground. Most fireroads are normally 15 feet wide unless they are within a fuelbreak when they are 20 feet wide with a 50-foot fuelbreak on each side. The Station maintains a GIS database on prescribed burn and wildfire burn boundaries; these GIS data were used to help develop the Fireroad/Fuelbreak Maintenance Plan.

Objective: Track and Monitor the Effects of Fires and Fuel Modifications

The effects of fires and fuel modifications on MCAS Miramar are tracked and monitored to inform hazardous fuel reduction actions in strategic areas on the Station, and to enhance or maintain native plant diversity and improve wildlife habitat.

The Station evaluated the use of native grass seeding for erosion control on Fuelbreak NS-5 and effects of such grasses on fuel management (Section 7.2.1, *General Vegetation Management and Soil Conservation*). However, native grass did not establish due to drought. The study was not continued due to costs without demonstrated benefits. The Station implemented a 2010 soil erosion control project (Restore Eroded Areas) on the upper portion of Fireroad R-15. R-15 was a 15-foot wide road that has been restored to the adjacent plant community. It will not be maintained as a fireroad.

The Miramar Fire Department includes prescribed burning as one of several fuel management tools that will support both fire and resource management objectives identified in the Station Fire Management Plan and this INRMP. Prescribed burn plans contain measurable objectives, a predetermined prescription, a fire escape contingency plan, and receive environmental review. Fire Department wildland planning within the Air Station boundary includes an element that all fire management activities will support and enhance ecosystem sustainability and the interrelated ecological, economic, and social components on a landscape scale.

Hunsaker and Awbrey (1999) studied the effects of fire on the Station using 12 study sites. This study showed the effects of a moderate intensity fire. The study indicated that unburned vegetation within general burn areas was important for ecosystem recovery. Black *et al.* (2016) studied the effects of wildfire on Miramar vernal pool habitat vegetation and found that native vernal pool vegetation is enhanced for the first several years after fire events (see Section 7.2.5, *Vernal Pool Habitat Management*).

Fire can have a positive impact on native vegetation and wildlife habitat. Prescribed burns can improve ecological diversity by fostering a mosaic of successional stages and age classes of vegetation types, which create vegetation patterns that increase forage for wildlife. The primary benefit of patchy mosaics to fire control is to lower the age class of vegetation, thereby lessening fuel load and buildup of the duff layer. This helps reduce the intensity and spread of unintentional spot wildfire ignitions (*e.g.*, roadside accidents, equipment sparks, powerline wire sparks). The resulting fire pattern is one of more frequent, smaller fires instead of providing seasoned, high fuel load vegetation that would contribute to larger-sized installation fires.

While wildfire typically occurs on MCAS Miramar each year, fire in any one area is typically much less frequent (*i.e.*, approximately every 20 years or more). Climate change, however, may alter natural fire regimes in southern California by increasing dry fuel loads due to decreases in precipitation, increasing winds due to amplification of the thermal gradient across the California interior, and decreasing humidity (Cayan 2013). Dry fuels, low humidity, and winds create extreme fire danger, and this compilation of factors may increase in the future due to warming temperatures. Consideration of the effects of climate change will need to be included in fire management goals and actions in order to effectively manage the

Station's natural resources.

The Natural Resources Division has established LTEM special purpose plots (Section 7.2.1, *General Vegetation Management and Soil Conservation*) in representative wildfire areas to monitor long-term effects to vegetation and soil conservation. Long-term monitoring will provide information regarding the effects of fire on vegetation and wildlife habitat.

7.2.3 Grounds Maintenance and Landscaping

Grounds maintenance and landscaping includes water conservation landscape design, use of regionally native plants in developed areas, reduction of fertilizer and pesticide use, low-flow irrigation, recycling of green waste, and weed control.

Ensure that Grounds Maintenance and Landscaping Operations are Consistent with Marine Corps Conservation Goals and Objectives

It is Marine Corps policy that environmentally and economically beneficial landscaping practices be used, per Executive Order 13148 and as outlined in a Presidential Memorandum (26 April 1994). The Presidential Memorandum directs federal agencies to:

- use regionally native plants for landscaping;
- design, use, or promote construction practices to minimize adverse effects on the natural habitat;
- prevent pollution by reducing fertilizer and pesticide use, using integrated pest management, recycling green waste, minimizing runoff, and similar practices;
- implement water efficient practices; and
- create outdoor demonstrations incorporating native plants and other similar practices.

A “native plant” occurs naturally in a particular region, ecosystem, and/or habitat without direct or indirect human actions (60 FR 40840).

Relevant orders and plans that affect grounds maintenance and landscaping on MCAS Miramar include:

- *Executive Order 13112, Invasive Species*, which requires preventing the introduction of and controlling invasive species;
- *National Invasive Species Management Plan* (2001), which include DoD goals to prevent and control invasive species as well as restore lands with native species;
- *DoD Directives 4715.1 and 4715.3*, which require military services to protect, preserve, and restore the natural environment using regionally native plants for landscaping;
- *Marine Corps Order P5090.2A, Chapter 11, specifically 11201.2* (26 Aug 2013), which states that installations are to maximize the use of native plants for urban and open areas incorporating cost-effective, environmentally sound landscaping practices; and
- *MCAS Miramar Base Exterior Architecture Plan* (2008), which provides landscape architecture guidelines in Chapter 6 and the Master Plant List in Appendix B (MCAS Miramar Base Exterior Architecture Plan 2008). An updated native plant list was added to the Base Exterior Architecture Plan in 2011.

The Natural Resources Division has distributed copies of Presidential Memorandum and Executive Order 13148 to personnel in charge of Station landscaping plans. Lists of regionally native plants suitable for the landscaping and sources for procurement have been provided to Station personnel involved with landscaping and can be provided to others upon request. The current Station Base Exterior Architecture Plan (MCAS Miramar Base Exterior Architecture Plan 2008), including the updated native plant list (2011),

follows the most current landscape conservation guidance as the template for all landscape design and management in developed portions of the installation.

The Environmental Management Department reviews and recommends changes to Station landscaping plans for compliance with the above legal instrumentalities. MCAS Miramar uses invasive plant control programs to reduce spread of invasive landscaping plants into natural areas (also see Section 7.2.1, *General Vegetation Management and Soil Conservation, Invasive Plant Species*).

During the bird breeding season, personnel need to check for nests prior to pruning or tree removal (Section 7.2.8, *Migratory Bird Management*). Pesticide application must be coordinated with the Station pesticide management coordinator and is part of the Station integrated pest management approach (Section 7.2.10, *Integrated Pest Management*).

Persons responsible for mowing around the runways and parking aprons are aware that, in many locations, there are Special Status Species in the immediate vicinity of the runways. This is particularly true in the case of vernal pool basins and watersheds. Mowing taller grasses around runways tends to attract birds that can become a Bird/Animal Air Strike Hazard (BASH). This circumstance requires special planning be done to avoid or minimize damage to habitat or injury to Special Status Species, and that BASH hazards are kept at a minimum. The flight line mowing program has been coordinated with the USFWS¹⁶ (Section 7.2.9, *Wildlife Damage Management*). MCAS Miramar has reviewed and revised the flight line mowing program standard operating procedures to maintain consistency with the BASH program and vernal pool management requirements (Section 7.2.5, *Vernal Pool Habitat Management*).

7.2.4 Special Status Species Management

Special Status Species include those that are federally listed as endangered or threatened, or proposed for such listing (refer to Table 4.6). Definitions for categories of Special Status Species are provided in Section 4.6, *Federal Special Status Species*.

Objective: Proactively Maintain Up-to-Date Data for Special Status Species

MCO 5090.2 (para. 11104.3a) states, “*Each installation shall survey and take other appropriate actions to document the presence of candidate species and endangered or threatened species on the installation, and identify their currently used and periodically-or indirectly-used habitats. Each installation shall assist FWS in determining whether any such habitats may be included or excluded from critical habitat designation. Each installation shall also survey and take other appropriate actions to document the presence of state or territory rare and endangered species.*”



San Diego Mesa Mint Natural Resources Division

MCAS Miramar’s approach to Special Status Species management proactively collects information on presence or absence, location, habitat availability and suitability, and life history requirements to support planning for military operational requirements and habitat conservation.

¹⁶ Bird Air Strike Hazard Prevention Program Mowing Operations, NAS Miramar (1-6-94-I-33) dated 14 January 1994.

MCAS Miramar consults with the USFWS (as appropriate) to ensure that its actions are not likely to jeopardize the continued existence of any endangered or threatened species in 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 (see Appendix A for more details).

The 2000 INRMP (MCAS Miramar 2000) addressed ESA requirements associated with the Biological Opinion for the Realignment of Naval Air Station Miramar to MCAS Miramar (USFWS 1996a). The 2005 INRMP (MCAS Miramar 2006) carried forward the applicable and ongoing management commitments made by this action, such as having a plan for multi-species conservation. This INRMP continues implementation of these commitments.

Table 4.6 summarizes information on federally listed species on MCAS Miramar. The six Special Status Species dependent on Station vernal pool habitat are described in Section 4.3, *Vernal Pool Habitat*. Surveys for fairy shrimp and vernal plants on MCAS Miramar are ongoing (e.g., Black in progress [2016-2017]). All vernal pool habitat on Station has been intensively surveyed since 2000 to document species presence and precisely map the pools and their associated watersheds. Surveys were originally focused in operationally important areas of the Station, but recent surveys have extended the survey areas to all portions of the installation including areas occupied by leases and grants. Basin and watershed delineation, associated species inventories, invasive species assessment, and associated GIS data provide resource information for appropriate habitat management.



Quino Checkerspot Butterfly

G. Huffman

Lepidoptera surveys were conducted on MCAS Miramar from 1995 to 1998 and in 2000 to search for Quino checkerspot butterfly. An estimated 625 Lepidoptera, including up to 10 previously undescribed species were found (San Diego Natural History Museum 2004b). Other project specific surveys failed to find this species in potentially suitable habitat. Due to recent sightings of this species adjacent to the Station in areas burned by the Cedar Fire, a new survey for this species on MCAS Miramar was conducted in 2011. The purpose was to identify suitable habitat and survey the best 1,400 acres in East Miramar. No individuals were found throughout the flight season by surveys completed using USFWS protocols. Recent surveys

for San Diego Gas and Electric reported finding this species on a ridgeline fuelbreak in East Miramar and a road in Mission Trails Regional Park (April 2017). The species was found at three locations on MCAS Miramar and one location on the Station boundary, as shown on Figure 4-6. An additional location was found approximately 1 kilometer south of MCAS Miramar and is not shown in Figure 4-6. In 2018, two additional locations were found, which are also shown on Figure 4-6. As more information is received, it will be incorporated.

Hermes copper butterfly was found on many sites in East Miramar before the 2003 Cedar Fire (San Diego Natural History Museum 2004b), but has not been observed on MCAS Miramar since. This species was found at multiple sites from 1996 through 1998 during 1995-1998 surveys (Brown and Bash 1999; San Diego Natural History Museum 2004b). In 2000, the San Diego Natural History Museum conducted Hermes copper butterfly surveys for the Military Family Housing Project and found the species at multiple sites (EDAW, Inc. 2004). All sites where this species had previously been found were severely burned. In 2010, the Natural Resources Division undertook in-house staff surveys of all areas where the species was

previously reported, but none were found. Additional sites supporting spiny redberry in canyon bottoms of West Miramar that were not burned in the 2003 fire were also examined. No sightings were made in 2010. Additional staff biologist surveys were performed in May and June of 2015. Two to three visits of approximately two hours were made to each of four previously occupied sites. No sightings were made in 2015. An extreme drought continued in the spring of 2015, and very few Hermes Copper butterflies were observed in currently known occupied areas around the County. Likewise in 2016, no sightings on MCAS Miramar were made by Natural Resources Division staff, and very few Hermes Copper butterflies were observed at any sites in the County by a San Diego State University surveyor. To assist with the persistence of the Hermes copper butterfly, MCAS Miramar implemented the off-site Lakeside Downs REPI project in the community of Lakeside (2.3 miles east of the Station), which is permanently preserving 409 acres of rare coastal scrub habitat that contains a documented breeding population of this species.

Table 7.1 summarizes the results of coastal California gnatcatcher surveys performed at MCAS Miramar since 1994. Survey results in 2007 found that coastal California gnatcatchers inhabited 16 additional areas relative to 2004. Recolonization of 2003 burned areas seems to be occurring still.

Table 7.1. Summary of Coastal California Gnatcatcher Survey Results at MCAS Miramar

Year	Number of Breeding Pairs	Source Report
1994	55	Hunsaker et al. 2000
1995	45	Hunsaker et al. 2000
1996	51	Hunsaker et al. 2000
1997	41	Hunsaker et al. 2000
1998	53	HSWRI 2000
1999	51	HSWRI 2000
2000	19	HSWRI 2000
2001	36	HSWRI 2006
2004	21 pairs, 1 lone male	Bitterroot Restoration Inc. 2005
2007	34 pairs, 3 lone males	RECON Environmental, Inc. 2008
2009	65 pairs, 24 males/females	Haas 2010
2013	43 pairs, 9 single males	Tierra Data 2014
2016	70 pairs	San Diego Nat. History Museum 2016

Effects of helicopter operations at MCAS Miramar on the coastal California gnatcatcher were studied by Awbrey and Hunsaker (2000). They found that take-off and landing maneuvers may pose a physical threat (egg and/or chick displacement from nests) only to nests within 100 meters of touchdown points. Effects of overflights on nesting birds were variable, and overflights at 1,500 feet only partially masked calls. A more recent study (Hubbs-Sea World Research Institute 2006) concluded the following:

- The coastal California gnatcatcher will find and inhabit suitable nesting habitat, in spite of the noise environment at MCAS Miramar. Nest success is equally likely in quiet and noisy areas within MCAS Miramar.
- Coastal California gnatcatcher nesting success was negatively associated with tall stands of broom baccharis and black sage with an understory dominated by dead leaf litter.
- Habitat, topography and fall rainfall were positively associated with reproductive success.
- Nesting success was not associated with any noise metrics measured, suggesting that noise from helicopters was not detrimental to coastal California gnatcatcher reproductive success.
- Nesting success rates increased with distance from flight tracks; however, after adjusting for covariation with habitat, climate, and physical metrics, success rates for nests close to helicopter flight tracks were statistically similar to those more distant nests.

Hunsaker *et al.* (1994, 1995, 1997, 2000) evaluated coastal California gnatcatcher habitat and home range. They provided management information regarding habitat requirements, fire, invasive plants, and Station operations. Section 7.2.1, *General Vegetation Management and Soil Conservation* describes these efforts on the Station.

In 1998, a breeding least Bell’s vireo was found on the Station (east of Interstate 15) for the first time. The range of the least Bell’s vireo extends from California to Baja California, Mexico. The species winters only in Southern Baja. Table 7.2 summarizes the results of least Bell’s vireo surveys performed at MCAS Miramar since 1998. Least Bell’s vireos found on MCAS Miramar have been detected both west and east of Interstate-15. Identification of five breeding vireos in 2008, eight breeding pairs in 2014, and 12 breeding pairs in 2017 represents an increase from pre-Cedar Fire results, in spite of severe habitat damage from the 2003 Cedar Fire. This indicates recovery from the severe habitat damage of the 2003 Cedar Fire (AmDyne Corporation 2008, San Diego Natural History Museum 2014 and 2017).

Table 7.2. Summary of Least Bell’s Vireo Survey Results at MCAS Miramar

Year	Number of Breeding Pairs	Source
1998	1 pair, 1 lone male	MCAS Miramar GIS
2002	1	MCAS Miramar GIS
2008	5	AmDyne Corporation 2008
2011	17 pairs, 6 lone males	Tierra Data 2011
2014	8 pairs, 2 lone males	San Diego Natural History Museum 2014
2017	12 pairs, 4 lone males	San Diego Natural History Museum 2017

Focused surveys for the southwestern willow flycatcher were conducted in 1998, 2002, 2008, 2011, 2014, and 2017. Migrating willow flycatchers were recorded early on MCAS Miramar, but none were confirmed to be the southwestern subspecies, and none bred on the Station. These individuals were likely a different subspecies of willow flycatcher (AmDyne Corporation 2008, Varanus Biological Services, Inc. 2003, San Diego Natural History Museum 2014). No southwestern willow flycatchers were detected during 2014 or 2017 surveys (San Diego Natural History Museum 2014 and 2017). Although there are no known nesting occurrences of the southwestern willow flycatcher on MCAS Miramar, it is likely that some of the transient willow flycatchers that have been observed on MCAS Miramar are the listed entity and are migrating through MCAS Miramar on their way to breeding locations in California.

MCAS Miramar supports a large proportion of the known population of the endangered plant, willowy monardella. Rebman and Dossey (2007) completed a Station-wide census for this plant and developed a long-term monitoring program for this plant on MCAS Miramar. The survey located 3,379 plants in 393 occurrences in six watersheds with active populations (a seventh watershed had three dead plants). Pre-Cedar Fire willowy monardella sites showed regrowth from the October 2003 Cedar Fire. However, after the high rainfall of 2004-2005, the willowy monardella population appeared to decrease significantly within the monitoring plots. As a result, two projects were undertaken to evaluate the Station population and habitat. In 2015, the population was re-mapped on MCAS Miramar with more detailed definitions (e.g., clumps versus individual plants).



Willowy Monardella Natural Resources Division

This station-wide data collection effort indicates the population is declining. There is no indication that the overall decline is related to military land uses. Data collection for both population and habitat evaluation will continue, enabling more accurate assessments of population trends, habitat management needs, and regional understanding of this species' life history.

Surveys have documented intermixed populations of Del Mar manzanita (*Arctostaphylos glandulosa* ssp. *crassifolia*), Eastwood manzanita (*Arctostaphylos glandulosa* ssp. *glandulosa*), and hybrids between the two subspecies in East Miramar. In 2006, a complete census of Del Mar manzanita was conducted with a monitoring plan for population trends and habitat assessment (Licon Engineering Co., Inc. & Garcia and Associates 2006). The census identified 2,341 individual plants within 5,610 acres in east Miramar. Recent preliminary DNA analysis of the Station manzanita populations (Del Mar and Eastwood) indicate the previously morphologically identified manzanitas may not be *Arctostaphylos glandulosa* ssp. *crassifolia*. Further study will increase knowledge of this species' population, habitat definition, and regional ecosystem importance. The Station's manzanita population resprouted from the Cedar Fire with vigorous regrowth due to less competition from previous surrounding vegetation.

Objective: Proactively Manage Special Status Species' Habitat

The Endangered Species Act was revised (ESA Section 4(a)(3)(b)(i)) via the National Defense Authorization Act of 2004, which states that, "*The Secretary [of the Interior] shall not designate as critical habitat any lands or other geographical areas owned or controlled by the Department of Defense, or designated for its use, that are subject to an integrated natural resources management plan prepared under section 101 of the Sikes Act (16 U.S.C. 670a), if the Secretary determines in writing that such plan provides a benefit to the species for which critical habitat is proposed for designation.* This again was reiterated in the Department of Interior and Department of Commerce's *Listing Endangered and Threatened Species and Designating Critical Habitat; Implementing Changes to the Regulations for Designating Critical Habitat; Final Rule* (50 CFR Part 424,81 Federal Register 7414, 11 February 2016). The Department of Interior and Department of Commerce have determined that, where applicable, federal critical habitat designation is not warranted if the USFWS and/or NOAA determine that an INRMP provides a conservation benefit to the species. The following four criteria will be evaluated to determine whether the INRMP provides a conservation benefit to the species (50 CFR Part 424).

1. "The extent of the area and features present." The management activities identified in the management plan, for the length of the plan, must maintain or provide for an increase in a species' population or the enhancement or restoration of its habitat within the area covered by the plan [*i.e.*, those areas deemed essential to the protection of the species].

2. "The type and frequency of use of the area by the species." Management activities within the plan may reduce fragmentation of habitat, maintain or increase populations, ensure against catastrophic events, enhance and restore habitats, buffer protected areas, or test and implement new strategies.

3. "The relevant elements of the INRMP in terms of management objectives, activities covered, and best management practices, and the certainty that the relevant elements will be implemented". Persons charged with plan implementation are capable of accomplishing objectives of the management plan and have adequate funding for the management plan. They have the authority to implement the plan and have obtained all necessary authorizations or approvals. An implementation schedule (including completion dates) for the management effort is provided in the plan.

4. "The degree to which the relevant elements of the INRMP will protect the habitat from the types of effects that would be addressed through a destruction-or-adverse-modification analysis." The following criteria will be considered when determining the effectiveness of the management effort. The

plan includes (1) biological goals (broad guiding principles for the program) and objectives (measurable targets for achieving the goals); (2) quantifiable, scientifically valid parameters that will demonstrate achievement of objectives and standards for these parameters by which progress will be measured are identified; (3) provisions for monitoring and, where appropriate, adaptive management; (4) provisions for reporting progress on implementation (based on compliance with the implementation schedule) and effectiveness (based on evaluation of quantifiable parameters) of the management effort are provided; and (5) a duration sufficient to implement the plan and achieve benefits of its goals and objectives.

Land-use planning strategies (*i.e.*, the incorporation of essential habitat¹⁷ into high priority management areas [Section 5.1, *Management Area Designations*]), flora and fauna inventory and monitoring, habitat management, wildlife management, Special Status Species management, and numerous other projects discussed in this INRMP will provide a cumulative benefit to federally listed species. Most essential habitat identified by the USFWS for species on MCAS Miramar is in areas identified in this INRMP as Level I or II MAs, which focus on proactive management of these resources (see Table 5.1).

The MCAS Miramar Commanding Officer has the authority to implement the plan, which will be accomplished by the Environmental Management Department staff, as scheduled and budgeted. Formal adoption of an INRMP by the installation commander constitutes a commitment to seek funding and execute, subject to the availability of funding, all projects and activities in accordance with specific timeframes and priorities identified in the INRMP (see Appendix E for Projects to be implemented under this INRMP). Under the Sikes Act, any natural resources management activity that is specifically addressed in the plan must be implemented (subject to availability of funds). Failure to implement the INRMP is a violation of the Sikes Act and may be a source of litigation (USMC 2007). Annual review of INRMP implementation to both the USFWS and CDFW documents the commitment of MCAS Miramar to acquire funding and implement the INRMP.

Goals, objectives, and long-term ecosystem needs, based on land-use sustainability for the MCAS Miramar military mission, have been analyzed and considered in collaboration with regulatory agencies. Marine Corps and MCAS Miramar goals and objectives are defined for the plan as a whole (Section 1.3, *Management Approach*), and specific projects established within the plan (see Appendix E). Each INRMP project has standards by which success will be monitored. Monitoring will occur within the Environmental Management Department on a regular basis, as described in Section 1.1.4, *Reviews, Approvals, and Revisions*.

Acquisition and conservation of lands that support habitat areas for rare and endangered species in the vicinity of MCAS Miramar contribute to species conservation and can buffer the Station from incompatible development. Buffers can be used for off-site mitigation and habitat conservation that promotes successful environmental stewardship while simultaneously reducing the potential for encroachment on the Station's mission. Section 6.2.4, *Encroachment Partnering*, describes the potential to implement land and conservation buffering partnerships on MCAS Miramar.

Critical habitat has been designated for five threatened or endangered species that occur on MCAS Miramar: the Riverside fairy shrimp (USFWS 2005, 2012a), willow monardella (USFWS 2006, 2012b), coastal California gnatcatcher (USFWS 2003, 2007a), spreading navarretia (USFWS 2010), and San Diego

¹⁷ The final determination of critical habitat for the endangered plant spreading navarretia included a definition of "essential habitat" (FR 70, No 200, p. 60662; 18 Oct 2005). The text states, "*The Service in this and other notices has been using the term "essential habitat" as shorthand for "areas eligible for designation as critical habitat."*" It further states, "*The use of the term "essential habitat" in this and past notices is not a determination by the Service or the Secretary that this habitat is, within the terms of the Act, essential to the conservation of the species, unless the use of the term is accompanied by an expressed statement that the Secretary has made such a determination.*"

fairy shrimp (USFWS 2007b). Essential habitat not designated as critical habitat on MCAS Miramar has been identified for the endangered Quino checkerspot butterfly (USFWS 2009); this species was recently reported on a ridgeline in the eastern part of the Station (April 2017). While essential habitat was identified on MCAS Miramar, lands on the Station, in all cases, were excluded from critical habitat designation rules for these species based on the Station having a legally operative INRMP (MCAS Miramar 2000, 2006, 2011a) that benefits each of these species.

This INRMP update continues the protection and benefits afforded to all threatened and endangered species present on MCAS Miramar, as outlined below.

- Development and use of Management Areas focused on differing resource types and sensitivities that will guide management and planning and afford protection to high concentrations of listed species and essential habitats. Associated guidance attempts to limit activities, minimize development, and mitigate actions in areas supporting high densities of vernal pools, listed species, and other wetlands and manage activities and development in areas with low densities, or no special status species and sensitive habitat. For example, 75.5 percent of essential habitat identified for the California gnatcatcher and 84.8 percent of essential habitat identified for willow monardella occur within Level I and II MAs, which are focused on the management of vernal pools and non-vernal pool threatened and endangered species (see Table 5.1). These same MA Levels I and II include a high proportion of the vernal pool habitat, including 85.4 percent of essential habitat for the San Diego fairy shrimp, 83.7 percent identified for Riverside fairy shrimp, and 92.2 percent for spreading navarretia.
- General management actions include restoring degraded sites, restricting access to sensitive areas through fencing/signage, training military personnel to recognize and avoid sensitive areas via incorporated natural resources instructions in the Station training order, distributing sensitive resources maps and brochures to Station personnel, invasive/exotic species removal, removal of unlawfully dumped trash, surveys to identify areas suitable for habitat restoration/enhancement, habitat compensation for unavoidable impacts from Station projects to ensure no net loss of habitat value, plant and animal surveys for listed and rare species, and long-term ecosystem monitoring of both plant communities and selected wildlife.
- Specifically regarding vernal pool species (*San Diego fairy shrimp*, *Riverside fairy shrimp*, *spreading navarretia*, and *California Orcutt grass*), measures completed, being conducted, and planned for MCAS Miramar, as described in Appendix E, have and will continue to appreciably benefit the species. These actions have and will also continue to appreciably benefit other federally listed species found in vernal pool habitats (*i.e.*, endangered San Diego button-celery and San Diego mesa mint). Past, ongoing, and planned actions include protective fencing along susceptible vernal pool group boundaries; trash removal (more than 250 tons); a Vernal Pool Burn Study (Black *et al.* 2016); Long-Term Vernal Pool monitoring (2010); identification of areas suitable for habitat restoration and re-establishment; posting signage to delineate vernal pool areas adjacent to Station activities; exotic plant removal; a study of *Agrostis avenacae* occurrence in vernal pools and options for control; Vernal Pool Surveys (~1989-2007, 2009, 2010, 2015); successful completion of all field work meeting BRAC 1995 vernal pool mitigation commitments with an additional surplus to bank; restoration of impacted



Fairy Shrimp Natural Resources Division

pool habitat; and seed banking for San Diego button-celery, spreading navarretia, California Orcutt grass, and San Diego mesa mint (Fraga and Wall 2012).

- Specifically regarding the *coastal California gnatcatcher*, measures completed, being conducted, and planned have and will continue to appreciably benefit the species. Past, ongoing, and planned actions include Habitat Evaluation, Home Range Determination and Dispersal Study (1993-1996); coastal sage scrub restoration site survey; study for effects of helicopter noise on the coastal California gnatcatcher (Hubbs-Sea World Research Institute 2006); Station-wide population surveys (conducted 1998-2001, 2004, 2007, 2009, and 2013) to include mapping of “use areas” (2004, 2007, 2009, 2013); numerous habitat compensation projects on Station (see Chapter 6). MCAS Miramar also implemented the off-site 409-acre Lakeside Downs REPI project (2.3 miles east of the Station), which is preserving coastal scrub habitat occupied by multiple breeding pairs of coastal California gnatcatchers. In 2016, the Lakeside Downs property supported 6 breeding territories of coastal California gnatcatcher.
- Specifically regarding *willowy monardella*, measures completed, being conducted, and planned have and will continue to appreciably benefit the species. Past, ongoing, and planned actions include partial surveys prior to listing, Station-wide baseline surveys (2002, 2009, and 2015), establishment of monitoring plots (2003) and re-surveying of plots (2004 and 2005), willowy monardella habitat enhancement project (2006-2010) and participation in a county-wide study, distribution map and propose long-term management with San Diego Natural History Museum and San Diego Association of Governments. Miramar’s long-term monitoring is planned to continue with data from plots collected about every three years and a resurvey of the Station about every six years.
- Study and surveys for *Miramar’s manzanita* population continue. As better data and population understanding develop, the Station knowledge and management will be coordinated with regulatory agencies and county organizations to improve region-wide understanding and management.
- Recent sightings of endangered *Quino checkerspot butterfly* were observed in 2017 and 2018 on East Miramar along a ridgeline fuelbreak. In 2018-2019, MCAS Miramar is having more comprehensive surveys of East Miramar to better understand the distribution of this species and its habitat. Upon completion of field surveys, the management area designations will be updated accordingly. A rare/endangered butterfly monitoring project is programmed for 2022. It is anticipated that rare/endangered butterfly monitoring will be performed every 3 years.
- Although *Hermes copper butterfly* has not been observed on MCAS Miramar since the Cedar fire, MCAS Miramar is currently undertaking comprehensive surveys to better understand the distribution of this species and its habitat because the USFWS determined that a proposed listing for the species will occur during 2018. Upon completion of field surveys, the management area designations will be updated accordingly. All sites identified as supporting the Hermes copper butterfly prior to the 2003 Cedar Fire remain undeveloped, and most sites are within areas already identified for special attention to conserve other non-vernal pool threatened and endangered species (Level II MA). Additional areas with unburned patches of its host plant that were never documented to support the butterfly also occur within Level II Management Areas. MCAS Miramar implemented the Lakeside Downs REPI project (2.3 miles east of the Station) that is preserving 409 acres of coastal scrub habitat occupied by this species. A rare/endangered butterfly monitoring project is programmed for 2022. It is anticipated that rare/endangered butterfly monitoring will be performed every 3 years.

Objective: Monitor to Ensure ESA Section 7 Compliance with Biological Opinions

As described in more detail in Appendix A, a biological opinion is the USFWS opinion resulting from the formal Section 7 ESA consultation process. It is a written statement from the USFWS regarding its opinion on effects of a proposed action on listed species and the potential to jeopardize the continued existence of the species. It provides nondiscretionary Terms and Conditions with Reasonable and Prudent Measures that must be implemented in conjunction with a proposed action to avoid or minimize impacts. The USFWS also provides nonbinding Conservation Recommendations as part of the biological opinion.

All MCAS Miramar approvals will be conditioned upon the action proponent's commitment to fund and/or implement Reasonable and Prudent measures with associated Terms and Conditions which result from this consultation/conference procedure. Terms and conditions can involve additional costs relative to mitigation requirements, which may include compensation for lost resources, minimization of, and avoidance of impacts on threatened or endangered species and critical habitat. Such potential costs must be considered as part of project planning and construction.

Objective: Protect Other Species of Special Regional Concern (i.e., Species at Risk [SAR])

DoDI 4715.03, Enclosure 3, states *"To the extent practicable, all DoD Components shall establish policy and procedures for the management of species at risk (SAR) to prioritize proactive management of those species that, if listed, could adversely impact military readiness. Program objectives shall focus on efforts that have the greatest potential to prevent listing of SAR (e.g., habitat conservation, planning level surveys, monitoring). Protecting these species is critical; therefore, the installation INRMP should consider funding for SAR protection a high priority,"* where SAR is defined in DoDI 4715.03 as *"Includes species on lists maintained by USFWS, NOAA Fisheries Service, and state agencies as threatened or endangered or candidates for such lists. SAR also includes species whose designation as threatened or endangered may require conservation efforts significantly impacting a military mission."*

MCO 5090.2 also states that installations should inventory and monitor state-listed species because NEPA analyses may require an installation to consider a proposed action's impacts on state-listed species and state laws and regulations may govern their possession, propagation, sale, or taking on the installation.

Other Species of Special Regional Concern at MCAS Miramar, discussed in Chapter 4, have been defined to include former candidates for federal listing as threatened or endangered, species of concern to the state of California, and species that are regionally rare or of limited distribution (refer to Table 4.7). These species and their habitats are considered as part of MCAS Miramar's general vegetation and wildlife management program.

The Natural Resources Division uses station-wide e-mails, brochures, and quarterly training classes to create and promote awareness of natural resources to Station personnel of the sensitivity, values, and obligations regarding the conservation of Special Status Species and their habitat. Protection of habitat for federally listed species often serves to protect all SAR as well. Finally, conservation of land due to Encroachment Partnering (Section 6.2.4), also helps to protect SAR. A few examples of MCAS Miramar's actions to protect SAR are discussed below.

MCAS Miramar had the Station surveyed for 17 rare and endangered plant species. This 4-phase project (Rebman and Dossey 2002, Tierra Data Inc. 2004, Saucedo-Oritz and Scheid 2005, and Dossey and Associates 2007) was completed in March 2007. Other site-specific surveys are also used to update MCAS Miramar Special Status Species, such as the "G" (Teacup) parcel survey in 2001 (Ecological Restoration Service) and surveys conducted in support of planning for the Military Family Housing Environmental Impact Statement. As a result, the entire Station has been surveyed for *Acanthomintha ilicifolia*, *Arctostaphylos glandulosa* ssp. *crassifolia*, *Baccharis vanessae*, *Chorizanthe orcuttiana*, *Fremontodendron*

mexicanum, *Ambrosia pumilla*, *Adolphia californica*, *Artemisia palmeri*, *Ceanothus verrucosus*, *Chorizanthe polygonoides* ssp. *longispina*, *Comarostaphylis diversifolia* ssp. *diversifolia*, *Dudleya variegata*, *Ferocactus viridescens*, *Githopsis diffusa* ssp. *filiacaulus*, *Harpagonella palmeri* var. *palmeri*, *Muilla clevelandii*, and *Quercus dumosa*. During the final survey phase, one new California Native Plant Society regionally rare species was found, *Ceanothus otayensis* (Otay lilac).

The USFWS has initiated a status review of the following species to determine whether listing is warranted: monarch butterfly (*Danaus plexippus*), western spadefoot toad (*Spea hammondi*), and tricolored blackbird (*Agelaius tricolor*).

The monarch butterfly is known to occur only as a transient on MCAS Miramar. No overwinter roosts have been identified on the Station. Small amounts of narrow-leaved milkweed (*Asclepias fascicularis*) have been noted on MCAS Miramar from time to time, but no established patches have developed. This may be due to high temperatures and drought over the past several years that affect seed viability. Sites identified as having its milkweed host plant are located in canyon bottoms and floodplains which mostly occur within Level II Management Areas already identified for special conservation attention.

The western spadefoot toad is known to be widely scattered throughout MCAS Miramar in low densities in a variety of habitats. Western spadefoot toads breed in vernal pools and other seasonally ponded areas which are already protected on MCAS Miramar. The tricolored blackbird is a colonial nester and not known to breed on MCAS Miramar. Although it is not known to breed on MCAS Miramar, individuals have been documented using wetland habitats during the non-breeding season. These wetland habitats are also protected on MCAS Miramar. Both the western spadefoot toad and tricolored blackbird are found in habitat primarily identified in management areas I, II, and III, as shown in Table 5.2 in Chapter 5. Conservation of vernal pools and wetlands afforded by the INRMP benefit spadefoot toads and tricolored blackbirds.

The Natural Resources Division is tracking the status of a number of other SAR that occur at MCAS Miramar, presented in Table 4.7. For example, MCAS Miramar supports habitat for burrowing owl, which is a California Species of Special Concern. There has been a dramatic reduction in numbers of resident breeding burrowing owls, as well as wintering, in coastal southern California. The species is under imminent threat of extirpation from San Diego County. In 2012, CDFW prepared a staff report on burrowing owl mitigation, which replaced the 1995 staff report. This report would be considered by MCAS Miramar during NEPA analysis. Focused surveys for burrowing owls during breeding and non-breeding seasons were performed in 2012 (Arnold 2013), and observations are noted by the Natural Resources Division staff and biological contractors. No potentially breeding pairs of burrowing owl have been recorded on the Station since 1994 (Table 4.7), however, isolated individuals have been observed as short term residents on MCAS Miramar.

7.2.5 Vernal Pool Habitat Management

This section addresses vernal pool habitat and other wetlands on MCAS Miramar that are described in greater detail in Chapter 4. Special Status Species dependent on vernal pool habitat at MCAS Miramar are described in Section 4.3, *Vernal Pool Habitat*. The San Diego button-celery, California Orcutt grass, San Diego mesa mint, Riverside fairy shrimp, and San Diego fairy shrimp are listed as endangered, and spreading navarretia is listed as threatened.

Other wetlands include vernal marshes, fresh water marshes, portions of some riparian vegetation types, and edges of open water ponds and are discussed further in Section 7.2.6, *General Wetland Management*. Management and use of these areas requires careful consideration of the CWA, ESA, and the national policy (Executive Order 11990, *Protection of Wetlands*) to permit no overall net loss of wetlands.

MCAS Miramar maintains up-to-date GIS for vernal pool habitat on the installation that supports proactive planning and impact avoidance.

Previous Plans

Previously prepared and relevant documents for the management of vernal pool habitat at MCAS Miramar include the 2000 and 2005 INRMPs (MCAS Miramar 2000, 2006), NAS Miramar Vernal Pool Management Plan (Bauder and Wier 1991) and *The Ecology of Southern California Vernal Pools* by Zedler (1987). Relevant content of these management plans have been incorporated into this INRMP.

The NAS Miramar Vernal Pool Management Plan (Bauder and Wier 1991) was prepared for a Naval Air Station with a different mission than that of MCAS Miramar. Since that time boundaries have changed, more accurate inventories have been conducted, technology has advanced, and the science of vernal pool management has progressed. The current INRMP contains portions of the NAS Miramar Vernal Pool Management Plan that remain applicable for continuing management of vernal pool habitat on the Station.

Early Surveys

Two vernal pool habitat surveys were conducted in the region during 1979 that include parts of MCAS Miramar: one for CDFW (Beauchamp and Cass 1979) and the other for Pardee Construction Company (Villasenor and Riggan 1979). Both surveys included many vernal pool areas not on the then NAS Miramar, and neither survey included the entire Station. Beauchamp and Cass (1979) mapped and counted vernal pools and estimated the surface area of pools and their watershed area. They also indicated the presence or absence of nine sensitive vernal pool taxa in each pool group, the type of associated vegetation, the degree of disturbance, and the land owner. Villasenor and Riggan (1979) mapped and numbered individual pools and noted the presence or absence of 12 vernal pool taxa in each pool. In some pools, only the presence of *Pogogyne abramsii* and *Eryngium aristulatum* var. *parishii* was noted. Pool dimensions were estimated.

Beauchamp (1982) conducted a vernal pool habitat survey limited to NAS Miramar with the purpose of mapping pool areas around runways on the Main Station and on Miramar Mounds National Natural Landmark. Maps were created for all of the Station, but detailed information on plant species and pool size was provided for only six pool series (AA - a portion, EE, GA, GG, HH, and U). He noted the presence or absence of 16 vernal pool habitat taxa and estimated pool size for these pools.

The Bauder (1986) report, compiled for CDFW, was intended to update the Beauchamp and Cass (1979) report. It surveyed all previously mapped pools and made an assessment of their condition, noted the presence/absence of sensitive taxa, and calculated the number of pools or pool areas that had been lost to development. This survey and those in 1991 by Bauder and Weir are the only surveys to assess pool habitat condition in detail. Bauder made no attempt to remap pools or map newly discovered pools. In addition to these comprehensive studies, a number of more focused surveys has been conducted over the period, including Woodward-Clyde Consultants (1980), City of San Diego (1981), Patterson (1987), Steele (1988), and Michael Brandman Associates, Inc. (1988).

Differences from survey to survey in the level of detail used in mapping pools in the field and the tendency to either merge pools that are interconnected or count them separately have contributed to different numbers of pools being recorded for each pool group during 1979, 1982, 1986, and 1990 surveys. In addition, the prolonged drought from 1986 through spring of 1990 may have reduced the numbers of plants of vernal pool habitat species in a given area and, thus, made locating vernal pool habitat more difficult.

Management Units

All vernal pool habitats identified on MCAS Miramar were assigned a group designation in 1991 (Bauder and Weir) following the system of vernal pool groups developed by Beauchamp and Cass (1979) for San

Diego County, as supplemented by Bauder (1986). Individual clusters/groups of pools were identified by a code employing letters and numbers. Letters refer to regions or series of pools, and numbers refer to clusters/groups within regions or series. Pool groups newly mapped or renamed in 1990 were assigned codes that were followed by a "+" (Bauder and Wier 1991). Data regarding the number of pools, plant species present, characteristics of pools, and other qualities were presented in descriptive paragraphs and summarized in Table 2 and Appendix 1 of the 1991 plan (Bauder and Wier). Exhibit 4 in that plan illustrated the distribution of pool groups, sensitive species, and Management Units. This exhibit was a synthesis of all previous mapping efforts. The abundance and distribution of vernal pools and other seasonally ponded features supporting vernal pool adapted species has been updated in recent years with additional and more intensive surveys (see Section 4.3.4, *Vernal Pool Habitat at MCAS Miramar*). Figure 4.3.4 of this INRMP shows current vernal pool habitat distribution and management units on MCAS Miramar and this data is maintained in the Stations GIS data layer.

Objective: Take Proactive Action to Prevent Damage to Vernal Pool Habitat

Vernal Pool Habitat Damage and Other Risks

Bauder and Wier (1991) summarized the relative likelihood of damage to vernal pool habitats via different mechanisms on a qualitative basis. The type and extent of damage visible (in 1991) at each site was used to predict future conditions unless a significant change in land use or management had recently taken place. Probability or likelihood of occurrence was coupled with an estimate of habitat restorability given the particular type of damage. For example, some events had a low probability of occurrence (*e.g.*, air crashes, toxic spills) but a high potential for inflicting serious, perhaps, irreversible damage. Conversely, dumping or mowing had a high probability of occurrence, but resulted in little irreversible damage.

Bauder and Wier (1991) summarized the following types of damage, either potential or realized for vernal pool habitat.

Aviation Mishaps - Although air crashes may occur infrequently, when they do happen, pools and surrounding habitat could sustain substantial damage from the impact of the plane, fuel spillage, fire, fire suppression, and the activities of emergency crews and vehicles.

Altered Hydrology - The construction of roads, runways, and buildings that interrupts the normal surface and subsurface flow of water creates an altered hydrology of pool areas. For example, vehicles usually cause longer periods of water retention (Bauder 1989a, 1989b), probably due to a combination of soil compaction and removal of soil that puts the hardpan closer to the surface.

Dumping/Trash - Dumping of trash refers to the accumulation of inert materials, such as wood, metal, bricks, and household goods, but not toxic materials.

Fire/Fire Suppression - Wildfires and associated activities can affect vernal pool habitat in three ways: fire suppression (vehicles, grading, chemical fire retardants), fire risk reduction (discing, grading, brushing), and the actual burning of vegetation (prescribed burns, wildland fires). Because vernal pool flora and fauna evolved in a landscape subject to periodic wildfires, they ought to be able to withstand fires so long as their frequency and intensity do not differ markedly from the historical norm.

Future Projects – Potential future projects¹⁸ or altered land uses (resulting from both military and non-military sources) occurring in vernal pool habitat could have a very high probability of damaging vernal pool habitat. Projects that will affect nearby land may impact pools via altered hydrology, toxic spills, increased disturbance, or some other effect associated with the juxtaposition of incompatible land uses. Also, changes to land higher in the drainage increase the probability of impacts to pools.

Grading - The threat of damage due to grading, defined as soil disturbance well below the surface, includes that of approved land uses as well as grading incidental to other activities. If grading or ripping pierce the hardpan or fill pool basins with soil, pool hydrology may be permanently altered.

¹⁸ This discussion refers to a concept and is NOT referring to a specific list of projects being planned.

Mowing and Discing - Mowing is known to alter the competitive relationships of species, but its effect on vernal pool species is unknown. Mowing generally occurs around the runways. If mowing is done when soils are dry and annuals have set seed, damage should be minimal.

Pedestrians and Horses - Although effects of foot paths and bridle trails are not as detrimental as motorized vehicles, both humans and horses can have negative impacts on vernal pool habitat.

Toxics - Toxics can directly kill vernal pool flora and fauna and may persist in soil and water for long periods of time.

Vehicles - Other than destruction of habitat by conversion to buildings, parking lots, and roadways, vehicles pose the greatest threat to vernal pool habitat. Information evident in aerial photos and field surveys (in 1991) on the ground suggested that vernal pool habitat on NAS Miramar was steadily being degraded and destroyed. This observation from 1991 failed to acknowledge the long history of military land use of the Station dating back to World War I. No comparison was made to conditions following World War II land use when Camp Elliott was the primary training base for the Fleet Marine Force.

Climate Change – Changes in precipitation and warming will likely affect vernal pools and the species that inhabit them. Decreases in annual precipitation may affect vernal pool hydrology, which in turn may affect the species of plants and animals that rely on the seasonal wetlands.

Objective: Implement Vernal Pool Habitat Restoration and Re-Establishment to Maintain No Net Loss of Vernal Pool Habitat Basin Resources

Compatibility of uses within Level I MAs is discussed in Chapter 5. The vast majority of vernal pool habitat basins and watersheds are encompassed within Level I MAs on MCAS Miramar to highlight them for management and conservation. Protection of vernal pool habitat has been given the highest management priority on MCAS Miramar. Management recommendations have been, and continue to be, developed to prevent the degradation or destruction of vernal pool habitat.



Vernal Pool Habitat Restoration Natural Resources Division

The 1991 Vernal Pool Management Plan (Bauder and Wier 1991, Appendix 6) included prioritized lists of management recommendations for each management unit. Many of these have been accomplished; some are outdated; and some remain to be done.

The 1991 Vernal Pool Management Plan (Bauder and Wier 1991, Appendix 7) includes vernal pool habitat restoration techniques (*i.e.*, decompaction, sculpting/recontouring, reseeding pools, re-establishment, invasive species removal), which have been used, and when necessary modified, to restore pools on NAS Miramar and MCAS Miramar during the past 14 years, as indicated by the following examples.

- In 1988-1996, 23 vernal pool basins (0.36 ac; 15,681 sq. ft.) were created in the northwestern portion of the Station (X1-3 Group) to compensate for vernal pools lost from construction of the West Coast Navy Consolidated Brig. This project included excavation of basins and inoculation with soil and seed collected from surrounding basins at the restoration site. Maintenance and success monitoring continued for seven years, and at the end of seven years all basins continued to meet success criteria (Black *et al.* 1996). A review of created vernal pool basins completed by Black and Zedler (1998) found that these basins suggested a gradual convergence of the function

and characteristics toward those of natural pools and that artificial basins can support populations of native species for considerable periods. Recent sampling for a few of these pools showed that the basins continue to provide vernal pool habitat in 2010 (C. Black, unpublished data).

- In 1992, restoration of 0.4-acre of vernal pool habitat south of the Navy-Marine Corps Reserve Center that was damaged by tank training was completed.
- In 1992-94, 30 pool basins were restored. This project included reconstructed mounds reseeded with appropriate upland native species and basins inoculated with appropriate species from pools that were to be developed; it also included removal of invasive plants in the surrounding watershed (Bauder *et al.* 2001).
- In 1997, 2.30 acres (79 pools) were restored within AA4-7, F (north), F16, U15, and U19 pool groups (Black 2000a, 2003a).
- In 1997, 2.3 acres (75 pools) were restored within Management Unit 2, X1-4, Z1-3, EE1, and HH3+ pool groups (Black 2000b, 2003b).
- In 1998-1999, 0.85 acres (69 pools) were restored within A4, AA8, AA9, and AA10 pool groups (KEA Environmental, Inc. 1999; EDAW, Inc. 2005).
- In 1999-2000, MCAS Miramar re-established/restored about 170,000 square feet of vernal pool surface in the Miramar Mounds National Natural Landmark Vernal Pool Group U (north) (Tomsovic and Macaller 2003, 2004a, and 2004b; Saucedo-Ortiz and Macaller 2005).
- In 2004, 0.50 acres of vernal pool habitat were restored in compensation for San Diego fairy shrimp habitat lost in association with improvements and paving of roads and lots of the Flightline Perimeter Road and Camp Elliott Warehouse Area (Tierra Data, Inc. 2008).
- In 2008, restoration of 0.443 acre and enhancement of 0.067 acre of vernal pool habitat at the Miramar National Cemetery for the Miramar National Cemetery vernal pool restoration project was completed. A total of 37 basins were created (33 restored, 4 enhanced). Additional upland watershed restoration was also conducted at the vernal pool restoration site.
- In 2009, a total of 17 vernal pools were created with a combined surface area of approximately 0.41 acre in compensation for the loss of 0.11 acre of vernal pool habitat for the West Coast Basing of MV-22 Osprey at MCAS Miramar and MCAS Camp Pendleton (2009 Department of the Navy).
- In 2016, the Year 4 Annual Management and Monitoring Report for compensatory vernal pool installation for the West Coast Basing of MV-22 Osprey at MCAS Miramar was published. All 17 of the created pools met Year 4 hydrology, species richness, and invasive species success criteria. Additionally, mature fairy shrimp were observed in 13 pools during the wet season and fairy shrimp cysts were found in all 17 pools; all created pools are considered to be occupied by the San Diego fairy shrimp (Naval Facilities Engineering Command Southwest [NAVFAC SW] 2016).

Cobb (2003) developed a restoration plan for the vernal pool habitat at the Miramar Mounds National Natural Landmark on the Station. This plan identified 124 vernal pool habitats (3.2 acres) within the Landmark that are suitable for vernal pool habitat restoration. The plan includes performance criteria and annual reporting requirements. This restoration planning methodology has value for Other Seasonally Pounded Features restoration projects in the future.

Black (2007) identified 293 acres in seven areas of the Station that appear suitable for re-establishing vernal pools. During 2005-2008, Black (2009b) identified basins suitable for restoration and enhancement in all suitable areas of the Station. In all, 1,716 basins (22.814 acres) were suitable for some type of restoration or enhancement treatment. The most common recommended treatments were deepening and enlarging marginal basins or combining and enlarging small adjacent basins. A total of 284.171 acres was suitable for new basin and associated new basin watershed construction. A net increase of 48.302 acres was determined to potentially be achieved through existing basin restoration and enhancement plus new basin construction.

The Branchiopod Research Group (2003) concluded monitoring water quality in vernal pool habitat restored in 1998-99 (KEA Environmental, Inc. 1999; EDAW, Inc. 2005). No significant coliform bacteria or hydrocarbon contamination was found. Soil disturbance associated with pool re-establishment/restoration did not appear to increase the availability or solubility of heavy metals. Soluble levels of heavy metals were generally low, but cadmium, lead, and iron were above Environmental Protection Agency potable levels in some areas. However, no comparison was made to naturally occurring background levels.

Black *et al.* (2016) studied effects of wildfire on vernal pools in the F (north) vernal pool group. In 2000, a wildfire started along a freeway (SR 163); 15 vernal pools burned by the fire were studied along with 30 unburned pools as controls. Subsequently, the October 2003 Cedar Fire burned the entire study site. Another smaller fire later burned a portion of the study site. The study continued to collect data on all pools through spring of 2009. It found that there was a generally positive effect of fire on native vernal pool plant vegetation and a negative effect on invasive annual plant populations for the first several years after burning.

Vernal pool ecosystem functionality is threatened by invasive plant species. *Agrostis avenacea* has invaded San Diego vernal pools since the 1980s and has become firmly established (Zedler and Black 2004). This species adversely affects at least three Special Status Species. The Station funded a study of the effects of *Agrostis avenacea* in vernal pool habitat on MCAS Miramar. Labor-intensive, hand weeding was suggested to be the best option for minimizing effects of this species (Bauder *et al.* 2002). Since the species is widespread on MCAS Miramar and easily windblown and spread, the best opportunity to manage this species is to reduce colonizing efforts by removing the species by hand during restoration/enhancement projects.

The Natural Resources Division has developed a general approach to respond to and repair accidental damage to vernal pool habitat and associated threatened and endangered species and maintains a budget line item to respond to damage repair and vernal pool habitat management. The Natural Resources Division has been using field markers, signs, or fencing around vernal pool habitat groups with a higher susceptibility for damage to prevent accidental and/or unintentional damage. The perimeter of the Sander Parcel, south of State Route 52, was fenced in 2005 to reduce trespass damage.

The Natural Resources Division continues delineating isolated ephemeral wetlands and other depressions ponding water (including vernal pool habitat) during winter/spring. This effort was started in 1999 and has included virtually all of the Station with more than 7,500 basins surveyed. Virtually all vernal pool basins have been or are being surveyed for fairy shrimp and listed plant presence and abundance. This was accomplished both as specific survey projects and using other projects that require vernal pool habitat mapping, such as the survey of Parcel G for possible transfer to the USFWS (Ecological Restoration Service 2001). Re-mapping of pools previously mapped with old technology using sub-meter accurate GPS equipment resulted in a more accurate, but lower, estimate of total acreage of vernal pool habitat on the Station in 2010 versus earlier years (147.1 acres in 2010 vs 157.3 acres reported in 2006). The apparent loss of vernal pool habitat acreage was only the result of more accurate mapping. Nevertheless, the total number of basins mapped increased by a few hundred in 2010. The most recent survey for vernal pool resources was completed in 2015. With virtually all of the Station now surveyed for vernal pool resources, the current focus is performing survey updates for operationally important areas.

Vernal Pool Mitigation Planning

A Finding of No Significant Impact was signed in August 2015 to identify suitable areas to establish and manage vernal pool wetland habitat at MCAS Miramar and to compensate for impacts to federally listed vernal pool species and/or jurisdictional areas. Areas identified and approved for potential future use have suitable site conditions (geology, topography, soil) and were deemed to be compatible with operations at

the time. A site-specific plan and crediting agreement with the USFWS and ACOE is under development for one identified area that would be used for advance mitigation credit development, possibly as a formal joint ESA and CWA conservation/mitigation bank, in-lieu fee mitigation program, or advance permittee-responsible mitigation. A second area identified is planned for use to meet compensatory mitigation needs that is not done in advance, beginning with that needed for new F-35 facility construction in 2018.

7.2.6 General Wetland Management

Objective: Maintain No Net Loss of Wetland Values

MCO 5090.2 (para. 11104.2a) states, “*The Marine Corps will comply with the national goal of no net loss of wetlands and will avoid loss of size, function, and value of wetlands. In addition, the Marine Corps will preserve and enhance the natural and beneficial values of wetlands while conducting its activities.*”

MCAS Miramar supports wetlands other than the vernal pool habitat addressed above, including vernal marshes, fresh water marshes, and portions of some riparian vegetation types and edges of open water ponds. As is the case with vernal pool habitat, management and use of these areas requires careful consideration of the CWA, ESA, and the national policy (Executive Order 11990, *Protection of Wetlands*) to permit no overall net loss of wetlands. Table 7.3 provides estimates of acreages of various wetland types found on MCAS Miramar. These data, in no way, are intended to identify which wetlands are subject to regulatory requirements of the CWA.

Table 7.3. Wetlands on MCAS Miramar

Types of Wetlands	Acreage
Vernal Pool	96
Other Seasonally Poned Features	52
Freshwater Marsh	26.4
Riparian Woodland	252.8
Total Wetlands	427.2

Lichvar (2000) delineated non-vernal pool wetlands and Waters of the U.S. at Main Station, including portions of the Rose Canyon area, on MCAS Miramar. He delineated 14.9 acres of non-vernal pool wetlands and 0.26 acres of drainage ditches and intermittent stream channels in the cantonment area.

Smith and Lichvar (2001) conducted a Station-wide planning level delineation of aquatic resources, mapping of floodplains, and a functional assessment of riparian ecosystems at MCAS Miramar, as discussed in Section 7.2.1, *General Vegetation Management and Soil Conservation*.

Lichvar and Dixon (2008) delineated non-vernal pool wetlands and other waters of the United States, updating the 2000 delineation done for the Main Station and adding all areas within the Flightline security fence. This work used the recently published Corps of Engineers Wetland Delineation Manual: Arid Wet Supplement of 2006. Additionally, the project made “nexus” determinations (of hydrologic connection) for all waters of the U.S., including vernal pool basins, within this same area, consistent with clarifications to the Clean Water Act that resulted from recent U.S. Supreme Court decisions.

Tetra Tech (2014) updated the Station-wide vegetation map. The 2014 vegetation map provides a more up-to-date and accurate representation of riparian plant communities as shown in Figure 4-2 and detailed in Appendix C.

Non-Vernal Pool Wetland Mitigation Planning

In anticipation of a need for non-vernal pool wetland mitigation for BRAC construction impacts, Burkhart (1999) analyzed two potential restoration sites (totaling 3.1 acres). To compensate for impacts of BRAC

projects, the Murphy Canyon site analyzed by Burkhart (1999) was used. The second site in San Clemente Canyon, east of I-15, was also identified as a potential location for future wetland mitigation efforts.

During 1999-2001 a contracted study was conducted for the Public Works Division to identify suitable restoration sites for coastal scrub, grasslands, and wetlands. This study (Johnson *et al.* 2003) identified 88.1 acres suitable for wetland restoration or enhancement.

Surveys conducted for suitable streambed and associated riparian wetland mitigation sites identified a number of man-made berms and other excavations in San Clemente Canyon, west of Kearny Villa Road and I-15, which were suitable for CWA mitigation. Removal of the man-made berms and restoration of riparian habitat were identified to have the potential to provide beneficial repair to the hydrology of the San Clemente watershed on Station. As a result of this survey, restoration of 0.28 acre of stream and 0.20 acres of wetland habitat was sited in San Clemente Canyon as compensatory mitigation for West Coast Basing of MV-22 Osprey facilities at MCAS Miramar. The project is currently in the fifth year of maintenance and monitoring.

In 2011 and 2012, surveys of the Base were performed again to identify potential mitigation sites for impacts to waters of the United States (HDR 2014). Non-wetland streambeds and non-vernal pool wetlands were identified for potential restoration (re-establishment and rehabilitation), establishment, or enhancement. Twenty-four Potential Mitigation Areas (POAs) were identified within four drainages on MCAS Miramar, including within Rose Canyon, San Clemente Canyon, Murphy Canyon, and Elanus Canyon. Of the 24 PMA's studied in 2012, Natural Resources Division staff selected seven for individual California Rapid Assessment Method (CRAM) analysis and development of individual conceptual mitigation plans (HDR 2014).

7.2.7 General Wildlife Management

Objective: Maintain Healthy Wildlife

Populations

Fish and wildlife management is defined by the Marine Corps as, “A *coordinated program of actions for conserving, enhancing, and regulating indigenous wildlife and its habitats, including conserving protected species and non-game species, managing and harvesting game species, reducing bird aircraft strike hazards, and controlling animal damage.*” (MCO 5090.2, para, 11105.17). At MCAS Miramar, BASH is considered in applicable management actions and is discussed further in Section 7.2.9, *Wildlife Damage Management*.



Owl Box

Natural Resources Division

Conservation of undeveloped areas and the habitat in those areas will protect the viability of all wildlife populations on MCAS Miramar. All species of wildlife will benefit from MCAS Miramar’s basic strategy to limit activities, avoid development, and perform mitigation actions in areas supporting high densities of predominantly vernal pool habitat, threatened or endangered species, and other wetlands.

Furthermore, the basis of good management is an understanding of the diversity, abundance, distribution, population dynamics, and habitat requirements of species. This approach is reflected in the Station’s past and ongoing biological studies. These studies have included monitoring of neotropical migrant birds and surveys of Lepidoptera, bats, reptiles, amphibians, small mammals, coyotes, and mule deer, in addition to focused surveys for threatened and endangered wildlife species.

Hunsaker and Cox (1997, 2001) conducted a vertebrate survey on MCAS Miramar that identified 190 bird species, 36 mammal species, 25 reptile species, and 7 amphibian species. Hunsaker (1997, 2001) studied the habitat use and relative density of bats at the Station. Habitat use and relative density of reptile and amphibian populations at the Station are summarized by Varanus Biological Services, Inc., and San Diego Natural History Museum (2001). Updated surveys were performed in 2009.

Game fish species recorded as having been stocked on Miramar include largemouth bass, rainbow trout, channel catfish, bluegill, and red-eared sunfish (USFWS 1992b). The Fish Pond, after being closed to fishing since about 1990, was restored and reopened to fishing in May 2003 (Section 7.2.11, *Natural Resources-related Outdoor Recreation Management*).

As discussed in Section 7.2.11, *Natural Resources-related Outdoor Recreation Management*, MCAS Miramar has determined that it is not currently feasible to develop and implement a recreational hunting program. However, wildlife game species at MCAS Miramar include California quail (*Callipepla californica*), mourning dove (*Zenaida macroura*), desert cottontail (*Sylvilagus audubonii*), black-tailed jackrabbit (*Lepus californicus*), brush rabbit (*Sylvilagus bachmani*), coyote (*Canis latrans*), bobcat (*Lynx rufus*), waterfowl, and southern mule deer.

The deer population on East Miramar in 1986 was estimated at 100 to 150 animals (Hannan 1987). Spotlight surveys conducted through 1999 by the Station, show a similar deer population. Quail surveys, conducted in 1986, estimated the quail population at 900 to 2,500 on East Miramar (Hannan 1987). Subsequent 1989 quail surveys indicated they were still abundant. The mourning dove population on East Miramar in 1986 was estimated at about 500 (Hannan 1987). Coyote surveys conducted in fall 1995 estimated densities of 4.1 coyotes per square kilometer for East Miramar and 2.3 in West Miramar, noting that densities were equal to the highest published densities in North America (Mason 1998).

The Natural Resource Division has worked with Station planners and security personnel to minimize barriers to movement of large wildlife that may be created by necessary security fencing. In areas of lower security concern, devices to allow larger wildlife passage have been included in new fencing plans. However, in some areas, such as the Flightline Area, Ordnance Magazine Area, and those containing munitions of explosive concern, heightened security or safety requirements preclude provision of any openings that would allow human access.

MCAS Miramar contracted for the removal of non-native fish and amphibians from aquatic ecosystems, in accordance with the Non-Indigenous Aquatic Nuisance Prevention and Control Act of 1990 and Executive Order 13112, *Invasive Species* (Varanus Monitoring Services 2002); results were not effective on a long-term basis. Issues of complete removal, reintroduction, or immigration after removal of these species are very difficult to resolve.

Long-Term Ecosystem Monitoring

MCAS Miramar and the Naval Facilities Engineering Command, Southwest have developed a faunal component of LTEM that coincides with a subset of the vegetation LTEM plots. Results of the initial year (1999) field studies for both flora and fauna were summarized (Varanus Biological Services, Inc., and San Diego Natural History Museum 2003) and provide a baseline for future comparisons. The fauna component includes small mammals, bats, reptiles, amphibians, and results of spotlight surveys. A repeat monitoring effort was more recently completed in 2009.

7.2.8 Migratory Bird Management

Objective: Manage Migratory Bird Conservation to Minimize Operational Conflicts

MCO 5090.2 (para. 11104.3c) states, “*The Marine Corps shall consult with FWS during INRMP preparation to ensure that actions not directly associated with military readiness activities (e.g., training) are conducted in a manner that minimizes the taking of birds protected by [Migratory Bird Treaty Act] and listed in [Title 50, Code of Federal Regulations, Part 10, Section 13, “List of Migratory Birds,” annual edition]. While incidental take of migratory birds is authorized during the conduct of military readiness activities, the Marine Corps will discuss with FWS the impacts of such activities to migratory birds. Installations shall consult with local or regional FWS offices on proposed actions intended to take (e.g., banding or marking, scientific collecting) migratory birds, their young, or eggs.*”

The primary consideration with regard to migratory birds is compliance with the Migratory Bird Treaty Act. Except as permitted, actions may not result in pursuit, hunting, taking, capture, killing, possession, or transportation of any migratory bird, bird part, or nest of any species listed in 50 CFR 10.13. Marine Corps installations must apply for depredation permits for those actions with the primary intent to capture, move, or kill migratory birds, their young, or eggs. 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. However, the long timeframe required to apply for and obtain special purpose permits makes it inappropriate for most one-time, individual cases. MCAS Miramar maintains a depredation-airport permit that allows authorized Station personnel to take, temporarily possess, and transport migratory birds to relieve or prevent injurious situations impacting public safety. Such depredation control activities must be within MCAS Miramar-specific and standard permit conditions. No hunting is allowed on MCAS Miramar. Appendix A discusses requirements of the Migratory Bird Treaty Act and the applicable military readiness rule in more detail.

The bird component of LTEM (Project - Long-term Ecosystem Monitoring, Faunal Component (MI95556), Section 7.2.7, *General Wildlife Management*) is used to monitor migratory birds on the Station in accordance with Executive Order 13186, DoD policy; and the Memorandum of Understanding between DoD and the USFWS for Migratory Bird Conservation (see Appendix A). Appendix A outlines organizations and their respective lists of Bird Species of Concern that warrant particular consideration and monitoring in accordance with these laws.

The following considerations are pertinent to migratory bird management.

- ***Nuisance bird problem prevention:*** Exclusion of nuisance birds is the preferred method; Natural Resources Division can provide technical support to those needing assistance. Installation and materials for such exclusion must be accomplished in coordination with the Public Works Division. Unfortunately, exclusion is not always possible or completely effective. Natural Resources Division biologists will assist in developing exclusion devices where bird access or nesting cause problems.
- ***Injured and nuisance birds:***
 - *Final Rule –Removal of Migratory Birds From Buildings* (as discussed in Appendix A) allows removal of migratory birds (other than federally listed threatened or endangered species, bald eagles, and golden eagles) from inside buildings in which the birds may pose a threat to themselves, to public health and safety, or to commercial interests. This regulatory addition facilitates removal of birds from buildings, which would otherwise require a migratory bird permit. Birds removed under this rule must be captured using a humane method and, in most cases, immediately released to the wild. “*This regulation does not allow removal of birds or nests from the outside of buildings without a permit. Removal*

of active nests from inside buildings must be conducted by a federally permitted migratory bird rehabilitator.” The permit cannot be used for situations where birds “*are merely causing a nuisance.*”

- MCAS Miramar annually renews a depredation-airport permit. In the past, removal actions to alleviate excrement falling onto workspaces and aircraft have been deemed impacting public safety. The Natural Resources Division and Public Works Division have developed procedures for responding to injured or nuisance birds including active bird nests (with or without eggs or chicks). The Public Works Division maintenance trouble call system is to be used for assistance. A standard form has been developed to record data for each removal action in order to support annual permit reporting requirements.
- **Construction and Maintenance:** The approach will be to coordinate with those scheduling and performing construction and/or maintenance to avoid the breeding season, where possible. Wording in contracts and work orders will explain the law, and that it applies to all persons (not just federal agencies). A contract or work order does not authorize, encourage, or condone violation of the law, and workers are expected to comply. The Natural Resources Division has developed contractual and work order language for construction, reconstruction, and maintenance projects on the Station to minimize loss of bird nests and costly delays due to Migratory Bird Treaty Act prohibitions. This information is available for use in contracts and work orders and has been incorporated into many project specifications.

MCAS Miramar supports the DoD policy for integrating neotropical migratory bird management into existing natural resource and land management programs, consistent with the military mission. MCAS Miramar established and maintained Monitoring Avian Productivity and Survivorship stations to help determine nationwide bird demographics from 1996 through 2002 (Jones & Stokes 2003). Birds captured included 94 species; both total numbers and adult breeders showed declines during poor rainfall years.

7.2.9 Wildlife Damage Management (Including Bird and Animal Air Strike Hazard)

Objective: Reduce the Potential for Wildlife Damage

MCAS Miramar's boundaries interface with both urban and natural environments. Conflicts can arise with nuisance animals (*e.g.*, coyotes, ground squirrels, rattlesnakes, rats), which occasionally pose a health hazard. Furthermore, Special Status Species and other native wildlife are prey for some domestic animals. MCAS Miramar pest control is conducted through the Public Works Division, and if necessary, other local vector/animal control agencies. Wildlife problems previously identified at MCAS Miramar include coyotes around the former horse stables and housing areas, gulls and ravens from the landfill, and interference from birds, coyotes, and deer on the runway.

Assistance with nuisance animal problems can be acquired from U.S. Department of Agriculture, Wildlife Services on a reimbursable basis. In general, special permits are usually required to remove nuisance animals and can delay the response to the problem. Although leg hold traps are often the most effective technique for catching some animals, the use of body gripping traps by Wildlife Services personnel is restricted to addressing a demonstrated human health or safety problem with the concurrence of the CDFW. Additionally, State law has further restricted control of mountain lions with a protected species status.

The BASH program is an important consideration at MCAS Miramar. Bird collisions with aircraft are a serious threat to flight safety. At MCAS Miramar, incidents in recent years have involved common ravens, small song birds, a red-tailed hawk, and a herring gull. 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. The U.S. Department of Agriculture, Wildlife Services (2002) completed a Bird Air Strike Hazard Assessment for the Station. A review of the assessment and current conditions was completed in 2014 by the Station Wildlife Biologist; however, a new assessment by USDA Wildlife Services should

be done about the time F-35 facility construction is completed and basing begins. Flight line mowing is planned to minimize the attractiveness to birds and avoid adverse effects to Special Status Species with guidance provided by the USFWS¹⁹.

Miramar Station Order 3750.2a, *Bird/Animal Aircraft Strike Hazard (BASH) Reduction Plan* (28 August 2014), is implemented to minimize aircraft exposure to potentially hazardous bird/animal strikes at and around the Air Station and reduce bird/animal strike potential through awareness, avoidance, monitoring, and actively controlling bird and animal populations and movements. The plan implements a red, yellow, and green Bird Warning Condition system to adjust awareness and flying activities to various risk levels. It also establishes a Bird Working Group with assigned responsibilities. The Airfield Operations Officer is the Chairman, and is supported by Airfield Operations staff, the Natural Resources Division, and Facilities Maintenance Division for implementation of the program. Airfield operations staff are key personnel for monitoring bird and wildlife activity that could be BASH hazards. They use hazing and employ banger and screamer noise devices to deter birds. A propane cannon has been recently purchased to supplement non-lethal noise deterrents.

City of San Diego landfill operations with regard to bird abatement have been improved in recent years, as required by the lease. As a result, bird concentrations at the landfill are generally low. However, common raven concentrations have recently become a concern on the airfield. Preliminary indication is that raven concentrations may be a result of colonial roosting in San Clemente Canyon, rather than attraction to landfill operations. Potential beneficial effects of owls inhabiting aircraft hangers have been evaluated at other air stations. Since owls are nocturnal, they are much less of a BASH concern than other species. They may also prevent or reduce the presence of other birds and rodents from inhabiting hangars. Unfortunately, the mess created by owls living in some of the aircraft hangers on Station has created conflicts with aircraft maintenance. A variety of methods are used to resolve problems, including exclusion, harassment, and relocation. Most other birds, since they are active during daylight hours, are a greater BASH concern.

The Natural Resources Division maintains a list of wildlife rehabilitation centers for placement of injured or abandoned wildlife. The Division also has prepared standard operating procedures for handling road-killed/injured deer and other larger animals. The feeding of wild animals is discouraged. The CDFW web site “*What to do about Nuisance, Dangerous or Injured Wildlife*” (<https://www.wildlife.ca.gov/Living-with-Wildlife>) discusses injured or orphaned wildlife and provides advice for common human-wildlife interactions. The CDFW Keep Me Wild program (<https://www.wildlife.ca.gov/Keep-Me-Wild>) is designed to avoid issues created by providing food to wildlife, either inadvertently or on purpose. Wild animals naturally fear humans and keep their distance—so long as they remain fully wild. If wild animals have access to human food and garbage, they lose their natural fear of humans and can become aggressive; they might be killed. The CDFW Living with Wildlife website (<https://www.wildlife.ca.gov/Living-with-Wildlife/Rodenticides>) discusses guidance for protecting wildlife and pets from rodenticide baits.

7.2.10 Integrated Pest Management

Objective: Comply with the Federal Insecticide, Fungicide, and Rodenticide Act and Minimize the Use of Pesticides

Pest control includes insect, rodent, and disease management, particularly pesticide application management. Most pest management activities on Station are performed in coordination with or under the supervision of the Public Works Division. A 2012 Integrated Pest Management Plan (MCAS Miramar 2012) for the Station complies with applicable requirements, particularly those of the federal Insecticide, Fungicide, and Rodenticide Act and DoD and Department of the Navy policies. More information on

¹⁹ Bird Air Strike Hazard Prevention Program Mowing Operations, NAS Miramar (1-6-94-I-33) dated 14 January 1994.

guidance for protecting wildlife and pets from rodenticide baits can be found on the CDFW website at <https://www.wildlife.ca.gov/Living-with-Wildlife/Rodenticides>.

MCO 5090.2, para. 11104.1b) states, “*Each installation shall use the principles of Integrated Pest Management to avoid and minimize the use of pesticides when non-chemical alternatives are available and cost effective.*” Pesticide use in support of Station natural resources management activities involves invasive plant/weed control (Section 7.2.1, *General Vegetation Management and Soil Conservation*). Sections 7.2.8, *Migratory Bird Management* and 7.2.9, *Wildlife Damage Management* of this INRMP discuss nuisance bird, wildlife, and BASH topics associated with integrated pest management.

A 2010 mosquito/West Nile virus risk assessment²⁰ indicated that naturally ponding areas have sufficient populations of natural predators to effectively suppress mosquito breeding. Treating vernal pools and other naturally ponding areas for mosquito control (larvicide) was not recommended, but continued monitoring was recommended. Ponding at unnatural sites should be addressed by making alterations to operations to prevent water from ponding. No historic information was found to confirm the absence or presence of West Nile virus in mosquito populations on Station.

Africanized honey bees are expanding their range, including in the direction of MCAS Miramar; however, these bees have not been found on the Station to date. The Miramar Fire Department is the designated first responder to incidents suspected of involving Africanized honey bees. The Natural Resources Division assisted the Fire Department and Safety Division with the development of an Africanized honey bee response plan.

Finally, it is DoD’s policy to use current BMPs to protect pollinators (e.g., bees, birds, bats, butterflies, moths) and their habitats, when possible and to the extent practicable, by using native landscaping and minimizing the use of pesticides, including herbicides, in sensitive habitats (Memorandum dated 04 September 2014, *Department of Defense [DoD] Policy to Use Pollinator-Friendly Management Prescriptions*) in accordance with the *National Strategy to Promote the Health of Honey Bees and Other Pollinators* (House Memorandum dated 19 May 2015). MCAS Miramar does not actively create pollinator habitat.

7.2.11 Natural Resources-Related Outdoor Recreation Management

Objective: Provide Outdoor Recreation Opportunities When Feasible

MCO 5090.2 (para. 11104.1c) states, “*Marine Corps lands will be available to the public for enjoyment and use of natural resources, except when a specific determination has been made by the installation Commanding General/Commanding Officer (CG/CO) that a military requirement prevents such use for safety or security reasons, or when such use would cause substantial environmental degradation. A nonaccess or limited access determination will be explained in the installation’s INRMP.*”

A draft NAS Miramar Outdoor Recreation Tripartite Agreement (precursor to INRMPs) was prepared in 1992. This INRMP incorporates relevant aspects of the draft agreement that remain applicable, as related to natural resource management, and supersedes any benefits of such an agreement.

A further goal of Marine Corps natural resources management is to provide outdoor recreational opportunities, as appropriate. However, recreational opportunities at MCAS Miramar are limited by

²⁰ Memo from Officer in Charge, Navy Environmental and Preventive Medicine Unit Five, Naval Base San Diego, CA to Commanding Officer, Preventive Medicine, Naval Medical Center San Diego, CA. 15 June 2010. Subject: *Findings and Recommendations for the West Nile Virus Surveillance Program at Marine Corps Air Station (MCAS) Miramar.*

military operational and security needs, safety concerns, limited management staff to administer programs, and the relatively small land area with a finite resource base. Recreational activities dependent on developed facilities, such as the Miramar golf course, are managed and operated by Marine Corps Community Services (MCCS) under their specific guidelines. Management of the Miramar Fish Pond is accomplished jointly with the Miramar MCCS managing recreational aspects, Public Works providing facility management support, and the Environmental Management Department providing technical support regarding fishery and water quality issues.



Fish Pond

Natural Resources Division

Management Issues

MCO 5090.2 (para. 11104.5a) states, “Installations shall provide the public access to natural resources, provided such access is consistent with natural resources and military readiness preservation.”

Management issues at MCAS Miramar include determining the appropriate level of public access to allow for natural resource-dependent outdoor recreation on MCAS Miramar; implementing a program for such access; and integrating outdoor recreation with the operations and military mission of MCAS Miramar without compromising either. Proper management and supervision of outdoor recreation programs is needed to ensure that military safety and security requirements are met and natural resource damage is prevented. Current staffing does not allow for any increase in outdoor recreation opportunities or access. Without an increase in staffing, future development of natural resources-based outdoor recreation is not possible. Further, recreational access to undeveloped areas at MCAS Miramar is limited to a few activities that have been approved by the Committee for Land and Airspace Management Policy and/or the Commanding Officer.

Marine Corps policy is to permit off-road vehicle use only in areas and on trails designated by installation commanders. Unimproved roads must be monitored to prevent movement into sensitive areas (MCO P5090.2). MCAS Miramar does not have the staffing to implement such a program for recreational off-road vehicle use that would include monitoring to ensure natural resources are not damaged.

Stowe Trail is a recently designated non-motorized, multi-use trail for authorized permit-holding users on East Miramar. Stowe Trail provides connections to trails of Mission Trails Regional Park to the north and

south of the Station. Since the trail is on relatively flat terrain, minimal maintenance is expected. Maintenance needs will be evaluated by MCAS Miramar personnel in coordination with representatives from user groups, such as the San Diego Mountain Bike Association. Any maintenance deemed necessary would be accomplished as a cooperative effort of Station personnel and user group volunteers using only hand tools, following authorization by the Commanding Officer. Trail maintenance is best done when moisture is present in the soil so that good compaction and cohesion is obtained. As such, any maintenance would likely be done between late fall and early spring.

As surrounding areas have become urbanized, there has been increasing interest from the public to access MCAS Miramar for natural resource-related field tours and other outdoor recreation. Requests for field tours are typically limited to granting about one per month due to staffing constraints. Requests for field trips need to be submitted to the Public Affairs Office at least 60 days in advance along with proof of liability insurance.

Compatibility of other outdoor recreational activities must meet:

1. military operational and security needs;
2. safety hazards, such as explosive safety distances, firing range surface danger zones, and aircraft operation compatible use/clear zones;
3. staffing limitations; and
4. requirements for resources conservation, which must be carefully evaluated and will continue to limit recreational access.

Implementation of any new outdoor recreational program would involve initial trial phases and will be limited to MCAS Miramar, Marine Corps Recruiting Depot, and local Marine Corps Recruiting personnel (active duty and DoD employees), their dependents, and guests. Initial trial phases are expected to last for two to three years. Following initial trial phases and a determination of surplus resource availability, access by the general public would be accommodated through lottery drawing.

Hunting and Fishing

Executive Order 12962, *Recreational Fisheries* directs federal departments, including DoD, to improve the quantity, function, and sustainable productivity of recreational fisheries for increased opportunities, when practical to do so. A main focus of the recreational fisheries is the operation of a continuously maintained 7-acre pond in West Miramar (the Fish Pond). Due to its limited size and management by MCCA, access has been limited to authorized MCCA patrons (Active Duty, Reservists, retirees, DoD civilian employees of MCAS Miramar, and family members). Limited guests of these categories are also authorized.



Happy Anglers
Natural Resources Division

The pond was stocked repeatedly with rainbow trout and warm water fishes over its early years. The pond was closed to fishing about 1990. The USFWS (1992b) concluded that, with management, the Fish Pond could support a viable recreational sport fishery for Station personnel. In 1998, the Station Installation Restoration Program concluded that no clean up action was required and recreational fishing would not be a human health risk. During the 1990s, conditions at the Fish Pond deteriorated due to strong eutrophication and dissolved oxygen problems. A shoreline, fishery, recreation facilities restoration project was conducted (Green *et al.* 2001) through a combined restoration effort of the Marine Support Squadron 373, Public Works Center San Diego, MCCS, Environmental Management Department, and the Public Works Division. In 2004, the Fish Pond was re-opened. Naval Consolidated Brig and other working parties have removed a considerable amount of vegetation and debris to help maintain the site

since re-opening of the pond.

MCAS Miramar maintains a CDFW aquaculture permit, which allows fish stocking and removal (including fishing) without the requirement for individuals to possess a State fishing license. The MCCS Outdoor Recreation Center issues free fishing permits to authorized patrons, which have the aquaculture permit number to allow fishing in the Fish Pond and support annual reporting requirements. The Fish Pond is generally managed as a catch and release operation, except for special events; removal of fish is not allowed.

Executive Order 13443, *Facilitation of Hunting Heritage and Wildlife Conservation*, directs Federal agencies with programs and activities that have a measurable effect on public land management, outdoor recreation, and wildlife management to facilitate the expansion and enhancement of hunting opportunities and the management of game species and their habitat.

No formal hunting program has operated on the Station. Beginning in the mid-1980s, Navy natural resource staff initiated work toward development of a formal recreational hunting program involving upland game and archery deer hunting. This work showed that sufficient populations of deer, coyotes, and upland game (rabbits, quail, and doves) were present on the Station to support a limited hunting program (Hannan 1987). Changing priorities related to BRAC ceased any further work on this effort due to the transfer of the Station from the Navy to Marine Corps.

Since then, MCAS Miramar has determined that it is not currently feasible to develop and implement a recreational hunting program. Opportunities for such hunting would be extremely limited, and the Station does not have the personnel to operate such a program, which would require close monitoring of hunting.

Special Natural Areas

DoDI 4715.03, Enclosure 3, states “*Areas on DOD installations that contain natural resources (e.g., ecological, scenic, recreational, or educational) that warrant special conservation efforts may be designated as special natural areas, where such conservation is consistent with the military mission.*” These special native areas should be reassessed if mission requirements change, according to DoDI 4715.03, Enclosure 3. The Miramar Mounds National Natural Landmark is one such area that is frequently visited by tours. Development of an interpretive trail around vernal pools would better support managed public access and viewing.

7.2.12 INRMP Planning & Implementation

Objective: Review and Update this INRMP at Least Every Five Years

This INRMP must be reviewed at least every five years, as stipulated by the Sikes Act and Marine Corps policy, and coordinated with the USFWS and CDFW. The INRMP must also be updated when major changes are made to the natural resources program. The list of planned projects in Appendix E can be used to guide the review and adjust applicable programs per the adaptive management process.

Objective: Provide Staffing and Supplies/Equipment to the Natural Resources Program

MCO 5090.2 (para.11104.1i) states, “*Personnel with natural resources responsibilities must, as a condition of employment, possess the appropriate knowledge, skills, and professional training/education to perform their duties. Installation commanders will provide natural resources personnel timely and necessary supplemental training to ensure proper and efficient natural resources management. Installation commanders will also maintain adequate natural resources staffing levels to provide and sustain installation natural resources.*”

MCO 5090.2 (para. 11200.1d) also states, “*Managing (including planning, implementation, and enforcement functions) and conserving Marine Corps natural resources are inherently Governmental functions that shall not be outsourced by the Marine Corps under the DOD Commercial Activities Program or an installation operating services contracts.*”

The following staffing (full-time permanent USMC civilian positions) is required within the Natural Resources Division to implement this INRMP at MCAS Miramar:

Director, Natural Resources Division	1
Botanist	1
Wildlife Biologist	1

Above personnel do not include other personnel within the Environmental Management Department, other personnel within Public Works Division, or other organizations on MCAS Miramar (*e.g.*, Provost Marshal’s Office, Ground Training Office) who have roles in implementation of this INRMP. It also does not include other agency personnel, such as personnel with the Naval Facilities Engineering Command, Southwest or within the USFWS or CDFW.

The MCAS Miramar Natural Resources Division strives to continuously improve the success of natural resources management activities through professional development, information exchange, use of modern equipment and technology, and regular procurement of supplies needed to support day-to-day operations and several smaller scale projects. Professional training ensures that staff knowledge of management strategies is state of the art.

In general, staff members obtain USFWS training in ESA Section 7 consultation, wetland delineation, CWA Section 404 Nationwide Permitting, Western Area Counsel Office Annual Environmental Law Conference, and similar compliance-related training. Other training obtained in recent years by one or more staff members include the *Endangered Species Act and Habitat Management Course*, Ecological Risk Assessment, California Invasive Plant Council Conference, fairy shrimp identification, annual National Military Fish and Wildlife Association meeting, and the DoD Conservation Conference. Wildland fire management training is needed for Natural Resources Division staff responsible for supporting wildland fire management on the Station.

Objective: Implement in a Manner Consistent with the Protection of Cultural Resources at MCAS Miramar

Cultural resources management at MCAS Miramar is provided in accordance with Section 106 and Section 110 of the National Historic Preservation Act (16 USC Section 470, as amended), the Archeological Resources Protection Act (16 USC Section 470aa-47011), the American Indian Religious Freedom Act (42 USC Section 1996), the Native American Graves Protection and Repatriation Act (25 USC Section 3001 *et seq.*), Executive Order 11593 (*Protection and Enhancement of Cultural Environment*), DoD Directive 4710.1 (*Archeological and Historic Resources Management*, 1984), and U.S. Marine Corps policies. Means to achieve compliance with these laws and policies are outlined in the MCAS Integrated Cultural Resources Management Plan (MCAS Miramar ICRMP 2011b), currently under revision.

Cultural resource management efforts at MCAS Miramar have accomplished or documented the completion of basic archaeological surveys for virtually all undeveloped lands on Station and have evaluated all of the previously recorded archaeological sites for eligibility for the National Register of Historic Places, as required by the National Historic Preservation Act. Nearly all of MCAS Miramar has been adequately surveyed for cultural resources. As such, adequate survey information exists to support most natural resources, and other installation, management activities and operations.

Cultural Resources Implications for Natural Resources Management

Few natural resources projects would have the potential to adversely affect significant archaeological sites because most activities associated with substantial soil disturbance would only occur on sites already degraded by historical activities. The environmental assessment associated with the development of this INRMP provides an assessment of the potential for cultural resources effects (undertakings) during INRMP implementation.

It is important to ensure that provisions of this INRMP are consistent with the protection of cultural resources. Prior to any ground-disturbing, natural resources activity, the Cultural Resources Program Manager will evaluate proposed activities for compliance with all appropriate cultural resources laws and regulations. The National Historic Preservation Act, Section 106, requires consultation with the State Historic Preservation Office, affected Indian Tribes, and other interested parties regarding “undertakings” that may affect historic properties. The Cultural Resources Program Manager will assist with Section 106 consultation, as necessary. If cultural resources may be impacted, steps must be taken to avoid or mitigate damage.

Vegetation and soils management. Of all practices associated with natural resources management on MCAS Miramar, vegetation restoration and erosion control projects have perhaps the greatest potential to disturb archeological sites. Natural resources projects that involve excavation, earth moving, and/or fill deposition can damage or bury archeological sites.

Wetland restoration and development. The construction of compensatory wetlands, including vernal pool habitat, can involve moderate ground disturbance that can damage archeological sites.

Where restoration or mitigation work is a planned component of a construction project, necessary National Historic Preservation Act consultation is now being integrated into the project planning process. For example, approximately 699 acres of areas identified in advance as suitable for vernal pool mitigation underwent Section 106 consultation during the environmental assessment (2015).

Objective: Maintain an Up-to-Date Station Natural Resources GIS

MCO 5090.2, Chapter 1 defines a Geospatial Information System (GIS) as a “computerized tool used to input, edit, store, retrieve, manage, analyze, and present geographic or geospatial information.”

MCO 11000.25 (para. 1) states, “*Geospatial information is critical to provide effective installation management, improve our stewardship of natural resources, protect the environment, and support the training of Operating Forces.*”

The USMC Geospatial Information System, also referred to as GEOFidelis, is the Marine Corps geospatial data program used in support of USMC installation management. GEOFidelis includes guidance for the creation and documentation of all existing and newly created spatial and geospatial data. MCO 11000.25 (para. 3a(1)) states, “*All activities with installation management responsibilities shall include IGI&S [Installation Geospatial Information and Services] in their management, review, analysis, and decision-making process in order to effectively and efficiently meet their installation management mission.*”

MCAS Miramar GIS information is maintained by the Public Works Division who also has the Installation Geospatial Information and Services billet for overall GIS database management on the Station. The MCAS Miramar Environmental Management Department serves as the subject matter experts for Station environmental data that is a part of the official Station GIS database.

The Natural Resources Division has completed in recent years or is completing a number of projects to improve its geospatial data program, including the following:

- developed and maintains natural resources GIS data layers according to GEOFidelis requirements,
- developed specific language that is included in all contracts to ensure that all spatial data produced are fully compatible with Natural Resources Division GIS requirements,
- continually updates database information for existing environmental GIS coverages, and
- cleared the backlog of the creation of GIS data layers for natural and cultural resources from various reports and NEPA documents written for the Station.

The Natural Resources Division requires that Station natural and cultural resources be mapped with global positioning (GPS) technology whenever possible. The GPS data are then required to be converted to GIS data in a format compatible with the current Natural Resource GIS database format. Most Station natural and cultural resource mapping is done by contractors as a contract deliverable using their own GPS units. It is the goal of the Natural Resources Division to continue providing current, up-to-date information on natural resources locations to managers and decision-makers.

7.2.13 Agricultural Outlease Management

Objective: Manage the Agriculture Outlease

As part of the integrated management of natural resources, installation commanders shall review the suitability of their lands for agricultural leasing, under the Military Construction Authorization Act, when such leasing is advantageous to the United States. Installation commanders should also review the suitability of existing leases to ensure they promote the national defense or are in the public interest and do not conflict with existing or planned military land-use requirements. In addition, any agricultural leases must be compatible with goals and objectives of the installation’s INRMP. (MCO 5090.2, para. 11104.2c).

Agricultural funds are primarily intended to offset costs of maintaining agricultural leases, but they are also available for preparing and implementing INRMPs as well as other natural resource projects. Agricultural outlease income at MCAS Miramar provides significant support for implementation of this INRMP; therefore, renewal of the agricultural outlease on MCAS Miramar during this effective INRMP period is critical. Most of the rental revenue from the Miramar nursery agricultural outlease is returned to the Station by Headquarters USMC for INRMP implementation (i.e., “agricultural funded” projects). NAVFAC SW acts as the USMC agent for outleasing.

In recent years, the Miramar nursery agricultural outlease has provided a significant funding mechanism for projects such as updating soil erosion repair/control, vernal pool habitat surveys and studies, a plant genetics study, LTEM, vegetation mapping, rare plant surveys, interpretive/educational activities, and minor restoration project plant materials. Natural resources project management support and agricultural outlease management support from the Naval Facilities Engineering Command, Southwest are also funded by receipts from agriculture outlease.

DoD policy²¹, as subsequently adopted by the Department of the Navy and Marine Corps, requires that INRMPs address resource management on all of its real property, including lands occupied by tenants or lessees or being used by others pursuant to any other form of permission. Installation commanders may require tenants, lessees, permittees, and other parties that request permission to occupy or use installation property to accept responsibility, as a condition of their occupancy or use, for performing appropriate natural resource management actions.

The Miramar nursery agricultural outlease contains a Soil and Water Conservation Plan with provisions for the lessee to undertake, including control soil erosion and noxious/undesirable weeds within the lease area. There are also annual audits for compliance to environmental laws (both federal and state) and monthly pesticide-use reporting. The outlease also allows for conservation and maintenance work directed by the government on a cost reimbursement basis through rent credit. The Station's natural resource management includes lease areas as part of its overall management, without distinction based on boundaries.

²¹ *Supplemental Guidance for Implementation of the Sikes Act Improvement Act, Additional Guidance Concerning INRMP Preparation*, May 17, 2005, Assistant Deputy Under Secretary of Defense (Environment, Safety and Occupational Health).

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